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Monitoring and evaluation of HIV screening and testing of hospitalized infants and their mothers

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SETTING: Improved HIV monitoring and evaluation (M&E) is urgently needed to help close gaps in inpatient infant provider-initiated testing and counseling (PITC) and pediatric case identification. A revised reporting system was piloted on the Breastfeeding Ward at Hospital Central de Maputo in Maputo, Mozambique.

OBJECTIVE: To demonstrate how a simplified reporting system designed for pediatric inpatient ward registers can be used to easily calculate key PITC indicators, including testing coverage, HIV status, linkage to antiretroviral therapy, maternal testing, and point-of-care nucleic acid testing.

DESIGN: This was a retrospective review of PITC data documented in the ward discharge register for all inpatient infants with charts closed from January 1 to June 30, 2020.

RESULTS: At chart closure, 97.7% of infants (477/488) had known serostatus: 76.3% were not exposed (364/477), 15.3% were exposed (73/477), 1.9% definitively non-infected (9/477), and 6.5% infected (31/477). There was a 26.9% positivity rate (14/52) for infant point-of-care nucleic acid testing. Of all HIV-infected infants, 80.6% (25/31) were linked to antiretroviral therapy by the time of discharge. Preferred maternal testing was done in 80.5% of eligible mothers (276/343), with 3.0% newly positive (8/276).

CONCLUSION: This straightforward PITC reporting system enabled simple calculation of key indicators needed for standard M&E, contributed to quality improvement efforts to increase testing coverage, and could be easily adapted for use in other settings.

The Mozambique Ministry of Health (MoH) estimates that there are 143,000 children living with HIV in the country, and that as of 2019, only 66% were diagnosed.[1]Enhanced pediatric case-finding is urgently needed to reach UNAIDS 90-90-90 targets.[2] In alignment with WHO recommendations, MoH guidelines call for all patients admitted to hospitals to undergo screening to determine HIV status and provider-initiated HIV testing and counseling (PITC) when indicated.[3,4] There is considerable evidence of the effectiveness of routine inpatient PITC for pediatric HIV diagnosis in sub-Saharan Africa.[5–10] In Mozambique, a pediatric inpatient PITC study reported overall testing positivity of 8.3%, with the highest positivity rates in patients diagnosed with malnutrition, sepsis, and/or TB.[11] Routine inpatient PITC can be especially useful for filling gaps in identifying HIV-infected children who are younger with more severe disease.[6,7,12]

However, despite high testing yields, implementation of routine screening and PITC remains a challenge in high-volume referral hospitals. This is especially true among pediatric patients, despite WHO recommendations to prioritize this age group.[13]As a result, many infants and children are discharged without confirmation of HIV status. Prior studies have identified suboptimal routine inpatient pediatric PITC.[11,14]A study from Mozambique found documentation of testing results in only 35.7% of patients across pediatric wards.[11]Inpatient PITC is particularly problematic in breastfeeding infants due to the need for serial screening of mothers for postnatal seroconversion and virologic testing for confirmation of infection in infants <18 months of age.[15,16]

Programmatic improvement in inpatient case detection and linkage to antiretroviral therapy (ART) will depend on improved monitoring and evaluation (M&E) and site-level data collection systems which, at present, are either insufficient or completely lacking in most Mozambican hospitals. Neither the MoH nor US President's Emergency Plan for AIDS Relief (PEPFAR) routinely collect M&E indicators that accurately report on the HIV screening and PITC cascade in hospitalized infants with the capacity to report on preferred maternal testing for PITC of breastfeeding infants, or testing coverage for eligible patients. The data sources that most pediatric hospitals use for M&E reporting are PITC registers which record rapid test (RT) results and early infant diagnosis (EID) registers which record nucleic acid testing (NAT) results. However, these registers do not include the denominator of children/mothers who needed testing, and do not adequately reflect the dynamic of HIV screening in breastfeeding mothers. The limited published guidance regarding best practices for M&E of inpatient PITC does not adequately address these infant-specific challenges.[17,18]

On the Breastfeeding Ward at Hospital Central de Maputo (HCM-BW), a five-column system was previously used in the ward discharge register to document maternal RT, infant RT, previous DNA polymerase chain reaction (PCR) results, inpatient point-of-care virologic testing (POC), and ART for HIV-positive patients. Analysis of 2018–2019 data showed that, despite this cumbersome reporting scheme, it was difficult to differentiate prior vs. hospital testing in both children and mothers, complicating accurate reporting on inpatient HIV screening and PITC.

A simplified, revised two-column reporting scheme was introduced in the ward register in January 2020

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that requires classification of patient serostatus based on infant and maternal testing performed, and reports on ART status for HIV-infected infants. This manuscript describes the implementation experience with this revised approach to reporting inpatient infant HIV screening and PITC, using 2020 results to demonstrate the type of reporting that can easily be generated with this system.

STUDY POPULATION, DESIGN, AND METHODS

Study site and PITC procedures

This study was conducted at HCM-BW, the primary ward for infants 1–12 months of age, regardless of pathology. HCM uses an Abbott m-PIMA™ HIV-1/2 machine (Abbott Laboratories, Chicago, IL, USA) for point-of-care nucleic acid testing (POC NAT). Rapid HIV tests are routinely performed by lay counselors, and POC NAT tests are performed by nurses. PITC follows WHO and MoH guidelines which call for preferential testing of the mothers of admitted breastfeeding infants.[4,19] During the time period of this study, the national EID algorithm used a 2-month window period after weaning from breast milk for definitive testing, and had not yet replaced the standard 9-month RT with an NAT per new WHO recommendations.[20]

Study design and reporting system

This study was a retrospective review of the routine PITC data recorded in the BW discharge register using the new reporting system. Table 1 shows the associated job aid with instructions on how to document PITC results and ART at the time of chart closure. In the first column, a coded number between 1 and 14 was entered based on infant and maternal testing performed to classify the infant's serostatus. These codes are used to sort infants into one of five serostatus categories: not exposed (Codes 1–3), exposed (Codes 4–6), previously exposed/definitively non-infected (Codes 7–9), infected (Codes 10–12), and unknown (Codes 13–14). In the second column, a coded number between 1 and 3 was entered to document ART status for HIV-infected infants only: on ART at admission (Code 1), initiated ART during admission (Code 2), or not on ART at chart closure (Code 3).

Study participants

All infants who were discharged, died, or transferred from January 1 to June 30, 2020, were included. All patients are eligible for HIV screening during hospitalization and all admissions are documented in the ward register. There were no exclusion criteria—patients who did not receive PITC are documented as such.

Data collection

At the time of chart closure, patients' basic demographic, diagnostic, and PITC data were documented in the discharge register by ward physicians. For this study, only the two columns of PITC data (PITC code and ART code) were extracted from the ward register and entered directly into a MS Excel® database (MicroSoft, Redmond, WA, USA). PITC codes and ART codes from the register were tallied using the count function in Excel, and these counts were then used to calculate study indicators.

Data analysis

Descriptive statistics were used to summarize PITC coverage, PITC positivity, and linkage to ART therapy. Narrative description was used to describe the implementation process of the new PITC M&E system. All statistical analysis was performed using Excel.

TABLE 1 Job aid for documentation of PITC and ART in the ward discharge register (English translation)

PITC column → choose one of the following codes to classify the serology of the infant on chart closure (discharge, transfer, death, LTFU/abandon):	
1	Not exposed, mother with negative RT in the last 3 months, not repeated during hospitalization
2	Not exposed, mother with negative RT during hospitalization
3	Not exposed, infant with negative RT during hospitalization (mother not tested)
4	Exposed, mother known positive, previous DNA PCR-negative, POC NAT not repeated during hospitalization
5	Exposed, mother known positive, POC NAT negative during hospitalization
6	Exposed, mother new positive during hospitalization, POC NAT-negative during hospitalization
7	Previously exposed/definitively noninfected, already discharged from outpatient EID clinic before admission
8	Previously exposed/definitively noninfected, RT negative during hospitalization >2 months after weaning
9	Previously exposed/definitively noninfected, POC NAT-negative during hospitalization >2 months after weaning
10	Infected, mother known positive, previous DNA PCR-positive before admission
11	Infected, mother known positive, POC NAT-positive during hospitalization
12	Infected, mother newly positive during admission, POC NAT-positive during hospitalization
13	Unknown, mother with previous negative RT from >3 months prior, not repeated during hospitalization
14	Unknown, mother without documentation of previous RT, not tested during hospitalization
ART column → only for HIV-infected infants (PITC codes 10, 11, and 12)	
1	Already on ART at admission
2	Initiated ART during hospitalization
3	Not on ART at chart closure

PITC = provider-initiated testing and counseling, RT = HIV rapid test, loss to follow-up, DNA PCR = deoxyribonucleic acid polymerase chain reaction, POC NAT = point of care nucleic acid test, EID = early infant diagnosis, ART = antiretroviral therapy.

Ethical considerations

The protocol was approved by the Scientific Directorate of HCM, Maputo, Mozambique; the Institutional Review Board of the University of Eduardo Mondlane School of Medicine/HCM (CIBS FM&HCM/026/2020), Maputo, Mozambique; and the University of California Los Angeles South General Institutional Review Board, Los Angeles, CA, USA (IRB# 13-000579). Informed consent was not required, as this was retrospective review of routine ward data, and no personal identifiers were collected, only PITC and ART codes.

RESULTS

Infant PITC coverage

During the study period, 488 infants were admitted to HCM-BW. Figure 1 shows PITC coverage outcomes. At chart closure, 477 infants (97.7%) had known serostatus. Of the 11 (2.3%) infants with unknown serostatus, 6 (54.5%) had mothers who previously tested HIV-negative >3 months prior to admission (PITC Code 13) and 5 (45.5%) had a mother without documentation of a previous RT (PITC Code 14).

Infant serostatus at chart closure

Table 2 presents a detailed summary of infant serostatus at chart closure for each of the five serostatus categories (not exposed, ex-

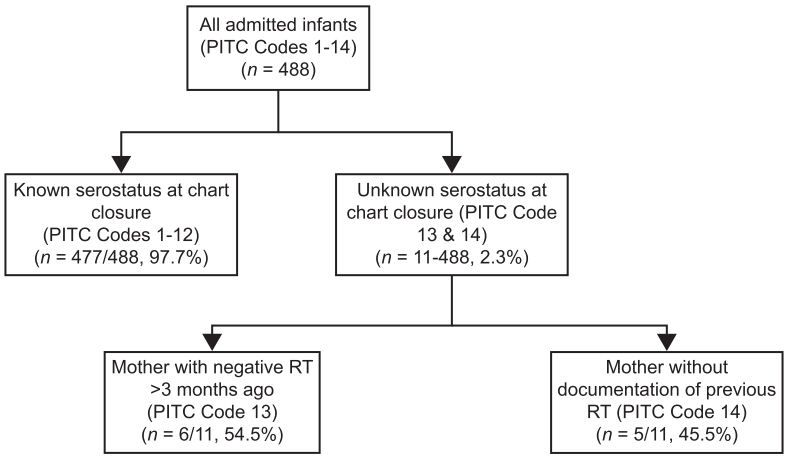

FIGURE 1 Infant PITC coverage. PITC = provider-initiated testing and counseling; RT = (HIV) rapid test.

posed, previously exposed/definitely non-infected, infected, or unknown) and for each of the 14 PITC codes. At chart closure, 364 infants (74.6%) were not exposed/not infected (PITC Codes 1–3), 73 (15.0%) were exposed/not infected (PITC Codes 4–6), 3 (1.8%) were previously exposed but definitely non-infected (PITC Codes 7–9), 31 (6.4%) were infected (PITC Codes 10–12), and 11 (2.3%) had an unknown serostatus (PITC Codes 13–14).

Linkage of HIV-infected infants to ART

Of the 488 infants admitted to HCM-BW during the study period, 31 (6%) had an HIV-infected serostatus at chart closure (PITC Codes 10–12). Of these, 14 (45%) were already on ART at admission (ART Code 1), 11 (36%) initiated ART during admission (ART Code 2), and six (19%) were not initiated on ART by chart closure (ART Code 3) (Figure 2).

Additional indicators and indicator calculation instructions

The revised data collection system can be used to calculate several indicators in addition to those presented above. These include the number of new diagnoses, maternal testing outcomes, and infant NAT testing outcomes. Tables 3 and 4 present a comprehensive list of infant and maternal indicators, respectively, with their calculation instructions and results from our site. During the study period, 14 infants and eight mothers were newly diagnosed with HIV at our site. Of the 343 mothers (70.3%) who were eligible for testing during admission of their infant (those without documentation of previous testing or those with their last test >3 months prior to admission), 276 mothers (80.5%) were tested, with 268 mothers (97.1%) testing negative and 8 mothers (3.0%) testing positive. NAT testing was

TABLE 2 Summary of infant serostatus at chart closure and PITC categories

		Infants	
PITC Code(s)	Infant serostatus at chart closure PITC category description	*n*	%
1–3	Not exposed	364	74.6
1	Mother with negative RT within the last 3 months, RT not repeated at HCM-BW	40	8.2
2	Mother with negative RT at HCM-BW	268	54.9
3	Infant with negative RT at HCM-BW (mother not tested at HCM-BW)	56	11.5
4–6	Exposed	73	15.0
4	Mother known positive, previous negative DNA PCR, POC NAT not repeated at HCM-BW	39	8.0
5	Mother known positive, negative POC NAT at HCM-BW	32	6.6
6	Mother newly positive with positive RT at HCM-BW, negative POC NAT at HCM-BW	2	0.4
7–9	Previously exposed, definitely uninfected	9	1.8
7	Discharged from outpatient EID clinic before admission to HCM-BW	2	0.4
8	Infant with negative RT at HCM-BW >2 months after weaning	3	0.6
9	Infant with negative POC NAT at HCM-BW >2 months after weaning	4	0.8
10–12	Infected	31	6.4
10	Mother known positive, previous positive DNA PCR	17	3.5
11	Mother known positive, positive POC NAT at HCM-BW	8	1.6
12	Mother newly positive with positive RT at HCM-BW, positive POC NAT at HCM-BW	6	1.2
13–14	Unknown	11	2.3
13	Mother with negative RT over 3 months ago, RT not repeated at HCM-BW	6	1.2
14	Mother without documentation of previous RT, RT not administered at HCM-BW	5	1.0
1–14	Total	488	100.0

PITC = provider-initiated testing and counseling; RT = (HIV) rapid test; HCM-BW = Hospital Central de Maputo, Breastfeeding Ward; PCR = polymerase chain reaction; POC NAT = point-of-care nucleic acid test; EID = early infant diagnosis, ART = antiretroviral therapy.

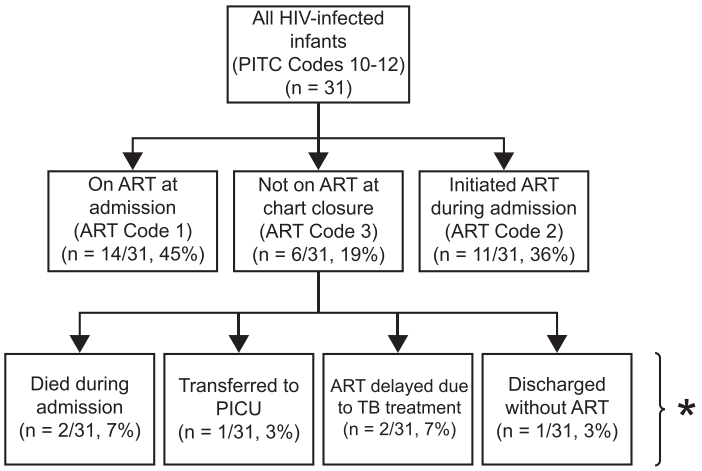

FIGURE 2 Linkage of HIV-infected infants to ART during admission. *Note that the data comprising the bottom row of the figure was collected through additional chart review. The PITC M&E system presented here could be modified by disaggregating ART Code 3 into several codes for sites that prefer to capture the reason why HIV-infected infants are not on ART at chart closure. This change is planned for HCM-BW. PITC = provider-initiated testing and counseling; ART = antiretroviral therapy; PICU = pediatric intensive care unit; M&E = monitoring and evaluation; HCM-BW = Breastfeeding Ward at Hospital Central de Maputo.

performed in 52 infants, with 14 infants (26.9%) testing positive and 38 infants (73.1%) testing negative.

DISCUSSION

Closing gaps in inpatient pediatric case-finding and linkage to ART will require improved M&E systems with robust data. Unfortunately, in contrast to other sectors such as antenatal clinics/maternity wards and TB clinics, the Mozambique MoH does not currently receive testing coverage data from eligible patients admitted to pediatric wards.[11] In addition, reporting on the PITC cascade for hospitalized breastfeeding infants is particularly challenging due to the added complexity of needing serial screening of their mothers for seroconversion and for virologic testing for confirmation of infection.[11,15,16] The new ward register-based PITC data collection system implemented at HCM-BW helps close these data gaps by being able to report PITC coverage while providing information on other key infant and maternal PITC indicators that could be incorporated into standard M&E reports or used for clinical evaluations and quality improvement initiatives. Furthermore, results can be easily cross-referenced with pre-existing PITC and EID registers to ensure data reporting accuracy.

The most important aspect of this new system is that it allows for reporting of PITC coverage by including the denominator of all patients who were admitted and eligible for PITC per MoH guidelines, something that is not possible with reporting based on PITC or EID registers that only report on the numerator of patients tested. In this study, 97.7% of infants had known serostatus at chart closure. This was in stark contrast to prior research from Mozambique obtained from chart reviews that reported PITC coverage of only 35.7% across various pediatric wards.[11]Significant

TABLE 3 Comprehensive list of infant indicators with calculation instructions

Infant indicator	How calculated	Results
Testing coverage		
Total number of infants	Sum of counts of PITC codes 1–14	488
Number of infants eligible for testing	Counts of PITC codes 3+5+6+8+9+11+12+13+14	122
Number of eligible infants tested	Counts of PITC codes 3+5+6+8+9+11+12	111
Proportion of eligible infants tested	[Counts of PITC codes (3+5+6+8+9+11+12)/counts of PITC codes (3+5+6+8+9+11+12+13+14)] * 100	91.0%
Serostatus at chart closure		
Number of infants with known serostatus	Sum of counts of PITC codes 1–12	477
Proportion of infants with known serostatus	[(Sum of counts of PITC Codes 1–12)/(sum of counts of PITC codes 1–14)] * 100	97.7%
Number of infants with unknown serostatus	Sum of counts of PITC codes 13+14	11
Proportion of infants with unknown serostatus	[(Counts of PITC codes 13+14)/(sum of counts of PITC codes 1–14)] * 100	2.3%
POC-NAT testing		
Total number of POC-NATs administered	Counts of PITC codes 5+6+9+11+12	52
Number of negative POC-NATs	Counts of PITC codes 5+6+9	38
Number of positive POC-NATs	Counts of PITC codes 11+12	14
Proportion of positivity of POC-NATs	[(Counts of PITC codes 11+12)/(counts of PITC codes 5+6+9+11+12)] * 100	26.9%
New diagnoses		
Number of newly diagnosed infants	Counts of PITC codes 11+12	14
Proportion of admitted infants newly diagnosed	[(Counts of PITC codes 11+12)/(sum of counts of PITC codes 1–14)] * 100	2.9%
Linkage to ART for infected infants at chart closure		
Total number of infected infants	Counts of PITC codes 10+11+12	31
Number of infected infants on ART	Counts of ART codes 1+2	25
Proportion of infected infants on ART	[(Counts of ART codes 1+2)/(counts of PITC codes 10+11+12)] * 100	80.6%
Number of infected infants without ART	Counts of ART code 3	6
Proportion of infected infants without ART	[(Counts of ART code 3)/(counts of PITC codes 10+11+12)] * 100	19.4%

PITC = provider-initiated testing and counseling; POC NAT = point-of-care nucleic acid test; ART = antiretroviral therapy.

TABLE 4 Comprehensive list of maternal indicators with calculation instructions

Maternal indicator	How calculated	Results
Testing coverage		
Number of mothers eligible for testing	Counts of PITC codes 2+3+6+12+13+14	343
Number of eligible mothers tested	Counts of PITC codes 2+6+12	276
Proportion of eligible mothers tested	[Counts of PITC codes (2+6+12)/(2+3+6+12+13+14)] * 100	80.5%
Testing outcomes		
Number of mothers testing negative	Count of PITC code 2	268
Number of mothers testing positive	Counts of PITC codes 6+12	8
Proportion of mothers testing positive	[(Counts of PITC codes 6+12)/(counts of PITC code 2)] * 100	3.0%
New diagnoses		
Number of newly diagnosed mothers	Counts of PITC codes 6+12	8
Proportion of all mothers newly diagnosed	[(Counts of PITC codes 6+12)/(sum of counts of PITC codes 1–14)] * 100	1.6%

PITC = provider-initiated testing and counseling.

efforts have been made in recent years to improve PITC practices at HCM-BW, and the introduction of this new system was needed in order to be able to demonstrate these results using routine register-based data.[21]

Another advantage of this new system is the ability to differentiate exposed infants from previously exposed, definitively non-infected infants for accurate reporting and follow-up. The new system enables this differentiation by integrating infant breastfeeding and weaning status as part of the PITC code assignment. An additional benefit is the system's ability to differentiate patients who already have a known serostatus at admission from those who are tested during admission. This is enabled by integration of prior testing history as part of the PITC code assignment. Not all patients require testing during their admission, and the system's differentiation here rightfully shifts the emphasis from the simple number of tests administered to the proper execution of testing algorithms.

The new system was designed to incorporate preferential maternal testing and link maternal and infant test results. The ability to identify newly positive mothers is an essential component of infant PITC, given the significant rates of incident maternal infection during pregnancy and breastfeeding, with high corresponding vertical transmission rates.[15,16] Results indicate that testing mothers is a productive case-finding strategy (8 [1.6%] newly positive mothers were identified), but that there is still room for improvement in terms of preferred maternal testing for hospitalized infants (only 80.5% of eligible mothers were tested).

By linking to ART outcomes, the new system can be used as a consolidated data source across the HIV continuum of care. Before the implementation of this system at HCM-BW, analyzing linkage to ART outcomes required cross-referencing several registers required for standard MoH reports including ART, EID, and PITC registers. While these other registers are still needed, consolidating comprehensive PITC and ART results in the ward register gives the ward clinical team easy access to data that can drive quality improvement initiatives and feed into standard MoH M&E reports.

Given the past experience with a cumbersome five-column ward register-based PITC reporting system at HCM-BW, usability was a key priority for this revised system. There is limited space in the ward register and other important data that need to be recorded about hospitalizations. Requiring clinicians to use a job aid to classify infant serostatus at discharge based on screening and testing performed allowed for a reduction to only two columns (PITC code and ART code) while significantly increasing the number of indicators that could be accurately reported. Periodic reports are easily generated by simply entering the PITC codes for each admission into an Excel spreadsheet with embedded formulas that automatically do counts and calculate indicators without the user needing to know how to do advanced spreadsheet functions.

This system could be easily adapted for other sites according to local context and preferences. First, the PITC codes could be revised for settings with different PITC algorithms for breastfeeding infants. Second, sites without access to POC NAT could include a PITC code for infants with a presumptive HIV diagnosis at time of discharge due to a pending conventional DNA PCR. Third, ART Code 3 (for infected infants not on ART at chart closure) could be disaggregated for sites that prefer to capture the reason why (this change is planned for HCM-BW). Finally, the codes could be adapted for wards that care for breastfeeding children >12 months of age.

There are notable limitations to the evaluation of this revised reporting system for inpatient PITC in breastfeeding infants. To date, the new system has only been implemented at one site (HCM-BW), and as a result we are not able to compare user experience between sites. Another limitation is that this ward register-based system requires that clinicians complete and assign PITC and ART codes based on the patient's medical history. For sites that rely on clerks to complete ward discharge registers, clinicians would need to assign PITC codes when closing the hospital chart, as these classifications cannot be made by administrative staff.

In conclusion, routine inpatient pediatric PITC is a high-yield case-finding activity recommended by the WHO and the Mozambique MoH, but available evidence suggests that there are significant gaps in implementation, particularly for breastfeeding infants. Reliable information on the testing coverage of eligible patients and their mothers is an urgent need for clinical service directors and public health policy makers, but systems for data collection and upward reporting are lacking. First, national HIV programs and donors should include inpatient PITC coverage and positivity as required indicators for hospital-level reporting. One possibility for sites to be able to comply with this reporting requirement would be to triangulate pediatric inpatient testing and hospitalization data. We recommend a ward register-based approach which can drive performance improvement and increase local ownership of results by requiring inpatient clinicians to document HIV serostatus at discharge. For children over 18 months of age who are no longer breastfeeding, there would only be a

need to record the child's HIV RT results, while the system presented here would be better to report on the more complex screening needed for breastfeeding infants and their mothers. Implementation of similar ward register-based systems would not only facilitate reporting of PITC coverage and positivity, but also provide more granular maternal and child testing data that, even if not included in routine M&E reports, could inform clinical evaluations and quality improvement efforts.

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CONTEXTE : Une amélioration du suivi et de l'évaluation du VIH est urgemment nécessaire afin d'aider à combler les lacunes en matière de conseil et de dépistage à l'initiative du soignant (PITC) chez l'enfant hospitalisé et d'identification des cas pédiatriques. Une nouvelle version du système de notification des cas a été testée dans l'unité dédiée à l'allaitement maternel de l'hôpital central de Maputo, Mozambique.

OBJECTIF : Démontrer comment un système simplifié de notification des cas conçu pour les registres des unités hospitalières pédiatriques peut être utilisé afin de facilement calculer les indicateurs PITC clés, dont la couverture du dépistage, le statut VIH, le lien avec le traitement antirétroviral, le dépistage maternel et le test d'amplification des acides nucléiques au point de services.

MÉTHODE : Il s'agissait d'une revue rétrospective des données PITC documentées dans le registre des sorties de l'unité pour tous les enfants hospitalisés dont les dossiers ont été clôturés entre le 1er janvier et le 30 juin 2020.

RÉSULTATS : Au moment de la clôture de leur dossier, 97,7% des enfants (477/488) avaient un statut sérologique connu : 76,3% n'avaient pas été exposés au VIH (364/477), 15,3% avaient été exposés (73/477), 1,9% étaient définitivement non infectés (9/477) et 6,5% étaient infectés (31/477). Le taux de positivité aux tests d'amplification des acides nucléiques réalisés au point de services pédiatriques était de 26,9% (14/52). Parmi tous les enfants infectés par le VIH, 80,6% (25/31) étaient reliés à un traitement antirétroviral d'ici à leur sortie de l'hôpital. Le test préféré de dépistage maternel a été réalisé chez 80,5% des mères éligibles (276/343), dont 3,0% ont reçu un résultat positif (8/276).

CONCLUSION : Ce système de notification PITC simplifié a permis de facilement calculer les indicateurs clés nécessaires à un M&E standard, tout en contribuant aux efforts d'amélioration qualitative visant à accroître la couverture du dépistage. Il pourrait aisément être adapté à une utilisation dans d'autres contextes.

Public Health Action (PHA) welcomes the submission of articles on all aspects of operational research, including quality improvements, cost-benefit analysis, ethics, equity, access to services and capacity building, with a focus on relevant areas of public health (e.g. infection control, nutrition, TB, HIV, vaccines, smoking, COVID-19, microbial resistance, outbreaks etc).

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