

**Kingdom of Cambodia
Nation Religion King**



**Documentation on Implementation of Continuous Quality
Improvement by Plan-Do-Check-Act at HIV Care Services in
Cambodia**



National Center for HIV/AIDS Dermatology and STD

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List of Abbreviations and Acronyms:

Abbreviation	Definition
ARV	Antiretroviral
ART	Antiretroviral Therapy
CD4	T-CD4+ Lymphocyte
CQI	Continuous Quality Improvement
COC	Continuum of Care
HAART	Highly Active Antiretroviral Therapy
SOP	Standard Operational Procedure
KII	Key informants interviews
LTFU	Lost to Follow Up
MDG	Millennium Development Goal
MOH	Ministry of Health
NCHADS	National Center for HIV/AIDS Dermatology and STD
OI	Opportunistic Infection
PLHIV	People Living with HIV/AIDS
TWG	Technical Working Group
VCCT	Voluntary Counseling and Confidentiality Testing
WHO	World Health Organization

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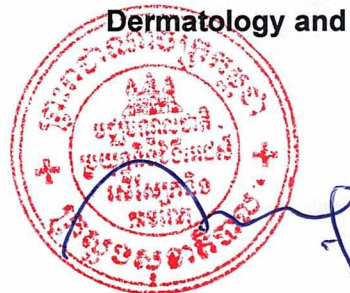
First of all, as the Director of the National Center for HIV/AIDS, Dermatology and STD (NCHADS), I would like to express my gratitude and sincere thanks to Sampeov Meas Provincial Hospital, MOUNG RUSSEY Referral Hospital, Sampeov Loun Referral Hospital, Poi Pet Referral Hospital, Kampong Chhnang Provincial Hospital, Sothnikum Referral Hospital, Doun Keo Provincial Hospital, Kampot Provincial Hospital, Association of Chhouk Sar Clinic and all participants who provided valuable information for the report of **Documentation on Implementation of Continuous Quality Improvement by Plan-Do-Check-Act at HIV Care Services in Cambodia.**

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**Director of National Center for HIV/AIDS
Dermatology and STDs**



Dr. Ly Penh Sun

Executive Summary

Introduction

Antiretroviral treatment (ART) is highly effective in reducing HIV-related mortality and thus improving life expectancy for people living with HIV (PLHIV) worldwide. In 2014, the UNAIDS announced its ambitious '90–90–90' goal. By 2020.

As part of this, NCHDS has developed two key activities: clinical mentoring and CQI. As outlined in “Standard Operating Procedure for Clinical Mentoring for Quality Improvement within Pre-ART and ART Services for Adults and Children in Cambodia”

Concept of continuous quality improvement (CQI) has been applied in HIV care and treatment services since 2010. Standard Operational Procedure (SOP) for the Continuous Quality Improvement for Continuum of Care for people living with HIV (PLHIV) in Cambodia was first put into practice in late 2012, and a revision was made in 2018.

Methods

This study was conducted in nine pre-ART/ART sites. are (1) Association of clinic in Municipality and eight others are province (Provincial hospital and Referral hospital).

Mixed method that combines quantitative and qualitative. Quantitative method will be used to measure the trends of the 06 indicators above by year starting from 2018 to 2020.

Qualitative method will be used to identify the perception of healthcare workers related to the benefits of having CQI implemented in the pre-ART/ART site, enabling and hindering factors associated with the implementations.

Results

The trend of the selected indicators on the selected study sites varies during the analysis period between 2018 and 2020, most of the indicators are much better in response to national policy and strategy settings to reach the national goals 90-90-90 by 2020

Apparently, such as the Indicator of AIDS-related deaths has declined in selected study sites from 0.50 percent in the first quarter in 2020 (Figure 12), to 0.22 percent in the fourth quarter. The average rate of ART patients lost to follow-up with the lowest rate of 0.51 percent was observed in the second quarter in 2019, but reached peak of 2.01 percent in the fourth quarter of 2020 (Figure 22). The average rate of ART patients coming for clinical visits as scheduled during the analysis period was fluctuated with the lowest rate of 69.42 percent in the first quarter 2018 was increased to 75.12 percent in the fourth quarter of 2020 (Figure 32). The average rate of PLHIV having the routine viral load test at least once for 12 months, over the analysis period, the lowest rate of 71.24 percent was observed in 2018 then increased to approximately 86.30 percent during the year 2020 (Figure 34). The rates of PLHIV who have

suppressed viral load was stable around 97% since 2019 to 2020 (*Figure 36*). The rates of retention in care have increased only marginally since 2018 with the rate is 79.87percent in 2019 and 77.91 percent in 2020 at selected sites (*Figure 38*).

The study showed that increasing the knowledge of health care providers is one of the strategies used to improve the CQI implementation situation in Cambodia. Training sessions were organized with aim of improving the knowledge and skills of health care providers/ART clinic staff on CQI implementation.

These different implementations would have had a different effect on the implementation of CQI at each clinic. Some experiencing improvements may have been progressive, acknowledging that comprehensive assimilation of CQI would likely take some time. Based on the study results, if health care workers remained committed and had available time, the implementation would have improved.

Discussion

There were differences in workload, building size, and functionality of the equipment. Common root causes — across most clinics for low care testing rates included poor clinical documentation, poor filing of results, and lack of a patient tracking system. Although most of the health providers participated in the CQI activities, received training on all the CQI tools, and had quarterly CQI meetings.

So, the capacity building is likely to strengthen clinic operations and availability of health workers to engage in the CQI implementation regularly whilst improving staff skills, ethics, and patient health outcomes.

The success of all ART sites' HIV response has been achieved with significant of great efforts by national HIV programs supported by civil society and international development partners. , with some elements of the response, such as health care providers, logistics support, laboratory systems strengthening.

Finally, although the results of implementation were high on some parts of the CQI's indicators, we did not measure the quality of their mentorship. It is possible that the quality of mentorship may have been as high as expected and that the CQI mentors themselves needed additional training and supervision. However, giving close support to the improvement mentors during implementation is likely to have been a major issue.

i. Introduction

Concept of continuous quality improvement (CQI) has been applied in HIV care and treatment services since 2010. Standard Operational Procedure (SOP) for the Continuous Quality Improvement for Continuum of Care for people living with HIV (PLHIV) in Cambodia was first put into practice in late 2012, and a revision was made in 2018.

Cambodia is now striving for virtual elimination of new HIV infections by 2025. Virtual elimination is defined as having fewer than 3 new infections per 100,000 population a year and decreasing the mother-to-child transmission to the rate of 5% or less, according to the Strategic Plan for HIV/AIDS and STI Prevention and Control in the Health Sector in Cambodia 2016-2020. Given that the progress of the national scale-up of ART treatment services is promising, Cambodia has set a national goal of getting 95% of PLHIV diagnosed, 95% diagnosed PLHIV on treatment, and 95% of PLHIV on treatment virally suppressed in order to eliminate new HIV infection by 2025 (1).

In order to reach these goals, NCHADS has outlined three main strategies for the health sector HIV responses:

1. Boosted Continuum of Prevention to Care and Treatment (CoPCT): key population prevention and links to services;
2. Boosted Continuum of Care (CoC): retention and improvement of service quality for patients in care;
3. Boosted Linked Response (LR): elimination of new infection among children while addressing the needs of their mothers.

This cornerstone activity brings together these three strategies, along with a new strategy of IRIR. B-IACM has strived to track individuals across a cascade of care through Case Management Coordinators (CMCs) and Case Management Assistants (CMAs), strengthened information systems and improved use of individual level data.

ii. Background

As part of this, NCHDS has developed two key activities: clinical mentoring and CQI. As outlined in “Standard Operating Procedure for Clinical Mentoring for Quality Improvement within Pre-ART and ART Services for Adults and Children in Cambodia” published in 2014, an on-site approach to develop and apply clinical competency through clinical mentoring so that staff capacity and professional support relationship can be built and referral networks between experts and sites can be established. Clinical mentors use the dashboards and

indicators established through the CQI as tools and metrics for monitoring their clinical mentoring work with the providers at sites.

What the CQI consist of and how the CQI operates are outlined as follows.

All of Antiretroviral Therapy (ART) clinics are supposed to apply the cycle of plan-do-check-act (P-D-C-A) to maintain or improve the quality of HIV care services. To implement the CQI, ART clinics are required to regularly collect quality data at sites of their services and properly store them in their own databases for performance review, problems identification and prioritization, causal analyses of the identified problems, and planning and implementation of corrective actions.

iii. Rationale

With more than 10 years of implementation in Cambodia, CQI for HIV care services and its effectiveness have never been documented. Proper documentation of the implementation of P-D-C-A by ART team will allow the national program to address key hindering factors and promote enabling factors through insights of actual practices in the HIV care and treatment services.

iv. Objectives

4.1. General Objective:

To assessing the coverage of practice of Continuous Quality Improvement (Plan-Do-Check-Act) and perception of health care providers on benefits of having CQI implementation at the pre-ART/ART sites including enabling and hindering factors.

4.2. Specific Objectives:

1). To estimate the coverage of implementation of continuous quality improvement (P-D-C-A) approach in Cambodia.

2). To measure trend of selected indicators

- a. Percentage of ART patients died,
- b. Percentage of ART patients lost to follow-up,
- c. Percentage of ART patients came for clinical visit as scheduled,
- d. Percentage of ART patients have routine viral load at least once for 12 months
- e. Percentage of PLHIV receiving ART who have suppressed viral load

- f. Percentage of PLHIV known to be on treatment for 12 months after initiation of ART

3). To identify perception of healthcare workers on:

1. Implementation of CQI at the ART facility,
2. Enabling factors to implementation of CQI at the ART facility
3. Hindering factors to implementation of CQI at the ART facility

v. Methods

5.1. Study design and Setting:

This study was conducted in nine sites selected from December 2020 to March 2021. The nine pre-ART/ART sites are (1) Sampeov Meas Provincial Hospital; (2) MOUNG Russey Referral Hospital; (3) Sampeov Loun Referral Hospital; (4) Poi Pet Referral Hospital; (5) Kampong Chhnang Provincial Hospital; (6) Sothnikum referral Hospital; (7) Doun Keo Provincial Hospital; (8) Kampot Provincial Hospital and (9) Association of Chhouk Sar clinic in Phnom Penh Municipality.

This study consists of two parts: quantitative and qualitative methods were carried out among health care provider and non-health care provider. There is a questionnaire of data collection tool was used for clinician/nurse/ data management officer or data entry clerk to assess perspectives of health care providers and non-health care providers.

5.1.1. Quantitative part:

Data collection: to measure the trend of selected indicators data were extracted from database at nine ART sites between 2018 to 2020.

Data analysis: Statistical analysis was performed using Stata software version 14.0 for cleaning and analysis data.

5.1.2. Qualitative part:

For qualitative part, the data collection team conducted in-depth interviews with health care providers and non-health providers at ART sites. The interviewers used a mobile device to digitally record audio during the interview and took notes by hand during the interview. Audio files were uploaded to our secure database for transcription. We did not collect any personal identifying information during interviews. All interviews were assigned an identification number based on clinic code and interview code. Qualitative data were manually coded and transcribed. We analyzed the data by key themes, built constructs and theories, and identified relations among them.

5.2. Study population:

The study setting includes ART sites in eight targeted provinces and municipality, and the target population were team members working at the sites who are health and non-health workers—providers of the continuum of care.

5.3. Sample size:

27 ART team members at 9 ART sites were recruited. At each site, 1 team leader/ clinician, 1 counsellor, and 1 data clerk were interviewed.

5.4. Sampling method:

The sampling frame was the list of all ART sites with 500 patients or more. Nine ART sites (8 in provinces and 1 in Phnom Penh municipality) were randomly selected using Microsoft Excel. Table 1 shows all the 9 selected sites.

5.5. Study tools:

We used question-guide below to gather qualitative data

- a. Related to having CQI implemented in the ART facility,
- b. Regarding factors that enable them to implement CQI in the ART facility
- c. Regarding factors that hinder them to implement CQI in the ART facility

vi. Findings:

6.1. Quantitative

6.1.1. To estimate the coverage of implementation of continuous quality improvement (P-D-C-A) approach in Cambodia

Origin and Objective of the CQI

Deming's approach, quality is maintained and improved when leaders, managers and the workforce understand and commit to constant customer satisfaction through the CQI—a problem-solving method. The Granddaddy of Continuous Improvement Model is adapted from the Deming or Shewhart cycle called P.D.C.A cycle: Plan>>Do>>Check>>Act.

- Plan: Identify and assess an opportunity, gap, or problem and plan a change to improve it
- Do: Make the change, generally on a small scale
- Check: Verify and use data, that the change

Shewhart cycle called P.D.C.A cycle: Plan>>Do>>Check>>Act

Figure 1: The PDCA Cycle



Structure, Role and Membership

Figure 2: Structure of CQI-CoC



Most of the ART clinics in Cambodia have implemented the CQI concept in order to maintain and improve quality health care service. It becomes a routine practice for all health care providers.

How many ART clinics of the 9 selected clinics are implementing CQI? Describe.

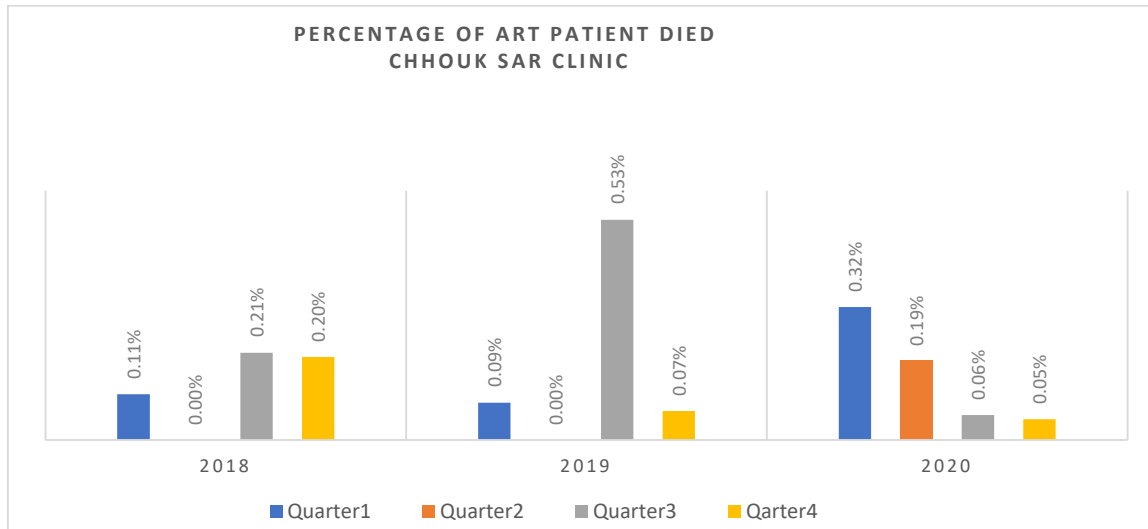
6.1.2. To measure trend of selected indicators

6.1.2.1. Percentage of ART patients died

AIDS-related deaths have been reduced in 2019, around 690 000 [500 000–970 000] people died from AIDS-related illnesses worldwide, compared to 1.7 million [1.2 million–2.4 million] people in 2004 and 1.1 million [830 000 –1.6 million] people in 2010. and AIDS-related mortality has declined by 39% since 2010. and in Cambodia AIDS-related deaths (all ages) in 2015, around 2000 [1400–3100], compared to 1300 [1000–1900] people died from AIDS-related in 2019 (3).

a. **Percentage of ART patients died at Chhouk Sar Clinic 2018- 2020**

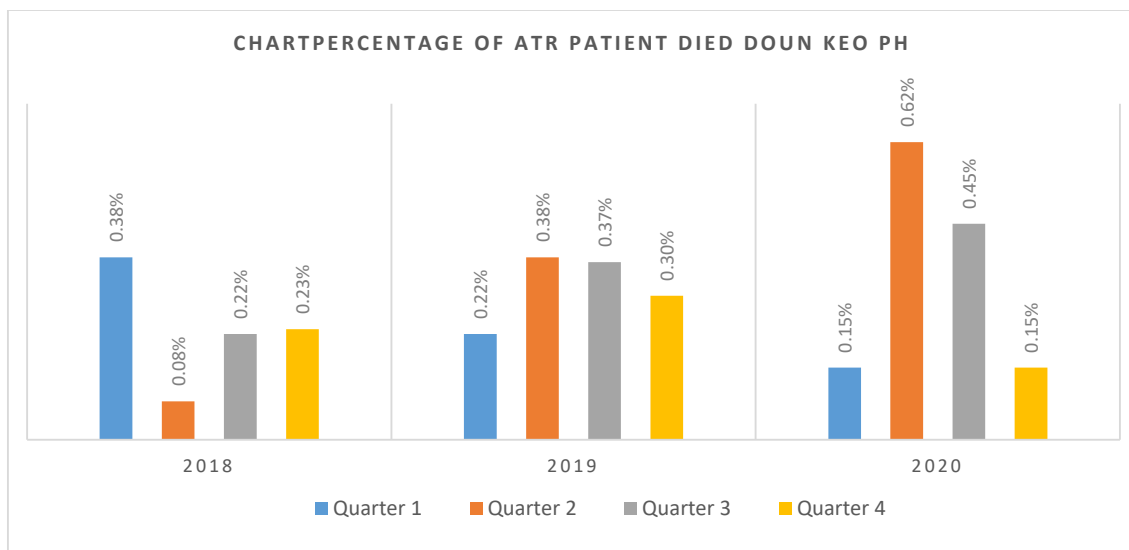
Figure 3: Percentage of ART patients died at Chhouk Sar Clinic



The percentage of ART patients died at Chhouk Sar clinic, over the analysis period between 2018 to 2020 is fluctuates with a peak of 0.50 percent in the third quarter of 2019, and no reported mortality rate of ART patients died was observed in the second quarter of 2018 and second quarter of 2019 (Figure 3).

b. Percentage of ART patients died at Doun keo PH 2018 – 2020

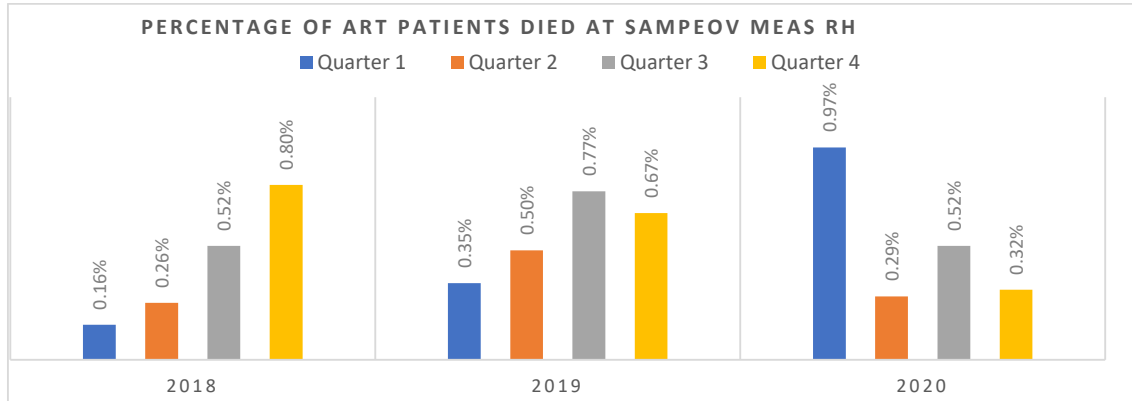
Figure 4: Percentage of ART patients died at Doun keo PH



The percentage of patients died at Doun keo PH between 2018 – 2020, over the analysis period is fluctuate with reach a peak of 0.62 percent in the second quarter of 2020, and the lowest rate of 0.08 percent was observed in the second quarter of 2018 (Figure 4).

c. Percentage of ART patients died at Sampeov Meas Provincial Hospital 2018 – 2020

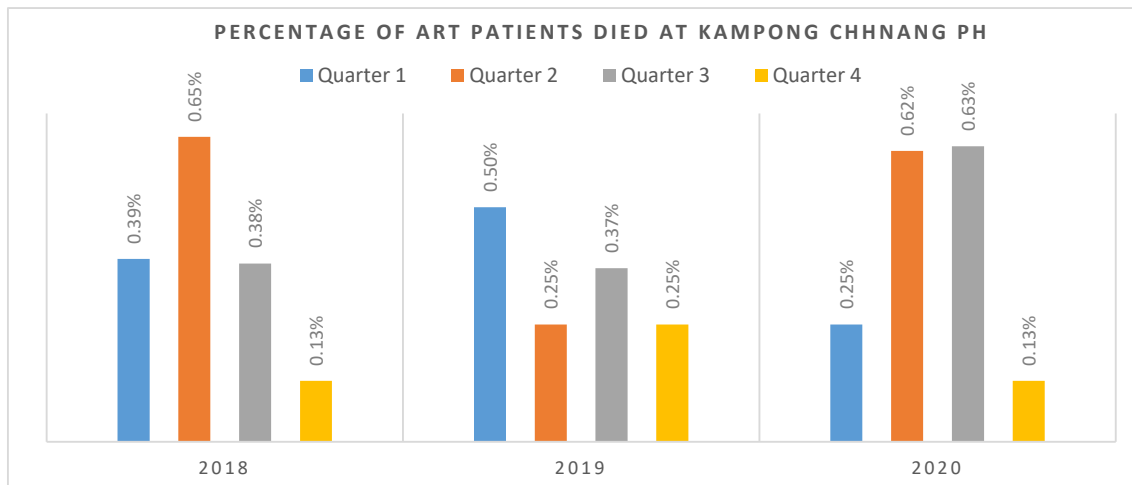
Figure 5: Percentage of ART patients died at Sampeov Meas PH



The percentage of patients died at Sampeov Meas PH between 2018 – 2020, over the analysis period is fluctuates with the lowest rate of 0.16 percent was observed in the first quarter of 2018, since then, the trend of patients died is fluctuates and reach a peak of 0.97 percent in the first quarter of 2020 (Figure 5).

d. Percentage of ART patients died at Kampong Chhnang PH 2018 – 2020

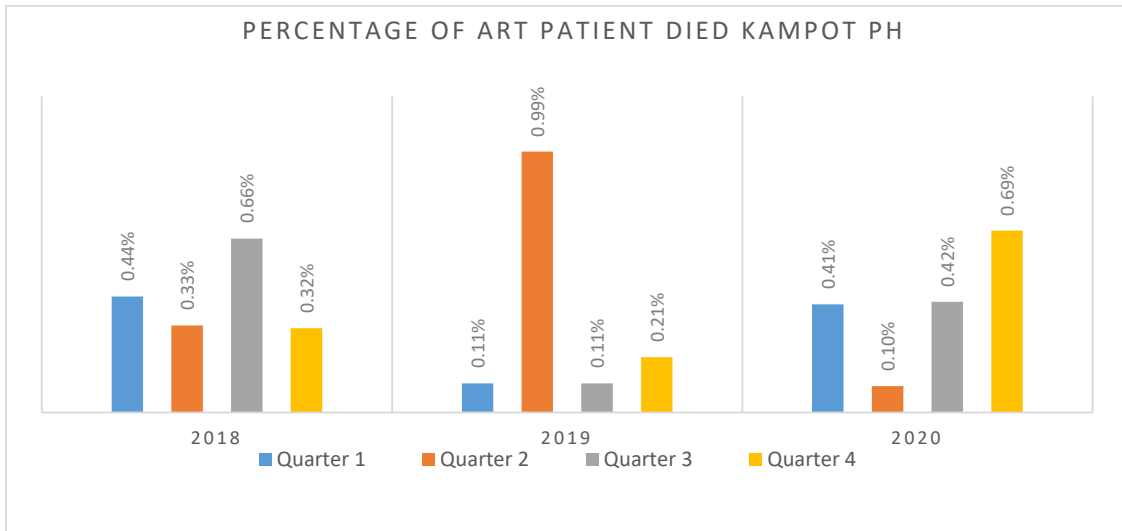
Figure 6: Percentage of ART patients died at Kampong Chhnang Provincial Hospital



The percentage of patients died at Kampong Chhnang PH between 2018 – 2020, over the analysis period is reach a peak of 0.65 percent in the second quarter of 2018. Since then, the trend of patients died is fluctuates and the lowest rate of 0.13 percent was observed in the fourth quarter of 2018 and the fourth quarter of 2020 (Figure 6).

e. Percentage of ART patients died at Kampot Provincial Hospital 2018 - 2020

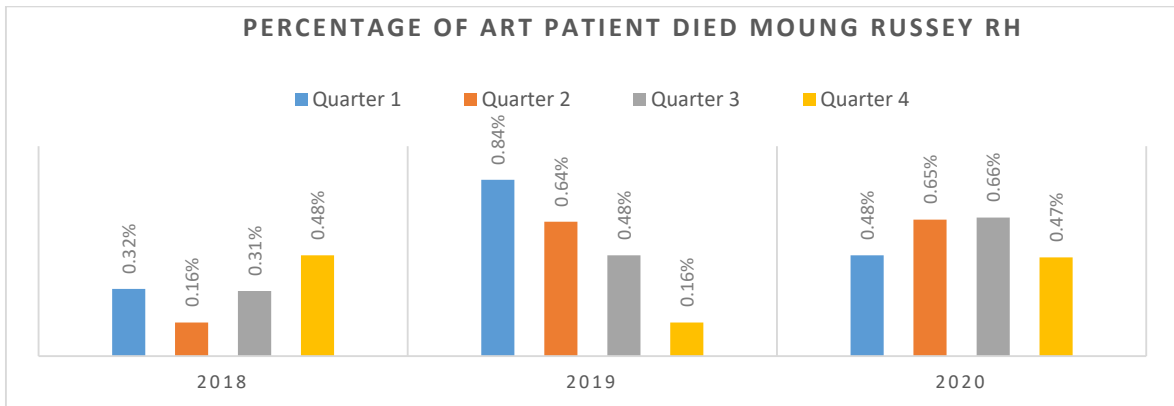
Figure 7: Percentage of ART patients died at Kampot Provincial Hospital



The percentage of patients died at Kampot PH between 2018 – 2020, over the analysis period is fluctuates with reach a peak of 0.99 percent in the second quarter of 2019. The lowest rate of 0.10 percent was observed in the second quarter of 2020 (Figure 7).

f. Percentage of ART patients died at Moug Russey RH 2018 2020

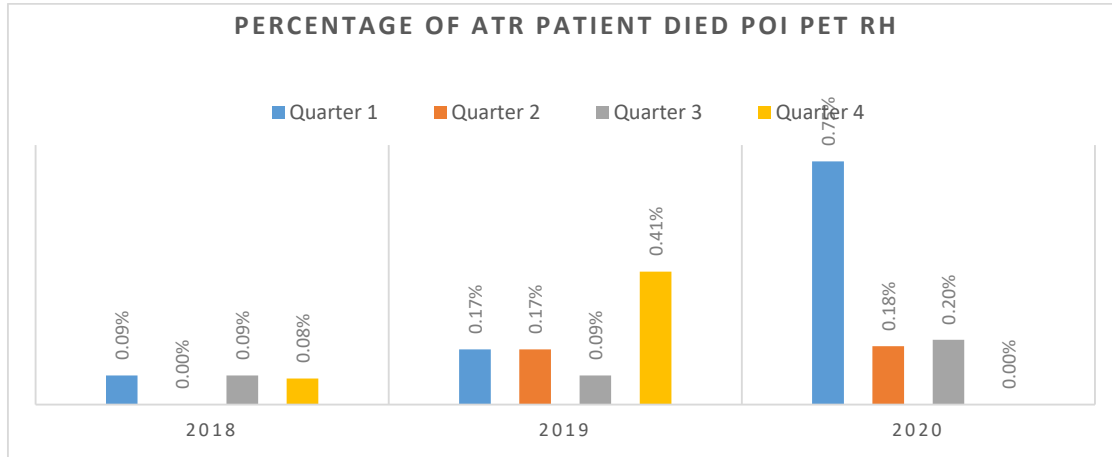
Figure 8: Percentage of ART patients died at Moug Russey RH



The percentage of patients died at Moug Russey RH between 2018 – 2020, over the analysis period is reach a peak of 0.84 percent in the first quarter of 2019. Since then, the trend of patients died is fluctuates and the lowest rate of 0.16 percent was observed in the second quarter of 2018 and the fourth quarter of 2019 (Figure 8).

g. Percentage of ART patients died at Poi Pet RH 2018 – 2020

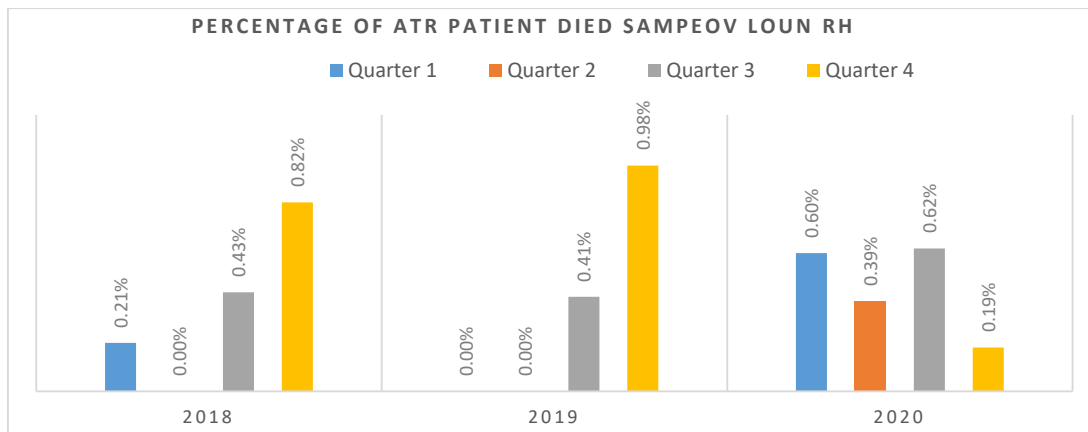
Figure 9: Percentage of ART patients died at Poi Pet RH



The percentage of patients died at Poi Pet RH between 2018 – 2020, over the analysis period is reach a peak of 0.75 percent in the first quarter of 2020. and no reported mortality rate of ART patients died was observed in the second quarter of 2018 and the fourth quarter of 2020 (Figure 9).

h. Percentage of ART patients died at Sampeov Loun RH 2018 – 2020

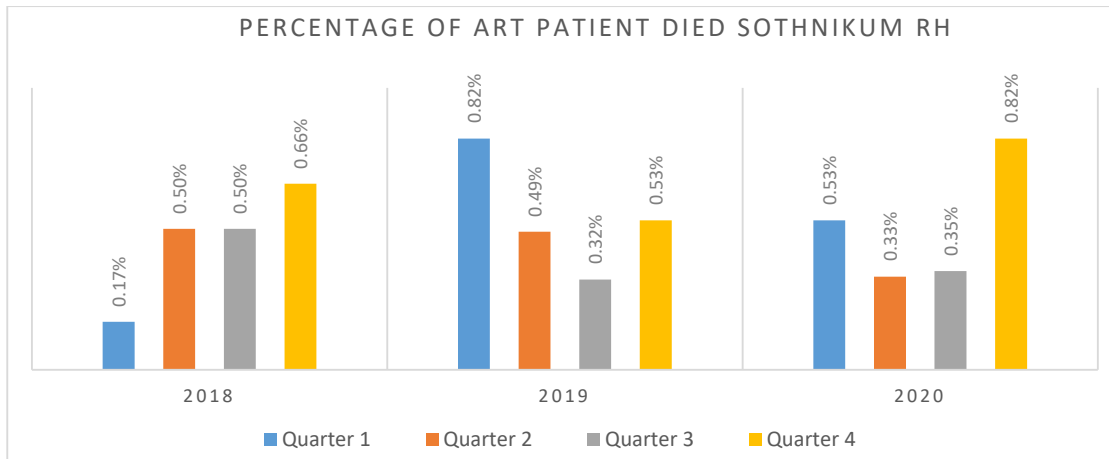
Figure 10: Percentage of ART patients died at Sampeov Loun RH



The percentage of patients died at Sampeov Loun RH between 2018 – 2020, over the analysis period is fluctuates with reach a peak of 0.98 percent in the fourth quarter of 2019, and no reported mortality rate of ART patients died was observed in the second quarter of 2018 and the first quarter, second quarter of 2019 (Figure 10).

i. Percentage of ART patients died Sothnikum RH 2018 – 2020

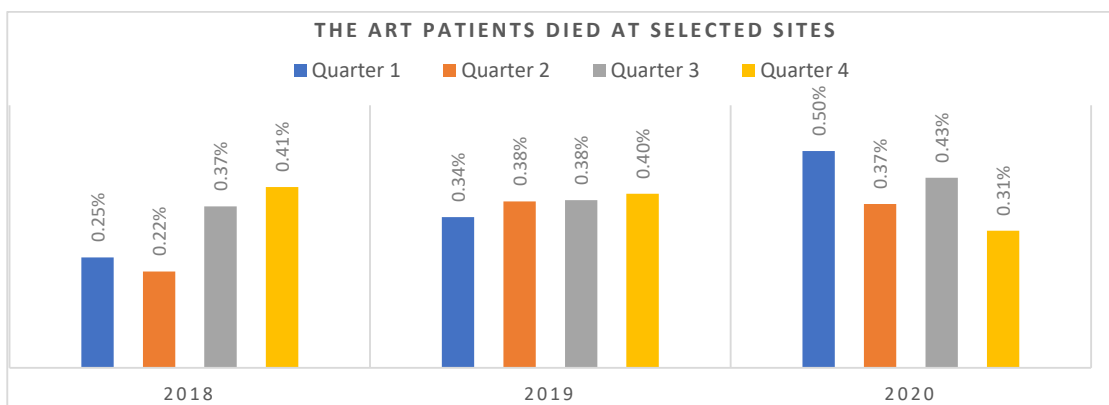
Figure 11: Percentage of ART patients died at Sothnikum RH



The percentage of patients died at Sothnikum RH between 2018 – 2020, over the analysis period is fluctuates with reach a peak of 0.82 percent in the first quarter of 2019 and the fourth quarter of 2020 and the lowest rate of 0.17 percent was observed in the first quarter of 2018 (Figure 11).

j. The average rate of ART patients died at selected study sites 2018–2020

Figure 12: The average rate of ART patients died at selected study sites



The average rate of ART patients died at selected sites fluctuates over the analysis period between 2018 to 2020, in the fourth quarter of 2019 was 0.40 percent about 0.10 percent higher than in the second quarter of 2019 when it was 0.34 percent. In 2018 and 2020 had a higher percent compared to 2019 (Figure 12) - with a peak of 0.41 percent in the fourth quarter in 2018 and 2020 had 0.50 percent.

The decline in HIV-related deaths proves that investments in HIV testing, care, and treatment and much of the reduction in HIV-related death rates were likely the result of diagnosing people with HIV earlier in infection and helping them to get – and stay on – lifesaving treatment.

This achievement was the result of great efforts by national HIV programs supported by civil society and international development partners.

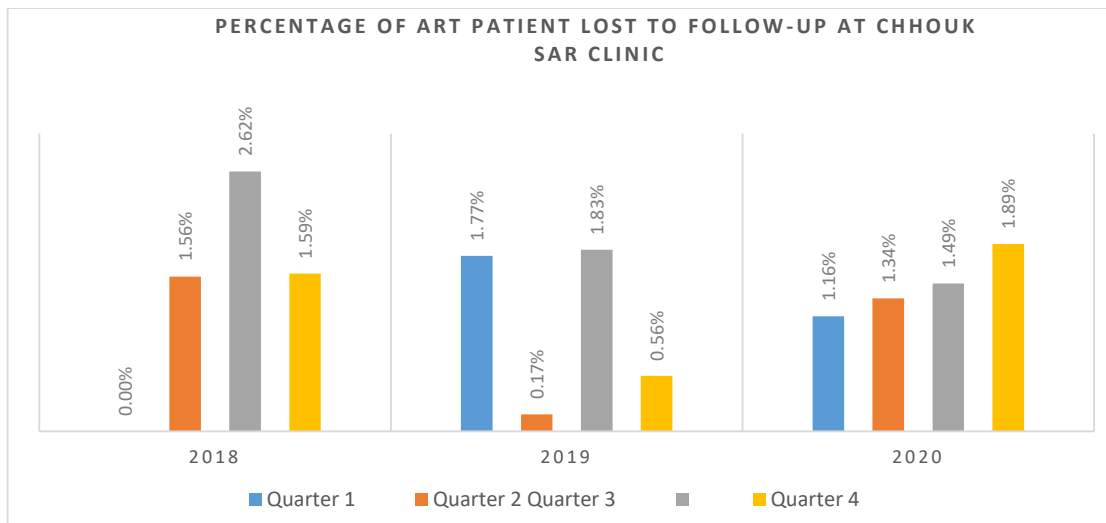
6.1.2.2. Percentage of ART patients lost to follow-up

ART has significantly reduced mortality and improved life expectancy of HIV-infected patients, but the success critically depends on regular patient follow-up. ART requires a large commitment from the patient and without good adherence viral resistance will develop. Loss to follow-up (LTFU) of HIV-infected patients is closely related to ART adherence and is becoming an increasing problem in Cambodia as ART programs.

Furthermore, mortality among patients lost to follow-up in ART settings has been reported to high range.

a. Percentage of ART patients lost to follow-up at Chhouk Sar Clinic 2018-2020

Figure 13: Percentage of ART patients lost to follow-up at Chhouk Sar Clinic

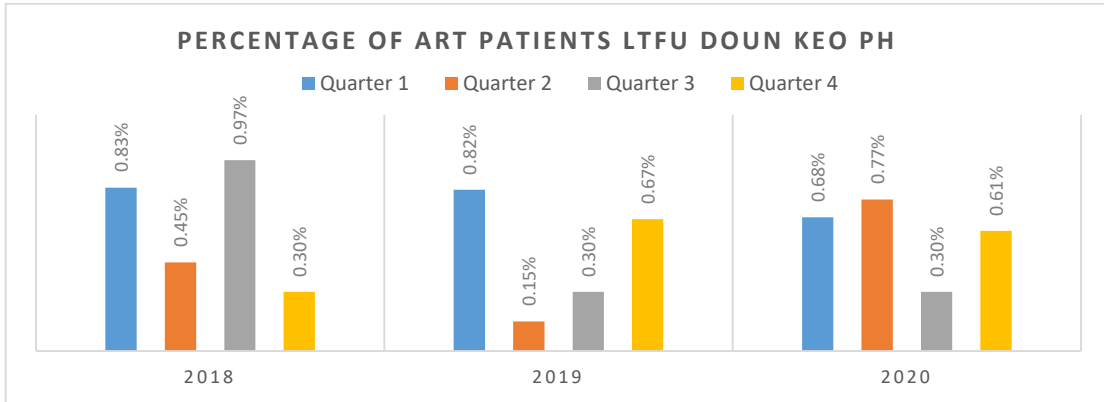


The result shows that 2.60 percent in the third quarter of 2018 were LTFU compared to 1.80 percent in the third quarter of 2019, while 1.90 percent of the patient were a rise LTFU in the

fourth quarter of 2020, So the trend of ART patients LTFU is fluctuates over the analysis period between 2018 and 2020, with the peak of 2.60 percent in the third quarter in 2018 (Figure 13). and no reported of ART patients LTFU was observed in the first quarter of 2018.

b. Percentage of ART patients lost to follow-up at Doun keo PH

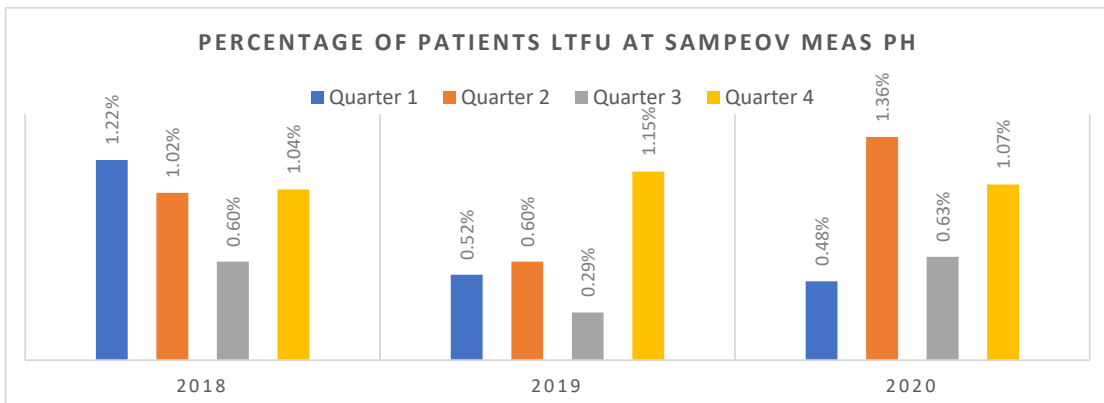
Figure 14: Percentage of ART patients lost to follow-up at Doun keo PH



The trend of patients lost to follow-up fluctuates over the analysis period with the peak of 0.97 percent in the third quarter in 2018 (Figure 14). The lowest LTFU rate of 0.15 percent was observed in the second quarter in 2019.

c. Percentage of ART patients LTFU at Sampeov Meas RH

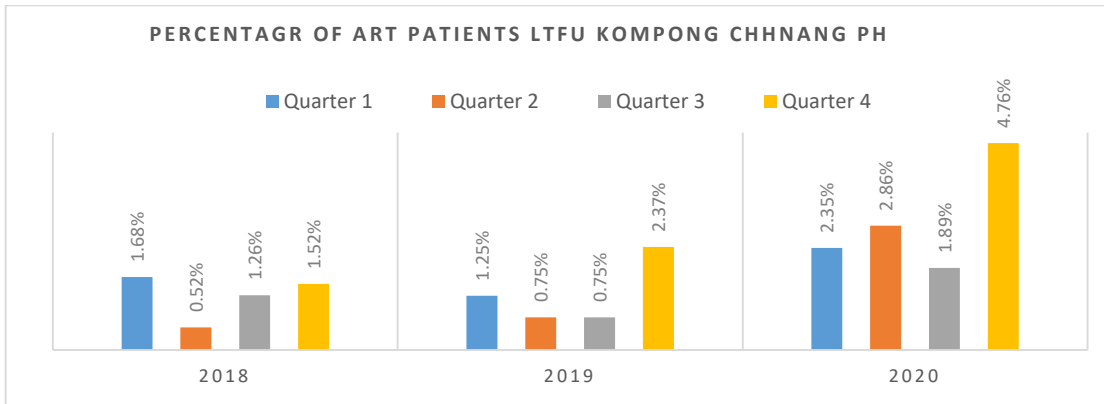
Figure 15: Percentage of ART patients LTFU at Sampeov Meas PH



The trend of patients lost to follow-up fluctuates over the analysis period with the peak of 1.36 percent in the second quarter in 2020 (Figure 15). The lowest LTFU rate of 0.3 percent was observed in the second quarter in 2019.

d. Percentage of ART patients LTFU Kompong Chhnang PH

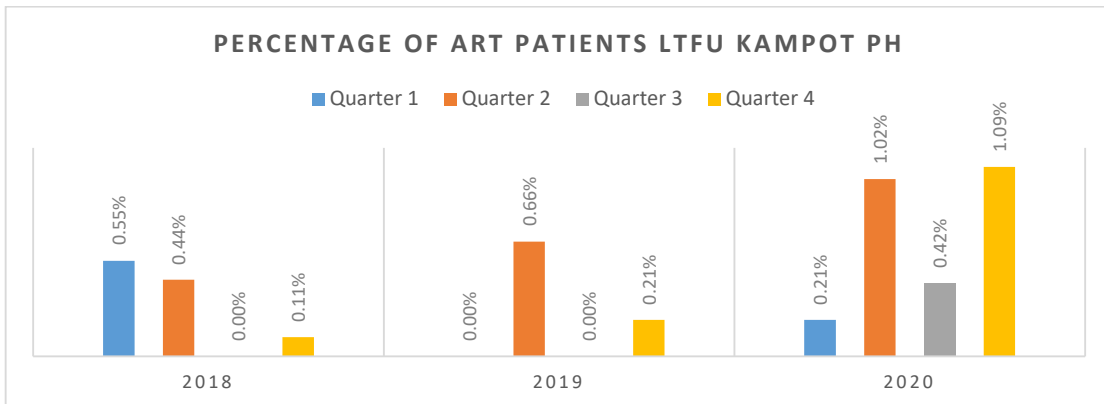
Figure 16: Percentage of ART patients LTFU at Kampong Chhnang PH



The trend of patients lost to follow-up fluctuates over the analysis period with a peak of 4.80 percent in the fourth quarter of 2020. The lowest LTFU rate of 0.50 percent was observed in the fifth quarter in 2018 at Kompong Chhnang PH (Figure 16).

e. Percentage of ART patients lost to follow-up at Kampot PH

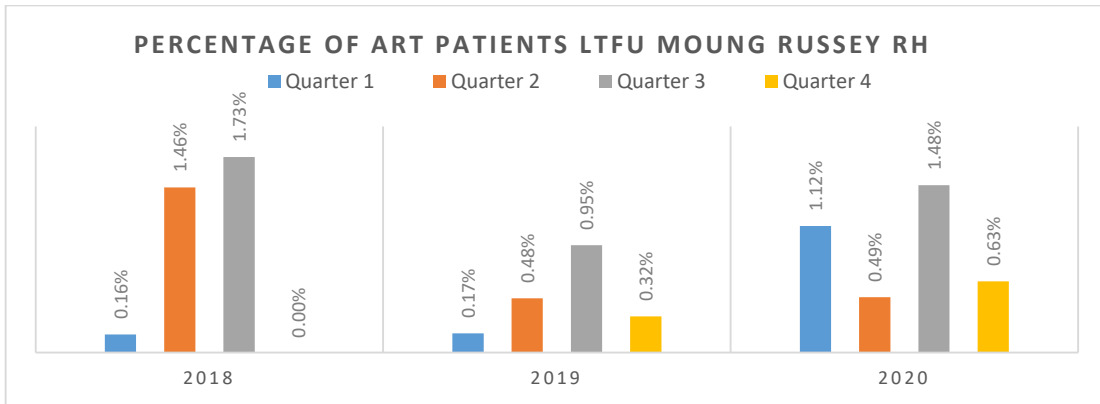
Figure 17: Percentage of ART patients lost to follow-up at Kampot PH



The trend of patients lost to follow-up fluctuates over the analysis period with a peak of 1.10 percent in the fourth quarter in 2020 (Figure 17). and no reported of ART patients LTFU was observed in the third quarter and third of 2018 and first, second quarter of 2019.

f. Percentage of ART patients LTFU at Moug Russey RH

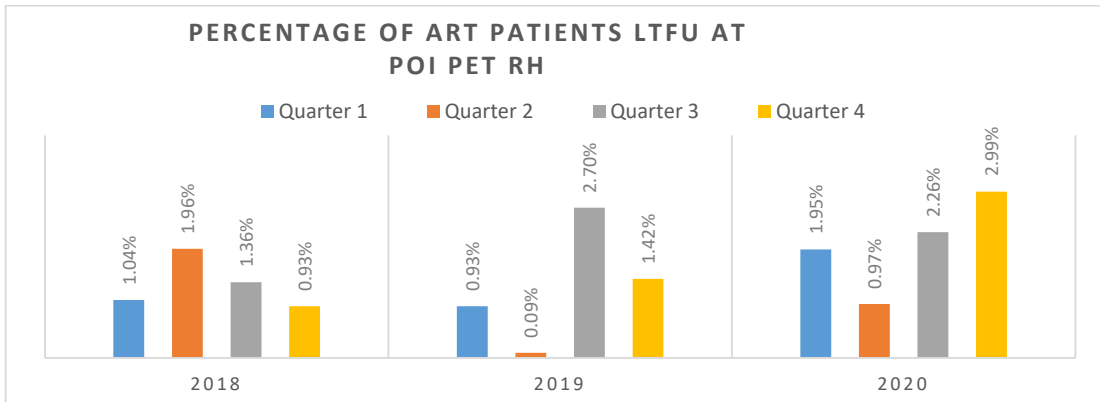
Figure 18: Percentage of ART patients LTFU at Moug Russey RH



The trend of patients lost to follow-up fluctuates over the analysis period with a peak of 1.70 percent in the third quarter of 2018, and no reported of ART patients LTFU was observed in the fourth quarter and third of 2018 (Figure 18).

g. Percentage of ART patients LTFU at Poi Pet RH 2018 – 2020

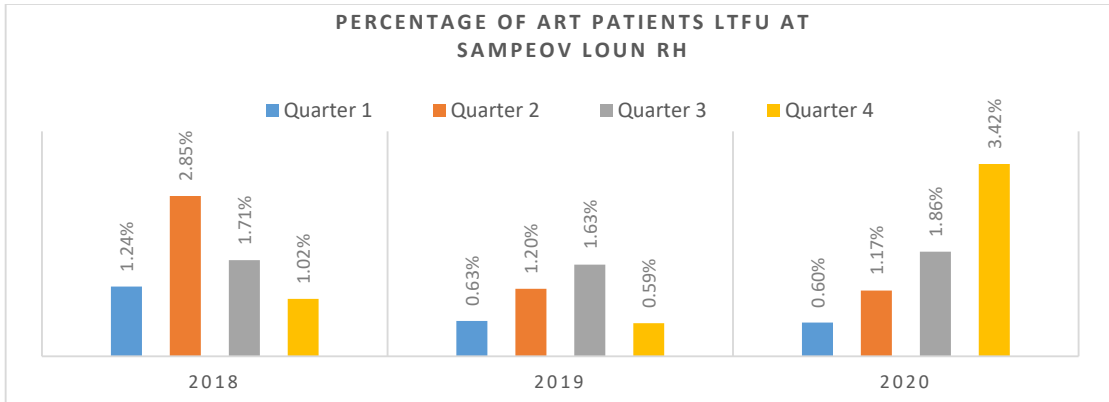
Figure 19: Percentage of ART patients LTFU at Poi Pet RH



The trend of patients lost to follow-up fluctuates over the analysis period with a peak of 3.00 percent in the fourth quarter of 2020. The lowest LTFU rate of 0.09 percent was observed in the second quarter in 2019 at Poi Pet RH (Figure 19).

h. Percentage of ART patients LTFU at Sampeov Loun RH 2018-2020

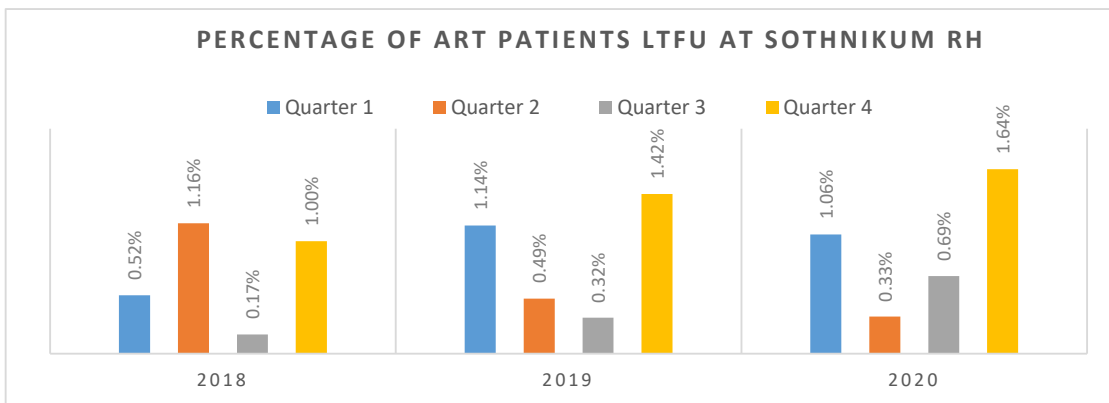
Figure 20: Percentage of ART patients LTFU at Sampeov Loun RH



The trend of patients lost to follow-up fluctuates over the analysis period with a peak of 3.42 percent in the fourth quarter of 2020. The lowest LTFU rate of 0.59 percent was observed in the fourth quarter in 2019 at Sampeov Loun RH (Figure 20).

i. Percentage of ART patients LTFU at Sothnikum RH

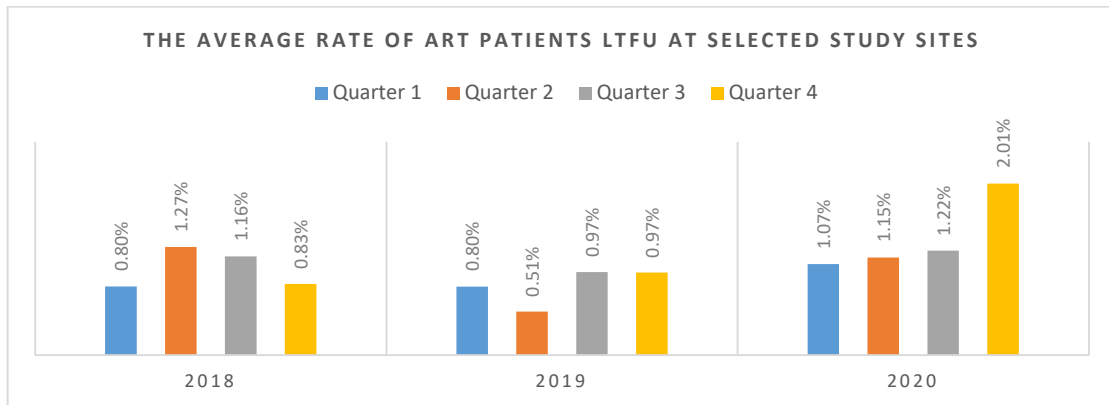
Figure 21: Percentage of ART patients LTFU at Sothnikum RH



The trend of patients lost to follow-up fluctuates over the analysis period with a peak of 1.60 percent in the fourth quarter of 2020. The lowest LTFU rate of 0.2 percent was observed in the third quarter in 2018 at Sothnikum RH (Figure 21).

j. The average rate of ART patients LTFU at selected study sites

Figure 22: The average rate of ART patients LTFU at selected study sites



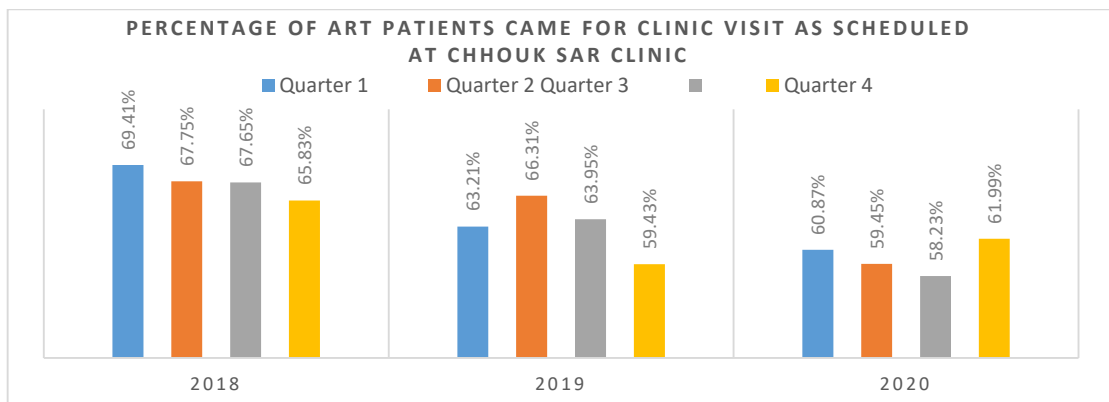
The average rate of ART patients LTFU at selected sites is fluctuates over the analysis period between 2018 to 2020, in the fourth quarter of 2020 was 2.01 percent about 0.94 percent higher than in the first quarter of 2020 when it was 1.07 percent. In 2018 and 2019 had a lower percent compared to 2020(*Figure 22*) - with a peak of 1.27 percent in the second quarter in 2018 and 2019 had 0.97 percent.

6.1.2.3. Percentage of ART patients came for clinical visit as scheduled

With the number of people living with HIV receiving treatment with antiretroviral therapy (ART) increasing in recent years in Cambodia(2), patient retention remains an important challenge(4). Disruption in care through missed scheduled visits can undermine both social (e.g., acceptance of a positive status [8] as well as clinical outcomes, including risk of virological failure) (5).While the discontinuation of ART can lead to drug resistance, HIV-related illnesses and death(6).

a. **Percentage of ART patients came for clinical visit as scheduled at Chhouk Sar Clinic 2018-2020**

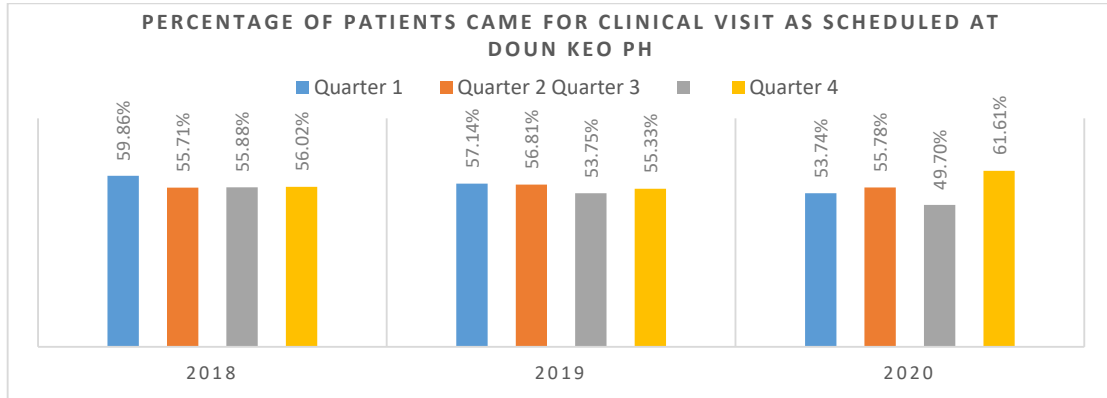
Figure 23: Percentage of ART patients came for clinical visit as scheduled at Chhouk Sar Clinic



The trend of ART patients came for clinical visit as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 69.40 percent in the first quarter of 2018. The lowest rate of 58.20 percent was observed in the third quarter of 2020 at Chhouk Sar Clinic (Figure 23).

b. Percentage of ART patients came for clinical visit as scheduled at Doun keo PH

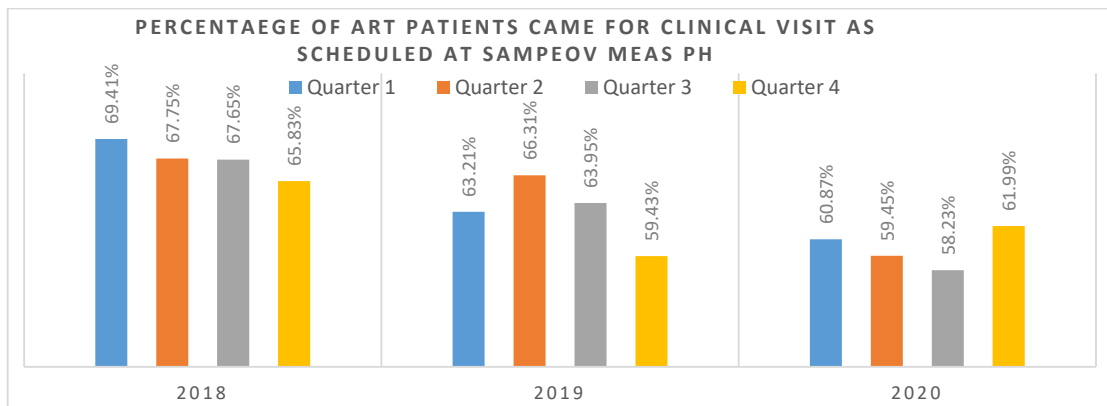
Figure 24: Percentage of ART patients came for clinical visit as scheduled at Doun keo PH



The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 61.60 percent in the fourth quarter of 2020. The lowest rate of 49.70 percent was observed in the third quarter of 2020 at Doun keo RH (Figure 24).

c. Percentage of ART patients came for clinical visit as scheduled at Sampeov Meas PH

Figure 25: Percentage of ART patients came for clinical visit as scheduled at Sampeov Meas PH

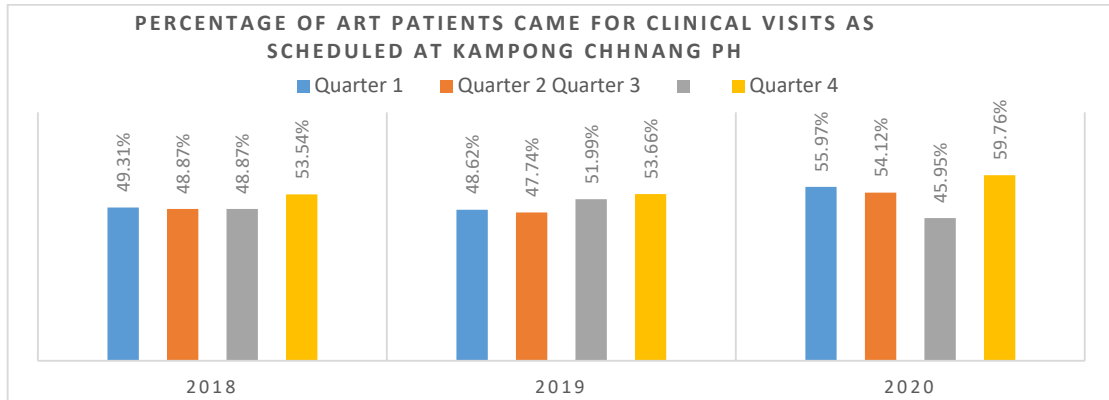


The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 69.40 percent in the first quarter of 2018. The

lowest rate of 58.20 percent was observed in the fourth quarter of 2020 at Sampeov Meas PH (Figure 25).

d. Percentage of ART patients came for clinical visits as scheduled at Kampong Chhnang PH

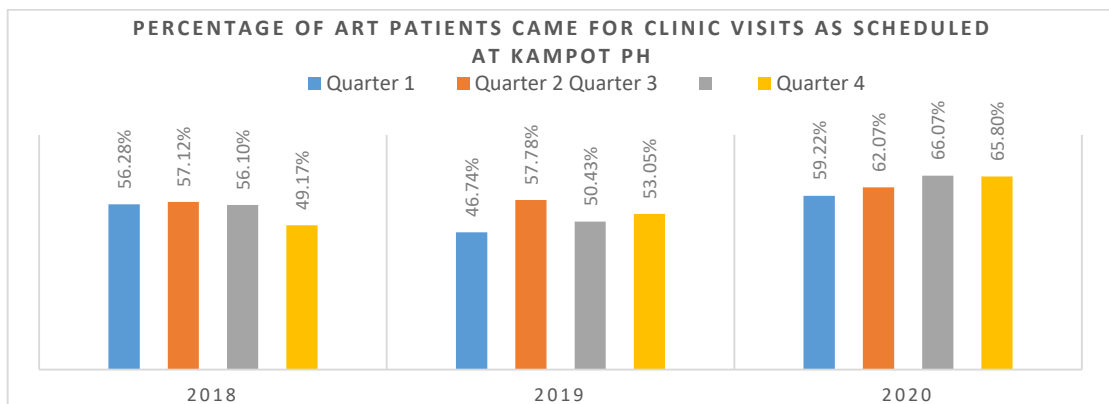
Figure 26: Percentage of ART patients came for clinical visits as scheduled at Kampong Chhnang PH



The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 59.80 percent in the fourth quarter of 2020. The lowest rate of 46.00 percent was observed in the third quarter of 2020 at Kampong Chhnang PH (Figure 26).

e. Percentage of ART patients came for clinical visit as scheduled at Kampot PH

Figure 27: Percentage of ART patients came for clinical visit as scheduled at Kampot PH

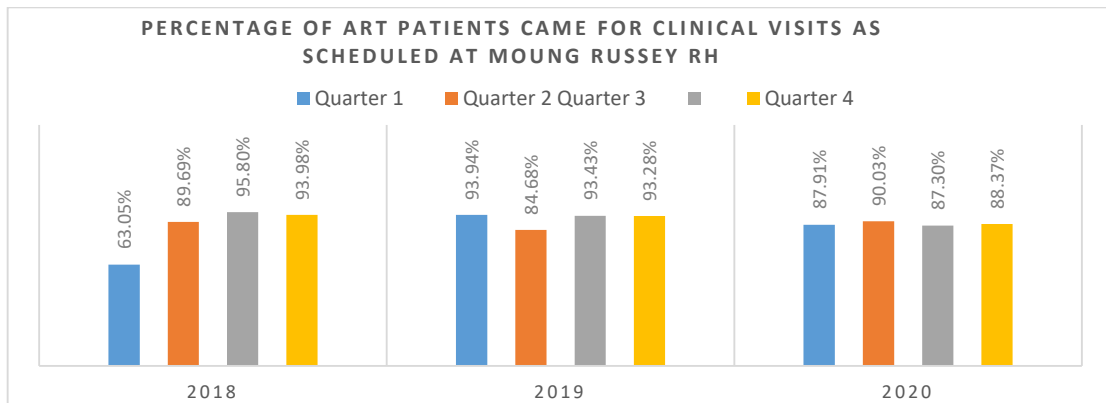


The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 66.10 percent in the third quarter of 2020. The

lowest rate of 46.70 percent was observed in the third quarter of 2019 at Kampot PH (Figure 27).

f. Percentage of ART patients came for clinical visit as scheduled at Moug Russey RH

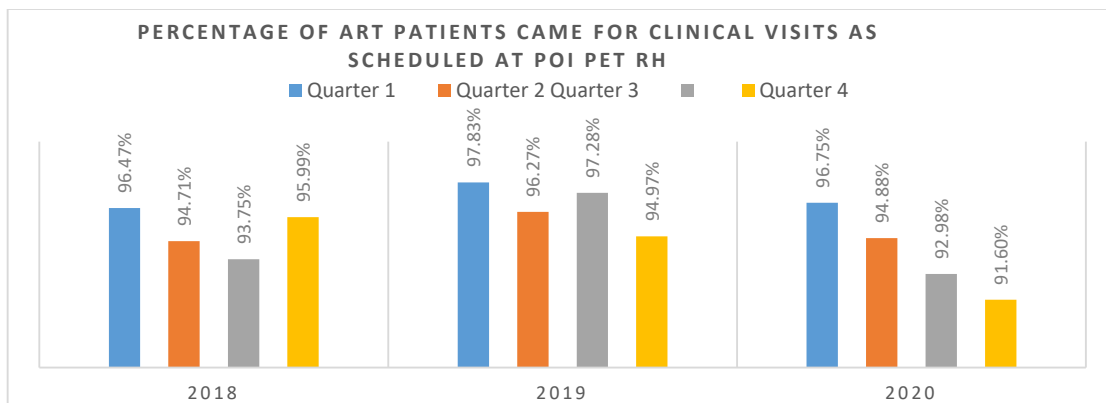
Figure 28: Percentage of ART patients came for clinical visit as scheduled at Moug Russey RH



The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with the lowest rate of 63.05 percent was observed in the first quarter of 2018 and reach a peak of 95.80 percent in the third quarter of 2018. at Moug Russey RH (Figure 28).

g. Percentage of ART patients came for clinical visit as scheduled at Poi pet RH 2018-2020

Figure 29: Percentage of ART patients came for clinical visit as scheduled at Poi pet RH

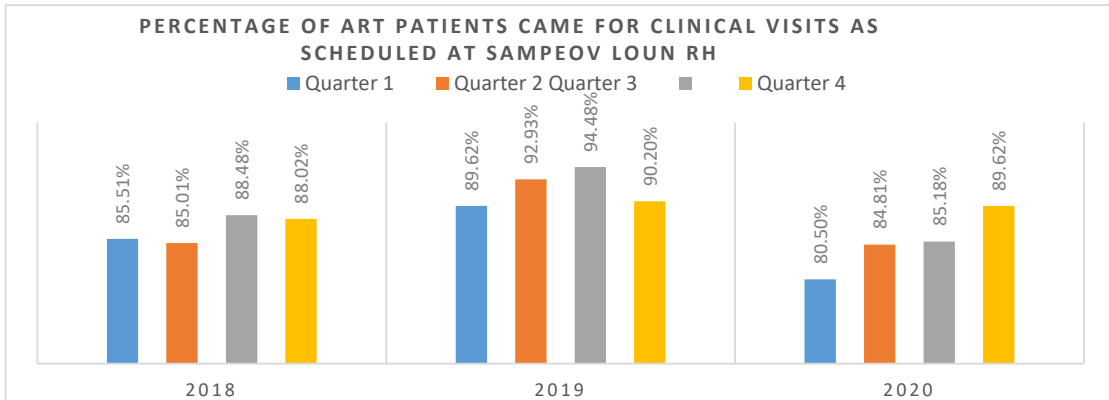


The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 97.90 percent in the first quarter of 2019. The

lowest rate of 91.60 percent was observed in the fourth quarter of 2020 at Poi Pet RH (Figure 29).

h: Percentage of ART patients came for clinical visit as scheduled at Sampeov Loun RH 2018-2020

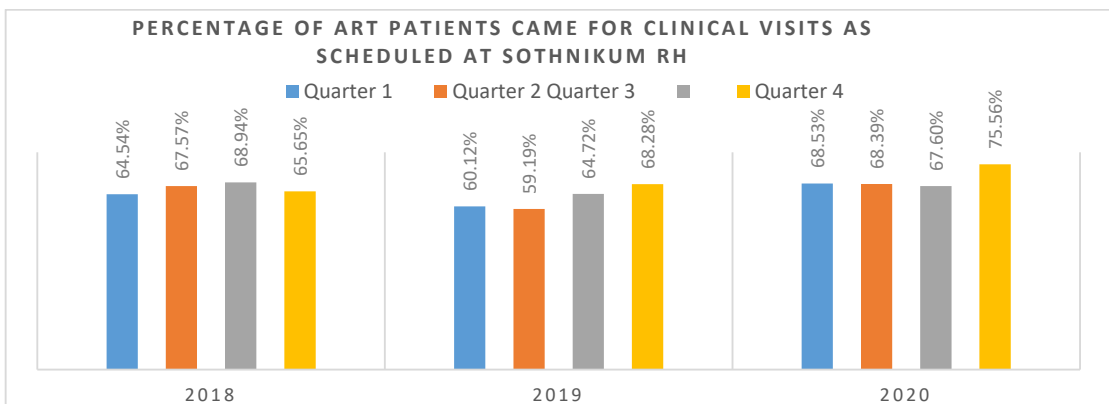
Figure 30: Percentage of ART patients came for clinical visit as scheduled at Sampeov Loun RH



The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak 94.50 percent in the third quarter of 2019. The lowest rate of 80.50 percent was observed in the first quarter of 2020 at Sampeov loun RH (Figure 30).

i. Percentage of ART patients came for clinical visit as scheduled at Sothnikum RH 2018-2020

Figure 31: Percentage of ART patients came for clinical visit as scheduled at Sothnikum RH

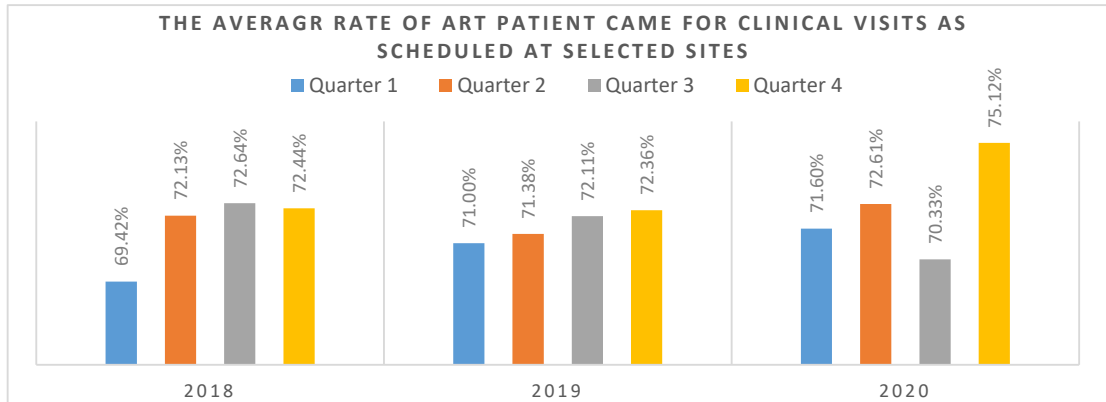


The trend of ART patients came for clinical visits as scheduled between 2018 to 2020, over the analysis period is fluctuates with a peak of 75.60 percent in the fourth quarter of 2020. The

lowest rate of 59.20 percent was observed in the second quarter of 2019 at Sothnikum RH (Figure 31).

j. The average rate of ART patients came for clinical visit as scheduled at selected sites 2018-2020

Figure 32: The average rate of ART patients came for clinical visit as scheduled at selected sites 2018-2020



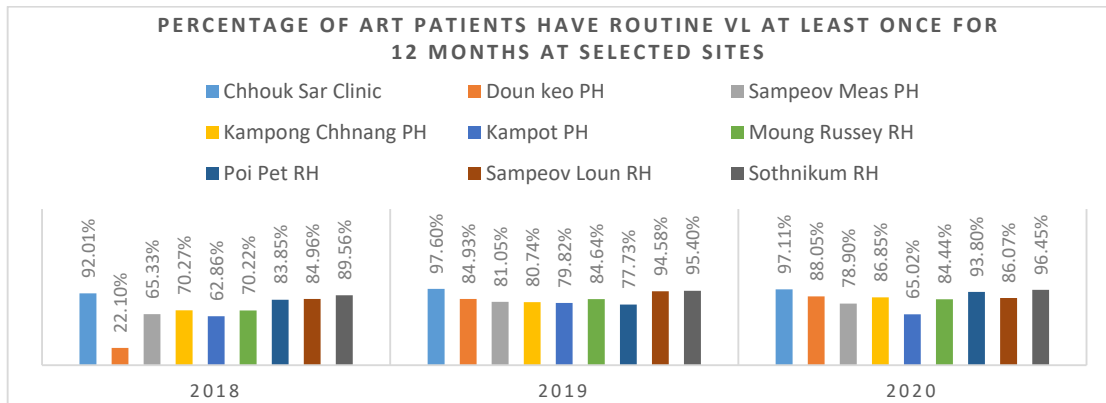
The average rate of patients came for clinical visit as scheduled at selected study sites is fluctuates over the analysis period between 2018 to 2020, In 2020 had high visit as scheduled at 75.12 percent was observed in the fourth quarter 2020 about 4.80 percent higher than in third quarter of 2020 when it was 70.33 percent. In 2018 and 2019 had a lower percent compared to 2020 (Figure 32) - with a peak of 72.64 percent in the third quarter in 2018 and 2019 had 72.36 percent. So, average rate of patients came for clinical visit as scheduled at selected study sites reach a peck visit as scheduled at 72.64 percent in 2018, 72.36 percent in 2019 respectively. Even though had high at 75.12 percent in the fourth 2020, finally the sites not reach the set target the SOP (CQI SOP at least 85%).

6.1.2.4. Percentage of ART patients have routine viral load at least once for 12 months at selected sites 2018-2020

Current guidelines require a viral load test to be performed six months after initiation on ART, then 12 months after initiation on ART, followed by annual viral load tests thereafter. For people living with HIV found to have elevated viral loads, a repeat test is required in six months.

a. Percentage of ART patients have routine viral load at least once for 12 months at selected sites 2018-2020

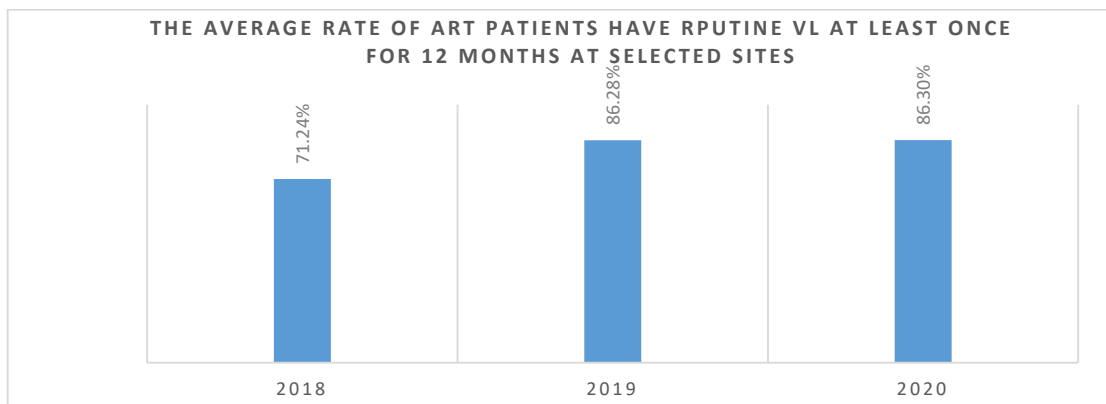
Figure 33: Percentage of ART patients have routine viral load at least once for 12 months at selected sites



The average rate of ART patients has routine viral load at least once for 12 months at selected sites fluctuates over the analysis period between 2018 to 2020, in 2018 was 92.01 percent was observed in Chhouk Sar clinic about 69.91 percent higher than Doun Keo PH in 2018 when it was 22.10 percent. In 2019 and 2020 had a higher percent compared to 2018 (Figure 33) - with a peak of 97.60 percent in 2019 was observed in Chhouk Sar clinic and 2020 had 97.11 percent.

b. The average rate of ART patients has routine VL at least once for 12 months at selected sites 2018-2020

Figure 34: The average rate of ART patients has routine VL at least once for 12 months at selected sites



The average rate of PLHIV have the routine viral load at least once for 12 months at all study sites between 2018 to 2020, over the analysis period, the lowest rate of 71.24 percent was observed in 2018. And PLHIV having a routine viral load in 2019 had 86.28 percent and 86.30 percent in 2020 had higher percent compared with 2018 (Figure 34).

However, the result in 2018 shows that only 71,24 percent of PLHIV having the routine viral load at least once for 12 months, suggesting many providers are not following viral load testing guidelines appropriately (7).

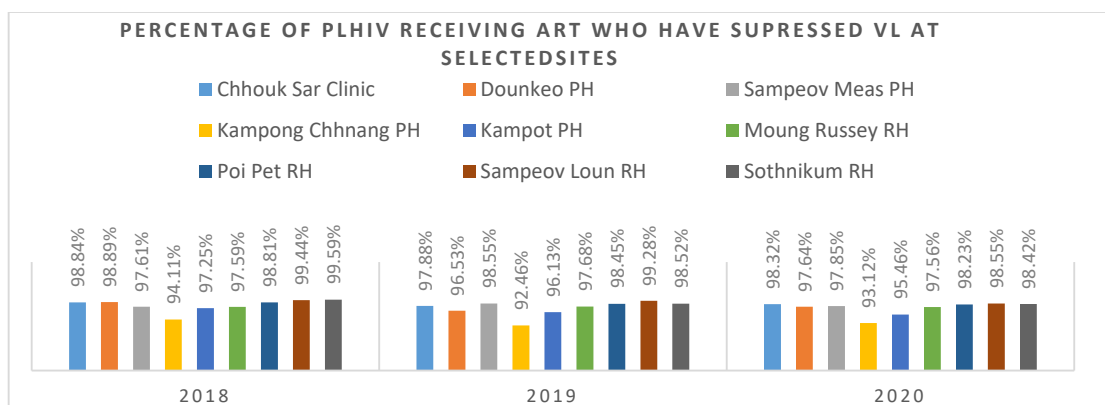
The 2019 NCHADS Joint Program Review highlighted several issues related to the completeness, implementation of ART services, and accuracy of reporting as well as providers' adherence to viral load testing guidelines. Specifically, there are improvements of implementation following the national guideline of viral load tests, over the analysis period with a sharp peak of 87.34 percent in 2019 and 86.30% percent in 2020.

6.1.2.5. Percentage of PLHIV receiving ART with suppressed viral load

Cambodia is successfully controlling its HIV epidemic through active case-finding strategies, increasing coverage of antiretroviral therapy (ART), and achieving a high rate of viral load suppression. It is globally recognized as one of the few countries to reach UNAIDS's "90-90-90" targets and is aiming to achieve "95-95-95" by 2025. UNAIDS's targets refer to 90 percent of all people living with HIV knowing their HIV status, 90 percent of all people with diagnosed HIV infection (7).

a. Percentage of PLHIV receiving ART who have suppressed viral load at selected sites 2018-2020

Figure 35: Percentage of PLHIV receiving ART who have suppressed viral load at selected sites

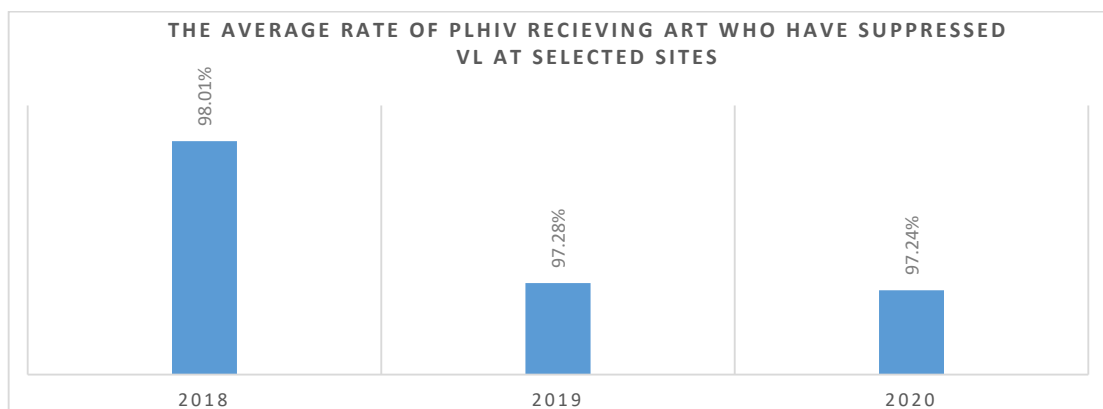


The average rate of PLHIV receiving ART who have suppressed viral load at selected sites fluctuate over the analysis period between 2018 to 2020, in 2018 was 99.60 percent observed in Sothnikum RH about 5.48 percent higher than Kampong Chhnang PH when it was 94.11 percent. In 2019 had 99.28 percent observed in Sampeov Loun RH and 2020 was 98.55 percent had lower percent compared to 2018 (Figure 35).

Sites that reached targets and achieving a high rate of viral load suppression (90%).

b. The average rate of PLHIV receiving ART who have suppressed viral load at selected sites 2018-2020

Figure 36: The average rate of PLHIV receiving ART who have suppressed viral load at selected sites



The average rate of PLHIV receiving ART who have suppressed viral load all study sites between 2018 to 2020, over the analysis during the year 2018, approximately 98.01 percent of PLHIV who have suppressed viral load. The rates of PLHIV who have suppressed viral load have declined marginally since 2019 from 97.28 percent to 97.24 percent in 2020 (Figure 36). The results of this study are similar to a study in Cambodia "The State of Viral Load Testing in Cambodia an Assessment of Key Challenges and Opportunities" (7).

To achieve these targets, one critical challenge is to scale up coverage of viral load testing. Implementation of routine viral load testing, initially prioritizing patients who had been on ART the longest.

Nevertheless, there is a need to further scale up viral load testing services to facilitate viral suppression among 95 percent of all people receiving ART.

The success of all study sites' HIV response has been achieved with significant donor support, with some elements of the response, such as health care providers, logistics supported, laboratory systems strengthening.

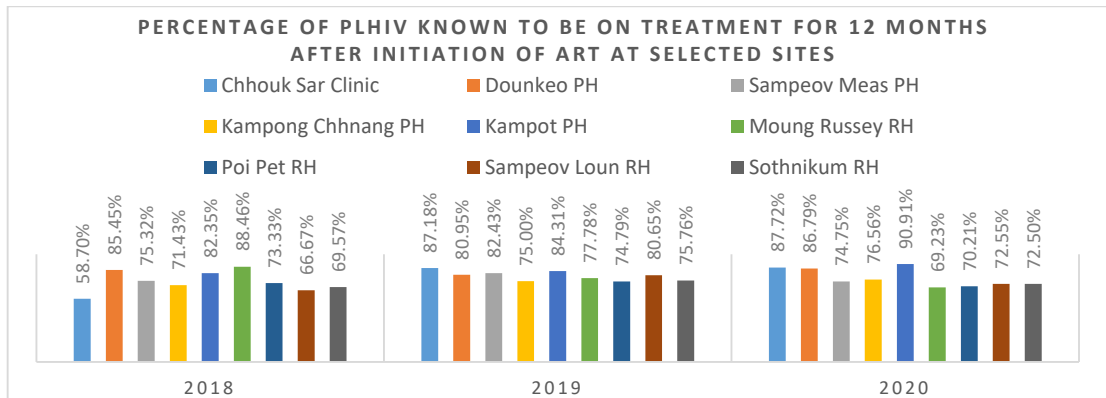
6.1.2.6. Percentage of PLHIV known to be on treatment for 12 months after initiation ART

For persons with HIV, the ability to remain retained in care plays a critical role in achieving good health outcomes and in preventing HIV transmission to others. Despite tremendous advances in HIV treatment, a significant proportion of persons with HIV do not consistently receive antiretroviral therapy, often due to decreased engagement in long-term clinical care. Recent work has shown that lower retention rates in HIV medical care serves as a major barrier for optimal HIV care and correlates with worse outcomes and increased transmission of HIV (8, 9).

In contrast, higher retention rates in care correlate strongly with suppression of HIV RNA levels, improved health outcomes, and lower risk of transmitting HIV. The National HIV/AIDS Strategy: Updated to 2020 set a goal that at least 90% of persons with diagnosed HIV in Cambodia are retained in HIV medical care.

a. Percentage of PLHIV known to be on treatment for 12 months after initiation of ART at selected sites 2018-2020

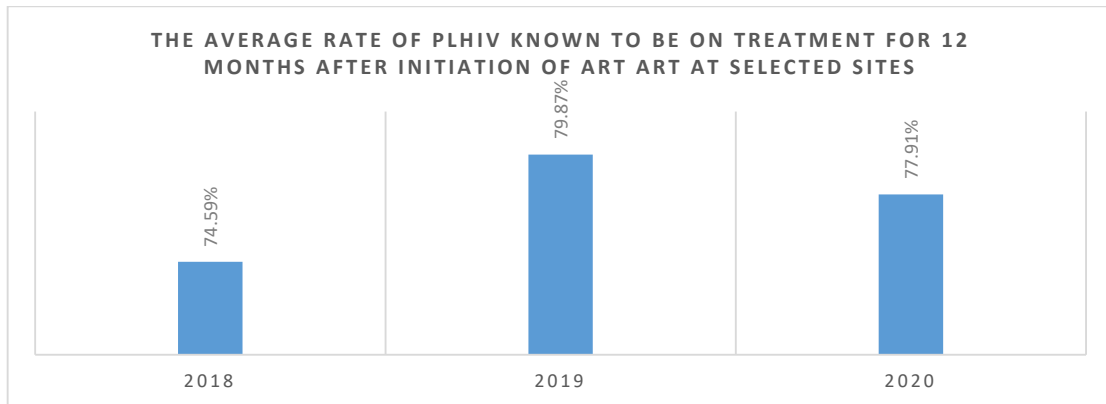
Figure 37: Percentage of PLHIV known to be on treatment for 12 months after initiation of ART at selected sites



The trend of patients known to be on treatment 12 months after initiation of ART fluctuates over the analysis period between 2018 to 2020, with the peak of 90.91 percent in 2020 observed at Kampot PH (Figure 37) about 21.70 percent higher than Moug Russey RH when it was 69.23 percent. In 2018 had 88.50 percent observed at Moug Russey RH and 2019 was 87.20 percent observed at Chhouk Sar clinic had lower percent compared to 2020 observed at Kampot PH.

b. The average rate of PLHIV known to be on treatment for 12 months after initiation of ART selected sites 2018 – 2020

Figure 38: The average rate of PLHIV known to be on treatment for 12 months after initiation of ART selected sites



The average rate of PLHIV known to be on treatment for 12 months after initiation of ART between 2018 to 2020, over the analysis during the year 2018, approximately 74.59 percent of PLHIV known to be on treatment for 12 months after initiation of ART were retained in HIV medical care. The rates of retention in care have increased only marginally since 2018 with the rate is 79.87percent in 2019 and 77.91 percent in 2020 at selected sites (*Figure 38*).

It should be a goal of all HIV services providers to identify risk factors for decreased retention for 12 months after initiation of ART in care and develop strategies to increase engagement and achieve a goal.

The trend of the selected indicators on the selected study sites varies during the analysis period between 2018 and 2020, most of the indicators are much better in response to national policy and strategy settings.

Apparently, such as the Indicator of AIDS-related deaths has declined in selected study sites from 0.50 percent in the first quarter in 2020 to 0.22 percent was observed in the fourth quarter in 2020. The average rate of ART patients lost to follow-up with the lowest rate of 0.51 percent was observed in the second quarter in 2019, but reach peak of 2.01 percent in the fourth quarter of 2020 The average rate of ART patients coming for clinical visits as scheduled over the analysis is fluctuates with the lowest rate 69.42 percent was observed in the first quarter 2018 and peaking at of 75.12 percent in the fourth quarter of 2020 The average rate of PLHIV having the routine viral load at least once for 12 months, over the analysis period, the lowest rate of 71.24 percent was observed in 2018. And approximately 86.30 percent during the year 2020 The rates of PLHIV who have suppressed viral load have declined marginally since 2019 from 97.28 percent to 97.24 percent in 2020. The rates of retention in care have increased only marginally since 2018 with the rate is 79.87percent in 2019 and 77.91 percent in 2020 at selected sites.

To achieve these targets, Due to the proves that investments in HIV testing, care, and treatment This achievement was the result of great efforts by national HIV programs supported by civil society and international development partners.

6.2. Qualitative

6.2.1. To identify perception of healthcare workers

6.2.1.1. Implementation of CQI at the ART facility

There are three levels of the implementation of the CQI-CoC activities- the National Core Group, the Provincial AIDS and STD officer, and the onsite CQI-CoC team (see Figure 2) (10).

Source of Knowledge and Perception of Health Workers on the implementation of CQI in the ART facility

“The objective of this CQI is to improve the service quality of ART clinics”. (KI_Doctor)

“To successfully achieve and improve the service quality of the ART clinic in accordance with our goal whether the target has been achieved or not. For an instance, patients coming prior to the appointment date, death case of the patient, loss-to-follow up, etc.” (KI_Data entry)

“The CQI implementation provided support for improving antiretroviral services. (KI_Doctor_RH Mong Russey)” (KI_Doctor)

“The overall objective of the CQI is to improve the service quality of ART clinics in provinces, districts, sites, etc. based on the indicators.” (KI_Counsellor)

“The CGI involves the annual quality evaluation to actually measure the statistics”. (KI_Data entry clerk)

“We aim to improve the service quality towards improving the quality of life of PLHIV.” (KI_Doctor)

“CQI is the continuum quality improvement project developed to strengthen the service quality based on targeted indicators such as Pre-ART, ART, INH, TPT, MMD, and VL and EAC; all the indicators relate to CQI.” (Data entry clerk)

“CQI is the implementation of quality care for people living with HIV”. (Doctor)

“CQI is the continuing quality improvement and healthcare service management for people living with HIV.” (Data entry clerk)

“CQI shows us the missing part of our treatment services and helps us find solutions to improve our service.” (Ki_Doctor).

There was different knowledge related to the meaning of CQI implementation. “What reported throughout the studies; for instance, to improve the quality of care and treatment services from providers to PLHIV in the ART services.”

“Relevant evaluation of the quality each year, the better and better the data obtained, the more accurate it can be”.

However, the health care providers perceived the CQI as meaningful concept of continuum quality improvement.

The health workers appreciated the CQI implementation. For instance, the research team observed that the health care providers who participated in the CQI implementation were enthusiastic about their increased capacity to improve the quality of service. Several health care providers expressed an interest in further training and mentoring on quality improvement tools and approaches.

Finally, health care providers urged the team to continue working with the CQI implementation to improve service quality and improve PLHIV health outcomes.

6.2.1.2. Enabling factors to implementation of CQI at the ART facility

The mechanisms, regarding factors that enable the CQI implementation at the ART facility

Key enablers of the CQI implementation as reported by the respondents is the

CQI methodology to improve quality of clinical services.

All the interviewed health providers found the CQI methodology to be novel and interesting and enjoyed working with the CQI implementation. Some highlighted that the CQI implementation identified gaps in their current clinical practice. Although gaps in the CQI implementation domain knowledge were reported, health workers reported having better motivation (11).

However, there were many challenges either:

- **Participation of health care providers in the CQI:**

“The staff is multi-tasking such as Counselling VCCT, Counselling ART, VL. Pump, patient registries”. (KI _Data Entry clerk)

As reported by the respondents, all the health care providers including provincial staff, Operational District officers, hospital staff, and NGOs staff received formal training in the CQI sessions from the national program officers.

The roles of staffing in the implementation of CQI in the ART facility (service providers at various levels) are various.
Despite shortage of staff, health workers are still working hard to provide HIV / AIDS services and other services available at hospitals.

- **Guidelines Factors:**

“There should be a well-established standard operating procedure document related to indicators and data retrieval”. (Data Entry)

“For the same day indicator, I used to see them but I don’t understand them”. (Data Entry)

“Some indicators can be easily set up but others should be guided by the national level. I asked the national level to update the CQI and update to the website”. (KI_Data Entry).

There should be a guidance book for us to understand what is required by the national level. (KI_Data Entry).

We, at the provincial level, has no problem with the updated database but other ART services are not flexible enough with the updated database. (KI_Data Entry).

Factors related to guidelines may be considered in Cambodia's National CQI Guidelines and for CQI intervention, as a new implementation of the “Guidelines”.

National CQI Guidelines and Other factors: Because the focus of CQI was national CQI guidelines implementation, the guidelines were an enabler of the intervention.

Due to the National Guidelines for CQI Implementation published by since 2017

However, feasibility has been challenged due to increased effort to implement CQI improvement (such as improved clinical documentation and implementation of the patient tracking system), although the latter approach directly implements CQI guidelines. As a result, implementation and/or review were noted at some clinics.

- **Individual Health Professional Factors**

“Employee has limited IT skills so that sometimes they cannot well manage the data when it is updated.” (KI_Data Entry clerk_Takeo)

“The workload is heavy and we don’t have much time to focus on documentation. We just pay much more attention to the treatment itself”. (KI_Doctor)

“We would like to require new training course on counselling”. (KI_Doctor)

“As we are implementing the CQI we understand more about our service quality. We treat patients and at the same time understand the problem.” (KI_Data Entry)

“If there is something missing, I have to do it myself and try to do it alone without a mentor” (KI_Counsellor)

If there is a new course, I suggest that non-trained health care providers should be trained to assist the clinic. (KI_Conseilor)

- **Key enablers to the CQI implementation as reported**

Respondents reported CQI approaches were to improve the quality of clinical services, and some noted that the CQI found gaps in their current clinical practice.

Although gaps in the CQI domain knowledge were observed, health care providers reported better motivation to follow up patients once they understood the rationale of the guidelines. However, challenges were many (12).

- . Limited self-efficacy from needing operational manager
- . Approval to implement any improvement activities, requirements.
- . For repeated training and supervision to improve routine data quality, and poor clinical documentation in medical records.
- . Staff interactions were important for disseminating CQI such as skills and continuity of improvement activities. Enablers were teamwork and collegiality.

- **Patient Factor**

However, some patients miss out on clinical follow-up due to long distance. Therefore, the patient did not do VL test in addition to running out of ART stock. (KI_Doctor)

“Respondents also identified patient needs and behaviours which contributed to the implementation of this CQI. Patients are good for their health care and regular health monitoring can facilitate HIV care services.” (KI_Doctor)

“Other patients' cell phones were discontinued or the number was incorrect, making it difficult to schedule a follow-up” (Ki_Data Entry).

Health care workers noted that many patients could not come to the clinic at the time, so annual routine tests were not performed. Finally, some health care providers were inflexible with changes to patient's workflow and complaints solving (KI_Doctor).

- **Professional Interactions**

Limited self-efficacy from needing operational manager, limited approval to implement any improvement activity, the need for repeated training and supervision to improve routine data quality, and poor clinical documentation in medical records

Additional constraints included limited building space, computer breakdown, and lack of printing equipment.

- **Civil Society and NGOs Factors**

“We have other partners such as PC and AHF who understand well about the project and increase patients’ awareness about the project”. (KI_Doctor)

“In the hospital, we are cooperating with NGOs and volunteers such as PLWHA and we always work as a team”. (KI_Doctor)

“As I know, NGOs also have funding to improve the provision of HIV treatment and care services for people living with HIV. They can participate through the National Center for supporting “HIV/AIDs clinic activities because they also have a focal point responsible for outreach activities in the community” (KI_Doctor).

Non-state actors beyond health sector include NGOs and other civil societies/associations. These groups had various activities, ranging from directly implementing continuous quality improvement related programs to the provision of financial and technical support to HIV programs carried out by other stakeholders. In most of the ART clinics in Cambodia, there are many NGOs implementing many programs to support the health and development for many years, including the improvement of ART services and outreach activities in the communities.

6.2.1.3. Hindering factors to implementation of CQI at the ART facility

Regarding factors that are barriers to the CQI implementation at the ART facility

“One Counsellor highlighted “the importance of hiring more lay counsellors as it was difficult to take on the additional responsibility of HIV testing and counselling with their existing workload”. (KI_Counsellor)

“The importance of the nurse / counsellor, because it was difficult to accept more responsibility to the routine testing / extract information of CQI indicators and counselling with the existing workload”. (KI_Doctor)

“In terms of staff capacity, it is still limited. It is difficult for them because there are not many skilled staff” (KI_Data entry)

The CQI implementation provided support for improving antiretroviral services. However, limited availability from the operational manager may have reduced capacity for improvement of the CQI implementation. Professional hierarchy can reduce the effectiveness of individual health care providers and the implementation of CQI”. (KI_Doctor)

“Staff interactions were important for disseminating CQI such as skills and continuity of improvement activities. Enablers were teamwork and collegiality.” (KI_Doctor)

Health care providers overcame their initial implementation of the CQI in charge, given the need to improve the quality of patient care, and, as we have seen, they are enthusiastic about CQI's results (13).

While some believed CQI was sustainable, others highlighted that staff transferred to other facilities (resulting in loss of CQI memory at the facility) or lack of leadership to motivate a culture of quality, would reduce sustainability of the CQI. (KI_Doctor)

" I found that the knowledge among ART clinic staff is limited, especially data entry skill. With their [current] knowledge of many indicators, how would we encourage health care providers in the ART clinic to join CQI implementation". (KI_Doctor)

The operational manager was essential for decision-making to start a new activity. Dissemination of CQI skills among team members was inconsistent.

There is limited space, the counselling rooms are small and are not fit for confidentiality for Voluntary Confidential Counselling and Testing. There are three doctors and we have only two counselling rooms. (KI_Counsellor).

While enablers include teamwork and collegiality, professional hierarchy hindered the implementation even with good teamwork: it was difficult for lower-level staff such as nurse/ counsellor/ data clerk in some clinics to share new knowledge with their superiors, even though the former were more available to participate in CQI activities. Staff interactions were important for disseminating CQI skills and continuity of improvement activities.

"It was difficult for data entry staff or counsellors even medical doctor in some clinics to share new knowledge with their superiors, even though the former were more available to participate in CQI activities". (KI_Data Entry)

One of the main challenges regarding the implementation of CQI was the shortage of human resource. Staff at all levels were often pre-occupied with other tasks and their technical skills is also limited. Health care providers/ART clinic staff usually are busy with their daily work, and some of the staff attend meetings/training sessions so they do not have enough time to spend on the CQI implementation. Besides burden of workload, lack of functional equipment and space in the building was also a challenge (14).

- **Patient Factor**

"Respondents also identified patient needs and behaviours which contributed to the implementation of this CQI. Patients are good for their health care, and regular health monitoring can facilitate HIV care services." (KI_Doctor)

“Other patients' cell phones were discontinued or the number was incorrect, making it difficult to schedule a follow-up” (KI_Data Entry).

- **Civil Society and NGOs Factors**

“Sometimes NGOs cannot provide monthly salary to their staffs so it is difficult to implement the project, field visit/follow-up, registration, but they still help us with the project.”
(KI_Doctor)

“Currently there are only NGO staff and a volunteer staff –in total three staffs.” (KI_Doctor).

Therefore, the assistance of civil society organizations plays an important role in the operation of the ART clinic, but the budget of NGO partners is limited (15).

vii. Discussion:

Based on the interviewing, there was a gap in understanding how the CQI should be implemented as some staffs who were working in the ART clinic at the referral hospitals were not yet clear about that [CQI] while asked some steps and procedures.

Staff knowledge about the CQI was also limited especially in data management and counselling. Some did not clearly understand the CQI indicators. The National Center should encourage staff in the ART clinics to better understand the CQI implementation.

Participation of health workers, in particular among key staff, in the CQI was also limited. This factor influenced the implementation and ‘normalization’ of the CQI in the ART clinic.

Many clinics could not improve immediately, such as the same day program, MMD, TPT, VL monitoring during the intervention and many clinics did not improve significantly in VL annual testing.

There were many challenges that reduced the outcome of the CQI implementation within the NCHAD's system and local context. Some issues were ‘Impactful’ such as general staffing shortages, gaps in routine data quality. Superimposed on these were several short and medium-term ‘shocks’: resignations without replacement such as counsellors/data clerk and other staff, an overhaul of the routine monitoring system, and the rollout of some indicators.

Staffing shortages particularly influenced health care provider's availability to participate and engage in CQI meetings and improvement activities.

Knowledge gaps of the content and national guideline 2017 CQI guidelines should be further improved.

Challenges limiting health care provider's ability to identify indicators of the CQI implementation guide included poor clinical documentation and routine data quality.

The results showed that the CQI implementation may be effective in most of the provinces, but some of provinces have found significant CQI drawbacks on some indicators, such as VL monitoring, TPT, MMD, and other indicators. Delay in the implementation of some indicators of CQI and / or infrequent review of most indicators of CQI performance by many clinics, particularly in larger ART clinics due to lack of staff and Covid- 19 epidemic in almost the last two years could be the reasons.

CQI Implementation and resource investments

The result showed that health care providers maintained positive attitude towards the CQI implementation. In particular, health care providers were enthusiastic about learning the CQI tools and improve quality of services and are interested in continuing to work with the ART services team.

Based on our findings, CQI mentors implemented the CQI intervention with high fidelity. However, clinic health care providers implemented the CQI and its techniques with lower fidelity. Most of clinic health care providers could not regularly participate in CQI quarterly meetings and failed to complete some of the CQI tasks, despite their enthusiasm for the implementation.

The key resource needed for the implementation of CQI is CQI mentors' time and health care providers' time. CQI mentors typically spent time training and supporting clinic health care providers during the implementation of CQI for each step and action.

CQI mentors who are adaptable and relatable professionally to health care providers at target ART clinic may be more successful at engaging health care providers in the CQI implementation. Mentors must be adept at generating descriptive data and familiar with the implementation of desired changes in practice.

It is possible that the quality of mentorship may not have been as high as expected and that the CQI mentors themselves needed additional training and supervision. However, given the close support by the improvement advisor during CQI implementation, this is unlikely to have been a major issue (11).

viii. Strengths and Limitation

Another problem identified was involvement of key staff in the COVID-19 activities in communities. The COVID-19 epidemics has been an obstacle to patient cooperation too.

This evaluation had several limitations:

First, the 13-months of Covid-19 epidemic had impacted the implementation of CQI on ART sites. This can affect optimization of change required to improve outcomes. Plus, the ART clinic resources in routine care were already overstretched.

Second, we have an assessment of the CQI implementation at randomly selected ART clinics. However, some key staff available for the interview were new staff. In this case, we expected that this might have underestimated the actual effectiveness of the implementation.

Third, we were unable to measure long-term sustainability of CQI over several years.

Although we have identified the CQI implementation features indicating that it would be sustainable, but we were unable to measure long-term sustainability on the ART services after the evaluation of the CQI implementation because our study duration was limited by our research budget.

ix. Conclusion and Recommendation:

The most notable challenge was the staffing shortage happening in most clinics, particularly professional nurses/counselors/peer educators and data clerks. This shortage was due to a cut in some NGOs ' funding, staff resignation, and change of workplace. In addition, staff needed to cope with the workload of other competing tasks.

Each clinic had different organizational challenges. There were differences in workload, building size, and functionality of the equipment. Common root causes — across most clinics for low care testing rates included poor clinical documentation, poor filing of results, and lack of a patient tracking system. Although most of the health providers participated in the CQI activities, received training on all the CQI tools, and had quarterly CQI meetings (e.g., patient tracking notebook for VL monitoring and another testing), there was diversity in seeking solutions due to the clinic context. This resulted in the heterogeneity of the implementation.

These different implementations would have had a different effect on the implementation of CQI at each clinic. Some experiencing improvements may have been progressive, acknowledging that comprehensive assimilation of CQI would likely take some time. Based

on the study results, if health care workers remained committed and had available time, the implementation would have improved.

Health care workers reported that the CQI may not be normal in this limited resource context, without ongoing external support from the CQI mentors, leadership, ownership, and continuing capacity building. To further expand ownership, capacity building for staff from onsite mentorship to enhance their advanced planning, problem-solving, priority setting, and management skills may be beneficial.

Such capacity building is likely to strengthen clinic operations and availability of health workers to engage in the CQI implementation regularly whilst improving staff skills, ethics, and patient health outcomes. This is achieved through a shift towards an active approach to providing treatment rather than a reactive approach.

Measuring sustainability of the implementation of CQI is crucial. Interest in the implementation of CQI by policy-makers would allow development of new national guidelines and team mentors to mentoring elsewhere in ART services, and this would be an important consideration for the sustainability of the implementation of CQI.

However, it is possible that assistance through coaching on side-chain management at all levels of staff is amenable to improvement initiatives as demonstrated elsewhere in the ART site in Cambodia. All of these factors reflect the importance of adequate time and support for health care providers to improve knowledge, skills, and maintain CQI activities.

The study showed that increasing the knowledge of health care providers is one of the strategies used to improve the CQI implementation situation in Cambodia. Training sessions were organized with aim of improving the knowledge and skills of health care providers/ART clinic staff on CQI implementation.

The main staff involved in training activities were; clinician staff, data clerk, counsellor, nurse, and health care providers who work for the CQI implementation. OD and PHD officers provide technical support to the ART staff.

Besides, NGOs also get involved in these activities through the provision of financial and technical support to the ART clinic for implementing the CQI program in the ART clinic directly.

Finally, although the results of implementation were high on some parts of the CQI's indicators, we did not measure the quality of their mentorship. It is possible that the quality of mentorship may have been as high as expected and that the CQI mentors themselves needed additional training and supervision. However, giving the close support by the improvement mentors during implementation is likely to have been a major issue.

Key Messages:

Implications for policy makers:

- Our findings demonstrated the importance of health systems strengthening alongside other initiatives to improve service quality.
- Our process evaluation of continuous quality improvement (CQI) in pre-ART/ATR clinics in Cambodia demonstrated that simple workable solutions were able to address the challenges.
- Despite health care providers' enthusiasm for improving service quality, resource shortages including staffing shortages, gaps in knowledge from the guideline, poor clinical documentation and data quality were barriers to CQI program achieving its full potential in this setting.
- Health system strengthening initiatives in parallel to CQI interventions are essential to optimize HIV care (and other services) quality in resource-limited settings.

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xi. Appendices

Objective	Method of data collection	Tool
1. To estimate the coverage of implementations of continuous quality improvement (P-D-C-A) approach in Cambodia.	Face to face interview	A question is included in the qualitative question-guide: "Is CQI activity implemented in this pre-ART/ART site?"
2. To measure trend of selected indicators	Get the data from pre-ART/ART database of the site 2015-2020	pre-ART /ART database
3. identify the perception of healthcare workers:	In-depth interview	Semi-structure question guide: 1. What is CQI?

<ul style="list-style-type: none"> a. Related to having CQI implemented in the ART facility, b. Regarding factors that enable them to implement CQI in the ART facility c. Regarding factors that hinder them to implement CQI in the ART facility 		<ul style="list-style-type: none"> 2. Is CQI implemented here? <ul style="list-style-type: none"> 2.1 if yes could you describe? 2.2 What benefits of CQI implementation in your ART facility? 2.3 If no CQI implementation, why CQI cannot be implemented here? 2.4 Please provide your opinion about CQI implementation (Good/bad/Strength/Weakness)? 3. What factors do you think to enable/facilitate CQI implementation? 4. What challenges with CQI implementation? 5. What suggestions to improve CQI implementation?
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