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Challenges associated with follow-up care after implementation of an HPV screen-and-treat program with ablative therapy for cervical cancer prevention

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Abstract

Background Cervical cancer is a preventable cancer; however, decreasing its prevalence requires early detection and treatment strategies that reduce rates of loss to follow-up. This study explores factors associated with loss to follow-up among HPV-positive women after implementation of a new HPV-based screen-and-treat approach for cervical cancer prevention in Iquitos, Peru.

Methods We conducted semi-structured interviews with “*obstetras*” (i.e., midwives) ($n = 15$) working in cervical cancer prevention and women ($n = 24$) who were recorded as lost to follow-up after positive HPV results. We used the Health Care Access Barriers Model to guide analyses. We utilized manifest content analysis to describe barriers to follow-up according to the *obstetras* and thematic analysis to report themes from the women’s perspectives. We also report the steps and time taken to contact women.

Results We found an incomplete and fragmented patient monitoring system. This incomplete system, in conjunction with challenges in contacting some of the women, led to structural barriers for the *obstetras* when attempting to deliver positive results. Women in this study expressed a desire to receive treatment, however, faced cognitive barriers including a lack of understanding about HPV results and treatment procedures, fear or anxiety about HPV or treatment, and confusion about the follow-up process. Women also reported having important work matters as a barrier and reported frequently using natural medicine. Reported financial barriers were minimal.

Conclusion This study highlights the barriers to follow-up after implementation of a primary-level HPV-based screen-and-treat approach. While some barriers that have previously been associated with loss to follow-up were not as prominently observed in this study (e.g., financial), we emphasize the need for screen-and-treat programs to focus on strategies that can address incomplete registry systems, structural challenges in results delivery, cognitive barriers in understanding results and treatment, and work-related barriers.

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Keywords Lost to follow-up, Cervical cancer, HPV screening, Screen-and-treat, Post-implementation

Background

Cervical cancer is the second most common cancer among women in South America [1]. In the Loreto district of Peru, cervical cancer is the primary contributor to cancer-related deaths among women, and the mortality rate from cervical cancer in this region is the highest in Peru at approximately 26.8 per 100,000 [2]. However, cervical cancer can be effectively prevented by utilizing vaccines for human papillomavirus (HPV) – the main cause of cervical cancer – and early detection and treatment (EDT) programs [3, 4]. Successful implementation of vaccination and EDT programs requires adaptations to the complexities of the local healthcare system. These adaptations are needed to ensure access to effective screening, timely follow-up for abnormal screening results, and prompt treatment for those requiring it. Among the adaptations required to reduce cervical cancer mortality rates is addressing loss to follow-up (LTFU). Women who are LTFU are screen-positive; however, they do not reach an appropriate conclusion in their continuum of care by either receiving treatment or a negative confirmatory screening test [5, 6].

To facilitate strengthening of the cervical cancer EDT program in the Loreto district of Peru, an implementation science project, Proyecto Precancer, worked with local health authorities to co-design and create a new EDT approach: a screen-and-treat program. This primary-level approach includes HPV testing as screening, and visual triage for those with a positive result. The visual triage determines eligibility for ablative therapy at select primary-level centers with trained personnel and equipment. Women ineligible for ablative therapy are referred for specialist hospital-level follow-up. Prior to implementation of this screen-and-treat approach, Proyecto Precancer collected monitoring and evaluation data on the number of women who tested positive following visual inspection with acetic acid (VIA) in the Micro Red Iquitos-Sur (MRIS) health network of Loreto and their subsequent hospital-level follow-up care or lack thereof. In the MRIS, before the new screen-and-treat approach (between January 2018 and June 2019), 69.8% (120/172) of these women were LTFU [7].

In parallel, also before implementation of the new screen-and-treat approach, the Proyecto Precancer team interviewed women who were LTFU at the hospital-level to help understand this high rate of LTFU [8]. These participants described a strong desire to complete the continuum of care but encountered a fragmented,

burdensome system that continuously impeded their care. They faced cognitive barriers such as a lack of knowledge about cervical cancer, misunderstandings about screening results or treatment, lack of awareness of the follow-up process, unclear communication from staff, and preconceived notions about challenges at the hospital-level. They also encountered structural barriers including challenges receiving results or scheduling appointments, unavailability of providers, long wait times, complicated care processes, and broken equipment, and financial barriers including out-of-pocket payments and costs related to travel or missing days of work [8]. These hospital-level barriers are also commonly found in other low- and middle-income settings [9–16]. Barriers to care in a primary-level HPV based screen-and-treat program were studied in Kenya from the perspective of healthcare providers [17, 18], which identified cognitive barriers among women including a lack of knowledge about HPV and cervical cancer, structural barriers such as a lack of supplies and lack of adequate staffing, and financial barriers including the cost of transport to health facilities.

Proyecto Precancer's implementation of the screen-and-treat approach aimed to address many of the reasons women are LTFU at the hospital-level by task shifting the follow-up and management of those with abnormal screening results (HPV positive in the case of the new approach) from the hospital-level to the primary-level facilities. Following implementation of this new approach in 2019, in an additional study conducted by our team, we found that screening rates significantly increased, more than doubling from 83 to 176 screening tests per month between January 2018 and February 2020 [19]. Moreover, in this post-implementation study (between July 2019 and February 2020), we found a LTFU rate of 30.0% (174/580) among women with a positive HPV result in the MRIS [7]. While this LTFU rate is a considerable improvement over the LTFU rate of 69.8% before implementation, women are still being LTFU in the screen-and-treat approach.

Our study aimed to explore the factors associated with LTFU in the HPV-based screen-and-treat approach, with visual triage and ablative therapy at the primary-level for those with positive HPV tests. We considered the perspectives of women who are recorded as LTFU after receiving a positive HPV test, as well as *obstetras* working in cervical cancer prevention in Iquitos, Peru. Women can be LTFU at several points through the continuum of

care including not receiving their HPV result, not wanting to attend ablative therapy treatment, and not attending ablative therapy treatment. While women can be LTFU in the new screen-and-treat approach at the hospital-level, we focus here on the primary-level as our previous paper outlines hospital-level barriers [8]. This study incorporates the perspectives of multiple stakeholders and provides insights into changes that are necessary in many low- and middle-income settings to further reduce rates of LTFU in screen-and-treat programs at the primary-level.

Methods

To ensure we obtained a detailed understanding of LTFU at the primary-level following implementation of the HPV screen-and-treat approach, we conducted two types of semi-structured interviews: 1. interviews recorded using a data collection spreadsheet with *obstetras* working in cervical cancer care and 2. Interviews recorded and transcribed verbatim with women who were documented as LTFU in the MRIS. All interviews focused on the same topic: reasons for LTFU following implementation of the screen-and-treat approach. Our team also recorded the steps and time required to contact each woman for the interview. Although we created a list of women who were documented as LTFU, we do not report a LTFU rate from this data because determining such a rate requires supplementary data collection (e.g., manual, hospital-level searches), which was beyond the scope of this study focused on exploring barriers to follow-up.

Setting

This study was conducted in the northern Peruvian Amazon rainforest, specifically in the MRIS health network (population 127,000) in Iquitos (population 400,000). Iquitos is the capital city of the Loreto district. It is the largest city in the world that can only be reached by plane or by boat; there are no roads to the city. Many of the MRIS communities outside of the city can only be reached by the one highway or by river. Additionally, within 15 min of leaving the city, there is limited to no cellphone coverage. Fishing, agriculture, logging, oil extraction, tourism, and small businesses are the main sources of income in Iquitos.

The public health facilities in this study are covered by the Seguro Integral de Salud (SIS) [Comprehensive Health Insurance]. SIS is a public healthcare insurance program that provides full or partially subsidized insurance to people in Peru living in poverty or extreme poverty. In Loreto, 67% of the population has SIS coverage [20]. All women in our study were covered by SIS, providing a general indication of socio-economic status of these women.

The MRIS is home to 20,000 women between 30 and 49 years old who are eligible for the new HPV-based screen-and-treat approach [21]. In this approach, women are first screened with an HPV test and if positive, are followed up with visual triage to determine eligibility for ablative therapy or referral to the hospital. Women in the MRIS can choose to either self-sample the HPV test at home (e.g., during a healthcare campaign) or at the health facility, or can choose to have the HPV sample collected by an *obstetra* at the health facility.

Within the MRIS, there are 17 SIS health facilities ranging in size and capacity. Some larger facilities are staffed with doctors, nurses, and *obstetras* and have laboratories, while other smaller facilities are staffed only by one *obstetra* and are open for limited hours. The *obstetras* provide preventative women's reproductive and sexual health services. Specifically in relation to the new HPV-based screen-and-treat approach, they provide HPV counseling (i.e., what the test is for, how to do it, and what a positive or negative result means), HPV testing, results delivery at the health center or by home visits (or if necessary, by phone), and scheduling for triage and ablative therapy appointments. The *obstetras* do not provide ablative therapy treatment; instead, this treatment is done by trained doctors at one of two primary-level triage/ablative therapy facilities.

Ideally, when women in the MRIS test positive for HPV, they receive their results with counseling from their *obstetra* and, during that visit, are referred to one of the primary-level triage/ablative therapy facilities for triage. At these facilities, women receive counseling on ablative therapy (in this case, thermocoagulation) from the *obstetra*. In the case where a woman attends primary-level triage and the doctor deems that she is not eligible for ablative therapy treatment (i.e., acetowhite lesions over 75% of transformation zone, suspicious lesions, or transformation zone that is not visible), she is referred to one of two regional hospitals for specialist follow-up care. All MRIS *obstetras* received training on HPV counseling using flipcharts and health education materials, as well as instruction about referring HPV positive women. *Obstetras* working at the two triage/ablative therapy facilities received additional training for counseling on the procedure. Doctors at the triage/ablative therapy facilities were trained by specialists and were supervised by local gynecologists for their first 15 cases.

Participant selection, procedures, and data collection

Our sampling process is summarized in Fig. 1. We began by generating a list of 630 women (ages 30–49) who had a positive HPV result between May 2019 and November 2020 (post-implementation of the HPV screen-and-treat approach) recorded in SIMOPP, a Proyecto Precancer

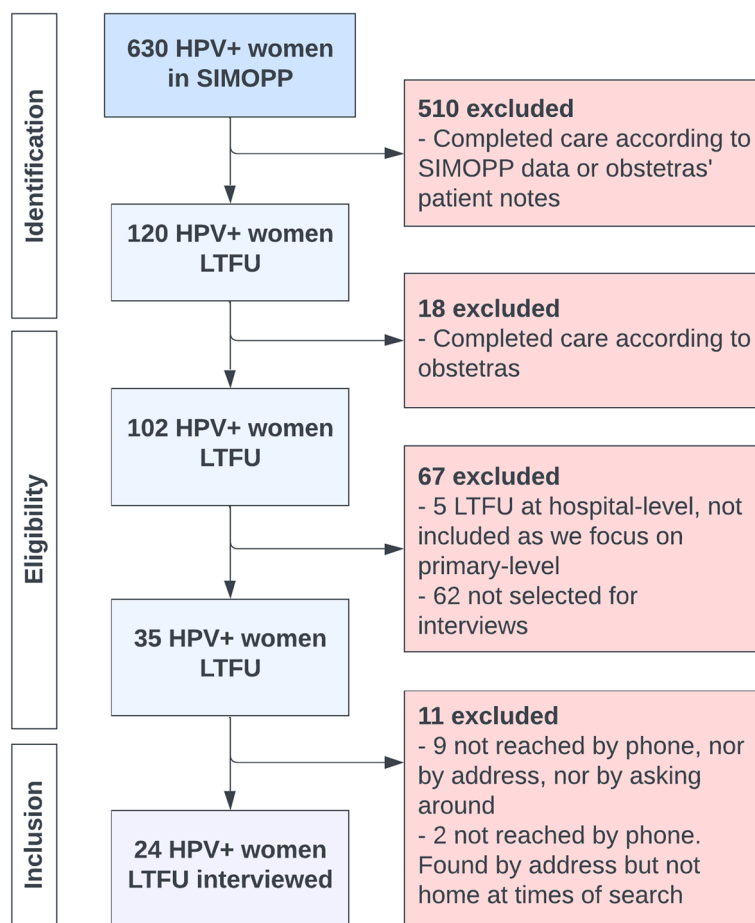


Fig. 1 PRISMA chart depicting the sample selection process

monitoring and evaluation system. We then subset this list to include only women who had no recorded evidence of treatment within 10 months of their positive HPV result. Despite implementation of SIMOPP, when HPV testing began in the MRIS, we observed that some *obstetras* continued to use handwritten notebooks to record their patient data. In most cases, *obstetras* recorded this data in their notebooks and in SIMOPP; however, in some cases, this data was only recorded in their notebooks. As a result, we also cross-referenced the SIMOPP list with *obstetras*' notebooks to create a final list of 120 women who had not attended treatment.

Interviews with obstetras

We then purposively selected a sample of *obstetras* from the 16 MRIS health facilities with women who were LTFU to complete semi-structured interviews regarding their perspectives on why the 120 women were LTFU. Most health facilities in the MRIS have only one *obstetra* per shift; however, at the larger health

centers with more than one, we invited the *obstetra* who was most involved in providing HPV-related care. We interviewed 15 *obstetras* between July 2021 and August 2021. All *obstetras* provided informed consent prior to interviews with one of two Peruvian researchers (J.B., E.J.R.L.). Interviews were completed in Spanish over the phone or in person in a private area of the health facility. For each woman who was LTFU at the *obstetra*'s health center, the *obstetra* was asked – to the best of their knowledge – to answer yes or no to each question and explain why or why not, as relevant: 1. Whether they were aware that the patient had a positive HPV test, 2. Whether they were able to contact the patient, 3. Whether the patient wanted to attend ablative therapy, 4. Whether ablative therapy treatment had been scheduled, 5. Whether the patient attended ablative therapy treatment, 6. Whether the patient received ablative therapy treatment, and 7. Whether the patient was referred for additional hospital-level follow-up. Lastly, the *obstetras* were asked what they believed the

final resolution was for each patient (e.g., where they were LTFU) (see Supplemental Fig. 1). The researchers documented responses using a data collection spreadsheet. The spreadsheet included space for additional comments.

During the interviews, the *obstetras* reported that 18 women who were previously recorded as LTFU had attended triage and either received ablative therapy or were referred to the hospital and received hospital-level treatment, despite there being no record of this.

Interviews with women

We then selected 35 of the women who were still reported to be LTFU to participate in semi-structured interviews, approximately one-third of the women reported LTFU (see Fig. 1). Although we knew we would be unlikely to be able to reach all 35 women, we estimated and later ensured that the subset of women we were able to reach would be enough to have diversity (e.g., women who were LTFU at different points in the continuum of care) and reach saturation based on previous work [8, 22]; however, we were prepared to add interviews as needed. For the interviews, we contacted women over the phone (if they had a phone and had service) or by a house visit to coordinate interviews. The women's interviews were conducted in Spanish between August 2021 and February 2022 over the phone or in a private location in the participants' homes, after they provided informed consent. We used a topic guide and focused the interviews on women's understandings of and experiences with HPV and HPV screening, women's desire to receive care, and women's emotions about and experiences with the care process. The interviewer also asked women, as relevant, whether they received their HPV result, wanted to attend ablative therapy, had scheduled ablative therapy treatment, attended ablative therapy treatment, received ablative therapy treatment, and were referred for additional hospital-level follow-up (see Supplementary Fig. 1). If the woman being interviewed had not yet received her positive HPV result, the interviewer (E.J.R.L.) explained that the HPV test was positive, provided counseling, explained that the woman could attend treatment, if she would like, and provided help scheduling treatment, if requested. In the case where a woman had received her positive HPV result but did not know about available treatment, the interviewer described the treatment and provided help scheduling an appointment, if requested. All interviews were audio recorded and transcribed verbatim. We conducted a total of 24 interviews with women, at which point the researchers did observe saturation and no new findings emerging. The interviewer also took field notes which included information on the steps and time taken to contact and interview each participant.

Data analysis

We used the Health Care Access Barriers (HCAB) Model to guide the analysis. The HCAB is a framework developed to classify, analyze, and report measurable and modifiable health determinants categorized into three types of barriers: financial, structural, and cognitive [23].

Analysis of obstetras' interviews

The researchers (R.M.M, J.B.) used manifest content analysis to analyze the *obstetras'* interviews. We categorized the women discussed in these interviews into groups according to the barrier stated by the *obstetra* that resulted in their LTFU, if this barrier was known, and to count the number of women in each of the groups. Each of the barriers was then categorized according to the HCAB model, if applicable, or was categorized as other, if not applicable.

Analysis of women's interviews

In Dedoose Version 8.0.35, the researchers (R.M.M, J.B.) analyzed the interviews with the women using thematic analysis and developed a codebook using the HCAB model. The codebook was adjusted as interview transcripts were reviewed. Ten transcripts were double coded, and any coding differences were discussed between the coders and resolved by consensus. Once all transcripts were coded, the coders reviewed the transcripts to ensure the coding was consistent with the final codebook.

Additional analyses

To consider challenges in contacting women, we report the steps the interviewer took and the time required to contact the women and conduct the interviews. Finally, to examine discrepancies and concordances between *obstetras* and women, we report whether the *obstetras'* reasons stated for why each woman was LTFU matched what each woman stated as her reason why she was LTFU.

Results

Obstetra interviews

We interviewed 15 *obstetras* working at 16 health facilities. One of the 17 health facilities was excluded as they had no women who were LTFU, and one *obstetra* worked at two health facilities. We interviewed the *obstetras* about the 120 women with no documentation of attending triage for ablative therapy or ablative therapy, who we considered LTFU. Following these interviews, we were missing data on two of the women whose completion of follow-up care was not reported during the *obstetra* interviews. Of the remaining 118 women, *obstetras* reported that 18 women reached an endpoint of care

despite there previously being no record of reaching an endpoint following their positive HPV test: 13 received ablative therapy, three received hospital-level treatment, and two received a negative confirmatory screening test through private follow-up care. Finally, of these 100 women reported by the *obstetras* as LTFU, one attended triage for ablative therapy and was referred to the hospital, and four were referred directly to the hospital. These four women completed Pap tests at the same time as their HPV tests and were referred to the hospital because of their positive Pap screening results. These five women were LTFU at the hospital-level, and we focus on the 95 women LTFU at the primary-level below. In summary, we arrived at 95 women LTFU at the primary-level out of 120 because two women were missing data, 18 received follow-up care according to the *obstetras*, and five had been LTFU at the hospital-level according to the *obstetras*.

Of the 95 women who were LTFU at the primary-level, the *obstetras* provided a reason for why the woman was LTFU in 70 cases; the reasons were unknown to the *obstetra* for the other 25. According to the *obstetras*, 47 of the 70 women were LTFU due to three main structural barriers: challenges in contacting the women, a lack of registry of the HPV results at the primary-level (e.g., a

new *obstetra* without access to the former *obstetra*'s notebook), or pending results delivery for women who had not yet been contacted. Eighteen of the 70 women were LTFU due to other reasons (e.g., vacation, being pregnant at the time of result delivery, preference for natural medicine). Five of the 70 women were LTFU due to two main cognitive barriers: fear of cancer or of treatment and aftereffects. No women were reportedly LTFU due to financial barriers (Fig. 2).

Contacting women for interviews

Of the 35 women who were selected to take part in interviews, we were only able to contact 24 women. Nineteen of the 35 (54.3%) women provided a phone number they could be reached at; however, only eight (22.9%) women were able to be contacted through the phone number (e.g., some women did not answer, some changed their number). The 27 (77.1%) women who could not be contacted by phone needed to be contacted with a house visit. However, out of these 27 women, 22 (81.5%) did not provide a specific address (e.g., did not include a street name or house number), and in the end, we were only able to contact 16 of the 27 (59.3%) women who could not be reached by phone. These women needed to be searched for in a

Steps in continuum of care	Cognitive Barriers	Structural Barriers	Financial Barriers	Other Reasons	
Has not received HPV result		<ul style="list-style-type: none"> Challenges contacting women (n=29/70): <ul style="list-style-type: none"> No phone number Not found at address No registry of HPV test or result (n=14/70) Not yet contacted (n=4/70) 			67.1% (47/70)
Did not want to go to ablative therapy treatment	<ul style="list-style-type: none"> Fear about (n=3/70): <ul style="list-style-type: none"> Having cancer Treatment and after effects 			<ul style="list-style-type: none"> Preferred to take natural medicine (n=5/70) Preferred to attend private follow-up (n=3/70) 	15.7% (11/70)
Has not attended ablative therapy treatment	<ul style="list-style-type: none"> Fear about (n=2/70): <ul style="list-style-type: none"> Having cancer Treatment and after effects 			<ul style="list-style-type: none"> Pregnant at time of results (n=4/70) On vacation (n=3/70) Moved to another health district (n=3/70) 	17.1% (12/70)
	7.1% (5/70)	67.1% (47/70)	0.0% (0/70)	25.7% (18/70)	

Fig. 2 Summary of barriers to the completion of care according to the obstetras

door-to-door search. It took the interviewer an average of 3.6 h and an average of 2.2 attempts searching in person to contact each of these 16 women, find where she lived, and arrive at the address. In summary, we were unable to contact 11 women by phone or house visit; these women were not interviewed. We were able to contact eight women by phone and 16 women in person for a total of 24 women interviewed.

Interviews with women

Sample characteristics

We interviewed 24 women (age_{mean} 39.6 years) identified as LTFU. Fifteen (62.5%) women were from urban health facilities, six (25.0%) from peri-urban health facilities, and three (12.5%) from rural health facilities. Of the 24 women, seven (29.2%) reported having their test done in the community (e.g., during a campaign where *obstetras* went door-to-door), 15 (62.5%) had their HPV test done at the health center, and two (8.3%) did not report where it was done but are still included in our sample. Of the 24 women, thirteen (54.2%) had not received their HPV result. Of those who had received their HPV result (n=11), seven (63.6%) received it at the facility, two (18.2%) during a house visit by an *obstetra*, and two (18.2%) over the phone.

Five of the 24 women reported that despite there being no record of reaching an endpoint of care, they did reach an endpoint: two reported receiving hospital-level treatment and three reported receiving ablative therapy at the primary-level. Two of the women who completed care received follow-up in a private facility:

Well, when I had the molecular test done, parallel to that, I had a biopsy done privately. With that biopsy, plus the molecular test, it was evident that I had

cancer; so, I was referred to the Regional Hospital. (Participant 13, completed treatment)

The five women who completed the continuum of care are not excluded from the following discussion as they spoke about barriers to follow-up that we consider important for understanding system challenges. Fig. 3 summarizes where in the continuum of care each woman was LTFU or completed care according to the women.

Main barriers to completing care

All 19 (out of 19) women who were LTFU expressed a desire to receive treatment. One woman described this as: *“I am positive for this disease [HPV], but I would like to be cured”* (Participant 18, LTFU). Another stated, *“Well, it motivates me a lot because as women, we can’t have this disease... It’s better to go to our health center and have the doctor’s treatment”* (Participant 7, LTFU). However, despite showing a strong desire to receive treatment, the women were faced with cognitive, structural, financial, and other barriers throughout the continuum of care.

Cognitive

Five main cognitive barriers emerged: lack of understanding about the HPV result, fear or anxiety about HPV, lack of awareness of or confusion about the follow-up process, lack of understanding of treatment procedures, and fear or anxiety about treatment.

Nine women showed a lack of understanding of their HPV result. For example, one woman stated after she received her HPV result, *“The lady told me that I had infections only,”* (Participant 9, LTFU). Another woman expressed confusion about the meaning of the result by stating that she was told her HPV result was negative:

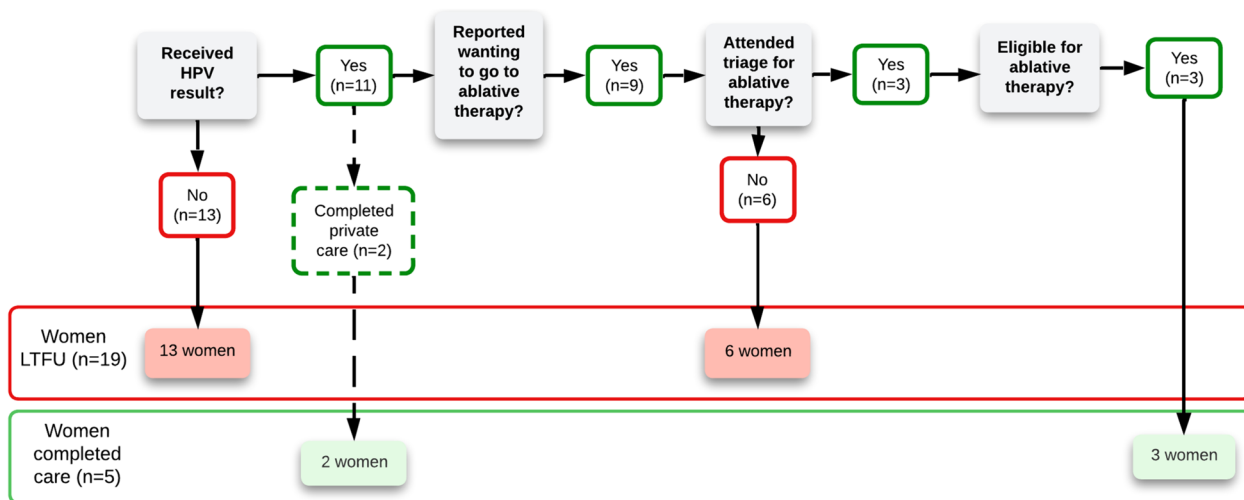


Fig. 3 Continuum of care model depicting where women were LTFU or completed care according to the women themselves

“She [the obstetra] told me, ‘I don’t think it came back positive, it came back good’” (Participant 14, LTFU).

In some of these cases, the lack of understanding was due to a lack of time spent on the explanation by the obstetra. One woman described this as, *“Sometimes you ask the obstetras and sometimes they don’t give you much attention because they have a lot of patients. Sometimes they don’t have a moment to tell you, to help you understand, and sometimes you leave with doubts”* (Participant 7, LTFU). In other cases, the lack of understanding was due to forgetting much of the obstetra’s explanation. One woman stated, *“Yes, they explained [the HPV test] to me, but I forgot”* (Participant 9, LTFU) while another stated: *“To be honest with you, I don’t remember it so well, but I was told that it was to rule out some diseases like cancer or venereal diseases”* (Participant 3, LTFU).

Seven women were anxious or scared about their result or specifically feared cancer. One woman described her fear, *“I felt bad, and I was afraid, and I knew I was going to have cancer. It was very hard ... The first thing that came to my mind was to think that I was going to die”* (Participant 13, completed treatment). Another woman described how her friends told her that if she went for treatment, she would find out she has cancer:

“Don’t go, you will really get cancer. They are going to put an ugly thing in you, like this. They are going to take out your uterus, oh, no, no, no, don’t go.” Yeah, I also cowardly said, “I’m not going to go.” I was afraid. (Participant 11, LTFU)

During a discussion of the process to receive HPV results, six women mentioned confusion about how to receive results. In some cases, women stated that they expected a house visit or phone call to receive their results and did not get one: *“Because the lady told me that if I have something, she will come and look for me. But I, well, I said to myself that I didn’t have anything. Why? Because she didn’t come looking for me”* (Participant 9, LTFU). In other cases, women were unsure how to receive their results:

At the health post, when I did it [the HPV test], they didn’t tell me to come back, and I thought that they would tell me something ... because the lady didn’t tell me, “You are going to come on such and such a day to find out about your test.” (Participant 20, LTFU).

When discussing treatment, 10 women showed a lack of understanding of treatment and its possible side effects. One spoke about concerns of sterilization with treatment: *“That has been my doubt and when they say*

‘sterilization’, ‘cauterization’ and all that” (Participant 4, LTFU). Two of these women expressed confusion about whether a treatment was available, with one woman asking the interviewer: *“I would like to ask you a question, does this disease have a cure?”* (Participant 7, LTFU).

Eight women discussed fear or anxiety about treatment. One woman stated, *“I am so afraid of the little machine [thermocoagulator]”* (Participant 9, LTFU), while another stated, *“I’m a little scared, I am. I’ve never done this, and it scares me a little bit”* (Participant 23, LTFU).

Structural

The main structural barrier was long wait times for receiving HPV results or follow-up care. Six women reported challenges with completing the continuum of care due to long wait times. Four of these women spoke about delays in receiving their HPV result. One woman stated, *“They told me to go to the health post, and when I went to ask, they told me that the results were not available”* (Participant 20, LTFU), while another stated, *“I went twice to ask the lady if my result had arrived. She told me it hadn’t”* (Participant 9, LTFU).

Other

The main other barrier, reported by five women, was needing to prioritize their more urgent work matters. One woman described her priority of work as: *“I never went, because of work I have not gone”* (Participant 1, LTFU). Another stated: *“I work, Miss. I sell. At the end of the day, I sell. I go to sell on the street. That’s why I haven’t gone”* (Participant 15, LTFU).

Financial

A minority of women (two of the 24 women) specifically mentioned financial barriers. One woman spoke about not having money to travel to the health center, *“I didn’t have the money to go. That’s why I haven’t gone”* (Participant 12, LTFU). Another spoke about the opportunity cost as a result of missing work: *“If I don’t sell, my children don’t eat. If I don’t wash other people’s clothes, they don’t eat either, so how could I go?”* (Participant 11, LTFU).

Facilitators of follow-up care

A few of the themes that were barriers to some participants (e.g., inadequate counseling, not understanding processes), were described as facilitators by those who did receive appropriate information. Specifically, women discussed two main facilitators to completing the continuum of care: good knowledge of or a desire to better understand HPV and its treatment.

Eight women showed a good understanding of HPV and its treatment, often due to good counseling from the *obstetras*. One woman demonstrated her understanding of HPV: “He told us that this requires a treatment because if we don’t have a treatment, it can advance. If you don’t realize it, as cancer is silent, it can arrive even when you are in the last stage” (Participant 6, completed care). One woman described a helpful explanation from the *obstetra*: “She took a good look at my face, she told me that I do have the beginnings of cancer, ‘pre-cancer’ she said, ‘No, the cancer is not there yet. You have pre-cancer. You still have time to get it fixed because you are young. You are strong’” (Participant 11, LTFU).

Additionally, five women showed a desire to learn more about HPV and its treatment. One woman asked the interviewer for more information about HPV: “Can my partner also have that [HPV]?” (Participant 3, LTFU). Another woman described looking for information on the internet: “I went and checked on the Internet: what is it, why and how come, and all those things” (Participant 4, LTFU).

Natural medicine

Ten women spoke about taking natural medicine as a supplement to the care provided in the public healthcare system. Seven of these women had not yet received treatment despite stating they would like to receive treatment during their interview. These women often reported taking natural medicine to address symptoms they were experiencing. One woman stated, “I took natural medicine for the pain” (Participant 9, LTFU). Three of these women had already received treatment and took natural medicine to improve their post-treatment healing: “That is why I continue with natural medicine and with my treatment” (Participant 22, completed care).

Obstetras’ and women’s outcomes

When comparing data from *obstetras’* interviews with women’s interviews, we found agreement in the reason why women were LTFU in 13 out of 24 cases, non-agreement in 10 cases, and encountered missing data from the *obstetra* interview in one case.

Discussion

An important finding in this study was the impact of the absence of a complete registry for managing appropriate follow-up care for HPV positive women. Despite efforts to develop and utilize a hybrid paper/electronic monitoring and evaluation registry system (SIMOPP), as well as manual searches for data at healthcare facilities, there were no records of women in the study completing care prior to the interviews. The *obstetras*, who coordinate much of the follow-up care, also often had

incomplete or inaccurate data on women’s follow-up, including instances where they had no registration of women’s HPV results and instances of mistakenly recording women as having received results when the women stated they had not. The fact that some women complete their care in private settings makes registration of follow-up even more complicated. Additionally, databases for monitoring screening and treatment data were fragmented between primary and hospital-level care, making it challenging to determine if patients referred to the hospital received follow-up care, including women in our study who received undocumented hospital care. While this fragmentation has been seen previously in the MRIS and in other LMICs [8, 24], this study also revealed instances where registration of treatment was missing at the primary-level. Successful EDT programs need integrated data registries that are consistently used by all relevant health professionals at the primary- and hospital-levels with accurate documentation of follow-up care linked across levels of care. Implementation science frameworks can be used, including Participatory Action Research, to improve the use of registry systems by allowing stakeholders to internally derive registry systems and feel ownership over the new system [25, 26].

Women who were LTFU expressed a desire for treatment but faced various barriers throughout the continuum of care, starting with receiving their results. *Obstetras* reported, and our team experienced, challenges in contacting these women due to invalid phone numbers or an inability to locate them at their registered address. Conducting house visits was time-consuming, taking almost half a day per woman. This was further complicated by the possibility of women being away during the visit or having moved address. To note, if *obstetras* were expected to find all their HPV positive women who could not be contacted by phone and it took them almost half a day on average per woman, it would be unfeasible; moreover, the public health system needs to consider that the more time that passes between the HPV screening and the results delivery, the more LTFU should be expected in this mobile community. Relatedly, some women assumed that if they were not visited by an *obstetra*, everything was fine, while others did not know when or how to pick up their results. For women who went in person to pick up their results, some women described long wait times. Far too often, these factors culminate in women being unable to receive their results in a timely manner or altogether. Long wait times and challenges in delivering results are barriers seen in LMICs [9, 24, 27]. The challenge of timely results delivery or delivery of results at all can be addressed through greater emphasis on information collection from women, including accurately recording full addresses or asking women to provide a second

phone number (e.g., a landline). Alternatively, at the time of screening, women could be provided with a phone number to call to receive their results and speak to a trained professional, ideally available 24 h per day, 7 days a week. The system could consider hiring a ‘patient navigator’ who can help guide women through the follow-up care process, particularly if the navigators can access the data registry that allows them to visualize patient data [28]. Patient navigators have been shown to increase care completion rates following positive cancer screenings [29, 30]. Importantly, the patient navigators do not need to be clinical staff but instead can be trained to coordinate care, provide health education and information, and offer counseling and psychosocial support [29].

The women and *obstetras* also outlined cognitive barriers to completing the continuum of care including a lack of understanding and fear or anxiety about HPV results and treatment. In some cases, cognitive barriers arose due to *obstetras* being too busy to provide detailed counseling. In other cases, women forgot information shared during counseling. Importantly, during implementation of the screen-and-treat program in the MRIS, Proyecto Precancer provided counseling training to *obstetras* that aimed to address many of these cognitive barriers, which were previously identified in the MRIS and other LMICs [8, 9, 12, 13, 18]. While this counseling training may have addressed some cognitive barriers – as seen by women in this study who discussed facilitators for care (e.g., a good understanding of HPV) – these cognitive facilitators were not sufficient on their own to overcome all of the barriers that resulted in some women being LTFU. The presence of one facilitator (e.g., a desire to learn more about HPV) is likely inadequate for ensuring care completion; there are multiple steps in the continuum of care, each with its own set of barriers, and to reduce LTFU, facilitators must be present throughout the entire system and corresponding barriers must be addressed. That said, this study highlights the importance of further improving counseling before and after HPV testing, including addressing *obstetras*’ time constraints, reducing fear and anxiety, and addressing women forgetting information. The patient navigators could be trained to provide counseling that specifically addresses fear and anxiety around HPV, alleviating the time constraints faced by *obstetras*. Guidelines and tools can also be developed for patient navigators to promote consistency in key messages and reduce the risk of confusion [31]. The tools can include take-home health education materials, which can be adapted to the local and cultural context and provide information on HPV, its treatment, and the process of seeking follow-up care. Traditional health education methods, such as take-home counseling materials, have been shown to improve

health literacy in LMICs [32], decrease anxiety, and increase knowledge following abnormal cervical cancer screenings [33].

Financial barriers in this study were minimal; *obstetras* reported that no women were LTFU due to financial barriers, while two (out of 24) women specifically reported financial barriers. Importantly, this is a substantial shift in barriers from our previous work in the MRIS at the hospital-level which found that 14 (out of 20) women faced financial barriers [8]. Financial barriers are commonly found in cervical cancer care in Latin America [10–13, 15], and the shift seen in this study underscores the possibility of reducing financial barriers through task shifting cervical cancer care to the primary-level.

Women in this study also commonly mentioned a lack of time due to more urgent work matters as a barrier. This has been found in other LMICs [9, 27, 34], and previous research in Latin America suggests that informal workers have fewer social protections to allow them to leave work to attend follow-up cervical cancer preventative care [14]. In Iquitos, much of the economy relies on informal work, and further research can explore support options for women unable to attend follow-up care due to work obligations, such as including a phone service for results or patient navigators.

Approximately half of the women in this study reported using natural medicine. These women also stated that they would like to receive follow-up care in the healthcare system; however, nearly all of them were LTFU, and the *obstetras* also reported cases where women used natural medicine instead of care in the healthcare system. This suggests two possibilities. First, some women may rely solely on natural medicine (as the *obstetras* reported), despite expressing a desire for follow-up care in the healthcare system, which may have been reported by the women due to social desirability bias. Alternatively, natural medicine may be used as a complementary approach alongside follow-up care in the healthcare system. Although further research is needed to better differentiate and assess the presence and impact of these two possibilities, in Peru, natural medicine has been found to be used in conjunction with care in the healthcare system [8, 35]. For the moment, improved counseling, including take-home materials, may help ensure that *obstetras* provide consistent and complete information about women being able to use natural medicine in conjunction with the healthcare system and fully inform women about treatment availability [32, 33].

While our previous research indicates that implementation of the primary-level screen-and-treat approach with HPV testing and ablative therapy reduced the LTFU rate from 69.8% to 30.0% in the MRIS [7], task

shifting cervical cancer care to the primary-level did not entirely eliminate LTFU. Instead, this shift reduced barriers seen in the previous system, including women's anticipation of challenges with seeking follow-up care, burdensome multi-step care processes, and out-of-pocket payments [8]. A holistic, systems thinking approach that considers multiple stakeholders' perspectives - from women to *obstetras* to specialists - is necessary for countries to meet cervical cancer elimination goals.

Limitations

Some of the women who were interviewed in this study were not LTFU, despite our inclusion of women who were recorded as LTFU. We decided to include the interviews from these women in the study as they added valuable information about the challenges in the current system. Moreover, during data collection, we triangulated data from a variety of different sources that often relied on recollection, rather than documentation, to try to obtain a complete picture of follow-up care. We recognize that there are likely recall errors. The interviews with the *obstetras* focused on whether their patients had been LTFU and why; it is possible that some *obstetras* may have felt pressured to say that they had, for example, delivered results to women when they had not yet. However, our team worked closely and was in regular communication with these *obstetras* for years. We had focused on building a relationship of collaboration and trust where the *obstetras* became empowered to discuss improvements needed for the cervical cancer EDT system without judgment and with recognition that they all are part of a larger system that needed collaboration for success. Additionally, when identifying potential participants, if the *obstetras* reported a woman had completed care, we chose at that time to not investigate further. Outside of the scope of this study, we did verify that the *obstetras* in this study were mistaken in some of these cases. It is possible that including these women in follow-up interviews would have elucidated additional themes not obtained with our sample; however, we reached saturation in this study. In the discussion, we consider the possibility that financial barriers were decreased in this study following implementation of the screen-and-treat approach. However, this is a qualitative study limited by its sample size. To draw any conclusion about the relationship between task shifting cervical cancer care to the primary-level and financial barriers, further studies with larger sample sizes are required. Lastly, the findings of this study may not be generalizable to other regions; however, they provide information on barriers faced in resource-limited, primary-level screen-and-treat systems.

Conclusion

This study highlights the need for cervical cancer EDT programs to address multifaceted barriers hindering access to follow-up care. By including multiple perspectives – *obstetras* and women – numerous barriers emerged. We highlighted the need for successful EDT programs to have complete registry systems with patient-level data linked across levels of care. *Obstetras* in this study encountered structural barriers in contacting women, compounded by a lack of clarity in how HPV results should be delivered. Despite expressing a strong desire for treatment, women in this study encountered additional challenges including cognitive barriers, such as a lack of knowledge about HPV and treatment procedures, fear, anxiety, and confusion about follow-up processes. Additionally, women discussed work commitments as a barrier and spoke about using natural medicine. A complete registry system, patient navigators, strong counseling and take-home materials, and support structures to accommodate work-related time constraints may help address these barriers.

Abbreviations

HPV	Human papillomavirus
EDT	Early detection and treatment
LTFU	Lost to follow-up
VIA	Visual inspection with acetic acid
MRIS	Micro-Red Iquitos Sur
SIS	<i>Seguro Integral de Salud</i> [Comprehensive Health Insurance]
HCAB	Health Care Access Barriers

Supplementary Information

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Supplementary Material 1.

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Authors' contributions

All authors contributed to the conceptualization and design of the study. R.M.M., J.B., E.J.R.L., A.K.S., P.E.G., and V.A.P.S. contributed to the data curation. R.M.M., J.B., B.A.P., and J.K.T. contributed to data analysis. R.M.M. and J.B. prepared a first draft of the manuscript. All authors contributed substantially to subsequent revisions and approved the final manuscript.

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Availability of data and materials

Data and materials are available on request to the corresponding author.

Declarations

Ethics approval and consent to participate

The study was reviewed and approved by all participating ethical institutional review boards at Asociación Benéfica PRISMA (CE0251.09), Tulane University School of Public Health and Tropical Medicine (reference number 891039), the University of Maryland School of Medicine (IRB#061614), Hospital Regional Loreto (ID-002-CIEI-2017), and Hospital Apoyo Iquitos (065-ID-ETHICS COMMITTEE HICGG- 2018). Written informed consent was obtained from all study participants prior to the interviews, and the study was performed in accordance with the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

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