

**CERVICAL CANCER SCREENING: SAFETY, ACCEPTABILITY, AND FEASIBILITY
OF A SINGLE-VISIT APPROACH IN BULAWAYO, ZIMBABWE.**

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The image shows the crest of Stellenbosch University, which is a shield with various symbols, topped with a crown and a banner. The crest is positioned behind the text of the dissertation title.

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DECLARATION

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree. I also declare that ethical approval for the study was obtained from the Health Research Ethics Committee of Stellenbosch University (Reference number: S13/02/036).

Signature: Date:"

ABSTRACT

OBJECTIVE: The purpose of the study was to assess the safety, acceptability and feasibility of Visual Inspection with Acetic Acid and Cervicography (VIAC) followed by Cryotherapy or Loop Electrical Excision Procedure (LEEP) at a single visit for prevention of cancer of the cervix in Bulawayo, Zimbabwe.

STUDY DESIGN: The study was descriptive using retrospective data extracted from electronic medical records of women attending the VIAC clinic at United Bulawayo Hospital in the period 1st February 2010 to 31st December 2012. Over 24 months 4641 women visited the clinic and were screened for cervical cancer using VIAC. If positive and eligible, cryotherapy or LEEP was offered immediately. Treated women were followed up at 3 months and 1 year.

RESULTS: The VIAC test positive rate was 10.8%. Of those eligible, 17.0% received immediate cryotherapy, 44.1% received immediate LEEP, 1.9% delayed treatment and 37.0% were referred to a gynaecologist. No major complications were recorded after cryotherapy or LEEP. Among those treated 99.5% expressed satisfaction with their experience. Only 3.2% of those treated at the clinic were VIAC positive one year later. The service was shown to be feasible to sustain over time with the necessary consumables. There were no service-related treatment postponements and the clinic staff and facility were able to meet the demand for the service.

CONCLUSION: A single visit approach using VIAC, followed by cryotherapy or LEEP proved to be safe, acceptable and feasible in an urban African setting in Bulawayo, Zimbabwe.

Key words: cervical cancer prevention, cervical cancer screening, cryotherapy, Loop Electrical Excision Procedure, visual inspection with acetic acid, cervicography, Zimbabwe.

1 INTRODUCTION

Cancer of the cervix is the most common cancer affecting women in Africa and second only to breast cancer worldwide.¹ This cancer claims approximately 270,000 lives of women annually worldwide. Nearly 85% of those deaths occur in resource-poor settings.¹ The reasons for these high rates are because preventive strategies and treatment are not well carried out in developing countries. In resource limited countries, like Zimbabwe, shortage of skilled health workers, lack of political will and insufficient funds towards women's health activities contribute to these high rates.² An additional one million more deaths from cervical cancer are predicted over the "next five years worldwide.

Nearly half a million new cases are reported per annum worldwide.³ Effective and definitive treatment is technically possible in the pre-invasive stage of this cancer, although treatment of frankly invasive cancer is difficult to impossible in developing countries.⁴ The introduction of the Papanicolaou smear during the late 1940's in the USA decreased the incidence of invasive cancer of the cervix by 70%. Screening has been known to reduce the incidence and mortality rates of cervical cancer in developed countries. The cytology based screening programme greatly reduced the burden of cervical cancer in developed countries, this approach is difficult to implement because of lack of financial and human resources in Zimbabwe. The poorly organized health system also contributes to failure in using pap smears as a screening test.⁴ New methods which are adaptable to limited resource countries have been investigated and are being used. Human papillomavirus (HPV) testing and visual inspection of the cervix with acetic acid (VIA) are two adaptable tests being proposed to identify pre-cancerous conditions of the cervix. The positive identification of the cause of the disease, which is a limited number of viral serotypes of the human papilloma virus (HPV) family, has significantly changed the scope of cervical cancer prevention¹¹

In Sub-Saharan Africa, cancer of the cervix accounts for 22% of all cancers in women.⁵ Effective screening programmes have greatly decreased the incidence of cervical cancer in developed countries. In many parts of Africa and Asia Oceania on the other hand invasive cervical cancer is relatively common, with most of the patients presenting in advanced stages.^{5,6} The true incidence of cervical cancer in most African countries is unknown and there is gross under reporting. Only a few countries have functional cancer registers and record keeping is minimal or non-existent.² Some of the figures quoted in the literature are hospital based, which represents a small fraction of women dying of cancer of the cervix, as most women cannot access hospital care and die at home.

1.1 Screening and Early Detection

In spite of knowledge of the cause and prevention of cancer of the cervix, successfully organized, population-based cervical cancer prevention programmes have not yet been implemented in most developing countries. Denny states that contributing factors to this situation are poverty, lack of resources and infrastructure, and disenfranchisement of women.²

Denny suggests that alternative methods of screening for cancer of the cervix like VIA will be suitable for low income resource countries.⁷ The two most widely studied alternative approaches to cervical cancer prevention are visual inspection (with acetic acid or Lugol's iodine) and HPV-DNA testing.²

1.2 Visual inspection of the cervix with acetic acid (VIA)

Visual inspection of the cervix with “acetic acid, also known as direct visual inspection(DVI), involves examining the cervix with the naked eye, using a bright light source, after the application of 3-5% dilute acetic acid using a cotton swab or a spray”.²The procedure involves waiting for one minute after the application of the dilute acetic acid.

The advantage of acetic acid is that it is found in vinegar, which is readily available worldwide. The area of interest for inspection is the squamo-columnar junction (SCJ), or the area of the cervix where squamous epithelium meets columnar epithelium. This area is of interest because this is where squamous cell cervical cancer begins.²

Unlike the Pap smear method which requires a series of steps both inside and outside the clinic to obtain a positive or negative result, the VIA method yields an immediate result. Advantages to this approach include the possibility of offering treatment at the same visit where VIA is provided, reducing anxiety about waiting for a test result, and eliminating further diagnostic procedures.²

Cryotherapy and LEEP, commonly used for treatment of pre-cancer, have a proven safety and effectiveness profile without evidence of adverse anatomical or physiological effects on the cervix.⁸

1.3VIAC- Visual Inspection with Acetic acid plus Cervicography

Cervicography is taking a digital picture of the cervix after VIA with a fairly ordinary camera mounted with a special lens.^{8,9,10} The photographs are viewed on a television or computer screen and interpreted by trained nurses or doctors.^{9,10} Cervicography magnifies the cervix so that it can be viewed on a large screen. It also gives a permanent record that can be discussed later with colleagues, can be shown to the client and can be compared with previous pictures. Cervicography has improved the sensitivity and specificity of VIA. The greatest criticism of VIA has always been quality control and VIAC has resolved this as there is now a visual record that can be discussed by colleagues and transmitted online. VIAC therefore is Visual Inspection with Acetic acid aided by cervicography.

1.4 Immediate post VIAC interventions

The goal of treatment of pre-cancerous lesions is to remove the lesion and this can be accomplished by either ablation (cryotherapy or cautery), excision Loop Electrical Excision Procedure (LEEP), cone biopsy or hysterectomy.^{11,12,13} All these treatments methods have a good success rate. and the choice of treatment depends on the size or extent of the lesion, client acceptability, reproductive needs, cost, availability of equipment and expertise. Since VIAC is based on a single visit ‘see and treat’ approach only treatment modalities that fit into this approach are discussed further: cryotherapy, cautery, LEEP and cone biopsy.^{11,12,13}

1.4.1 Cryotherapy

Cryotherapy of the cervix is a method of destroying pre-cancerous cells by cold coagulation using ice-cold gas and no local anesthesia.^{11,12} The main disadvantage is that there is no

histological specimen available for evaluation. If an aceto-white lesion is visualized during VIAC, cryotherapy treatment can be performed.^{14,15,16,17}

If the lesion covers >75% of the cervix, disappears into the internal os, there are abnormal vessels or gross evidence of cancer the client should be referred for LEEP.^{14,15,16,17} If an aceto-white lesion is visualized during VIAC, cryotherapy treatment can be performed following set criteria.^{14,15,16,17}

1.4.2 Loop Electrical Excision Procedure (LEEP)

LEEP is also called Large Loop Electro-diathermy Excision Procedure and is performed under local anesthesia using 2-5 ml lignocaine without adrenaline at 3-, 6-, 9-, and 12 o'clock positions. It entails using a wire with an electrical current passing through it to cut and remove tissue under direct vision.¹¹ The wire cuts and simultaneously coagulates. The transformation zone, including the lesion, is therefore removed. This can be used as both a diagnostic or therapeutic procedure.

Criteria for LEEP:¹¹

- Aceto-white lesion covering > 75% of the transformation zone
- Lesion disappearing into the os
- Lesion contains abnormal blood vessel patterns
- Persistent lesion after cryotherapy
- There is failure of agreement between cytology, VIAC and histology
- The limits of the lesion in the cervix cannot be completely defined by VIAC

1.5 Scientific value of the study

The main value of the study is to show that a single visit approach to cervical cancer screening is acceptable and feasible to staff and patients and the treatment options are safe. Similar projects have been undertaken in Ghana⁹, Zambia¹¹ and Thailand.¹⁶ In Ghana a single-visit approach using cryotherapy proved safe, acceptable and feasible in an urban African setting.⁹ In Ghana and Thailand they used VIA, while in Zambia they used VIAC.

In Zambia the high proportion of women (67%) that accepted screening for cervical cancer and the high proportion of women completing the referral, show that existing HIV prevention interventions provide a springboard for rapidly reaching women with timely, life-serving and easily adaptable cervical cancer prevention and treatment programmes such as “screen and treat”.¹²

Both the Ghanaian and the rural Thailand studies assessed the safety, acceptability and feasibility of cryotherapy performed by trained nurses. Therefore the knowledge gap to be addressed is to find out if this approach is acceptable and safe to those accessing it in the Zimbabwean context and also to evaluate if it is feasible to effectively offer such a service in the context of the poorly resourced health system. There will be a need to look at certain aspects of the screening process such as follow up care of the patients with abnormal results, sustainability of the programme and whether the programme meets the screening standards set by WHO. The findings of the study will be discussed with the Ministry of Health and relevant policy makers. The findings of this

study will add knowledge required to develop effective health policies in Zimbabwe on an important aspect of women's health.

1.6 Aim and objectives

The aim of the study was to evaluate VIAC screening and immediate intervention (cryotherapy or LEEP) for the prevention of cervical cancer amongst women attending the United Bulawayo Hospital in Zimbabwe. The objectives of the study were:

- To evaluate the safety of this approach - proportion experiencing severe bleeding, shock or requiring hospitalization during treatment, proportion with post treatment complications and proportion returning for an additional visit due to problems.
- To evaluate patient satisfaction with and adherence to this approach-proportion that consented at their single visit, proportion of treatment postponed in order to consult with family members, proportion attending follow up appointments, proportion whose partners abstained from sex for four weeks after treatment by successfully adhering to home care instructions, proportion satisfied with the screening and treatment service.
- To evaluate the technical feasibility of this approach-treatment performance rate in that eligible, proportion with treatment postponed due to break down of equipment.
- To evaluate the clinical outcome - VIAC positive rate at 1 year post treatment at the clinic.

2. METHODS

2.1 Study design

This was a descriptive cross sectional study using retrospective data from medical records of women attending the VIAC Clinic at United Bulawayo Hospital in the period 2010-2012.

2.2 Setting for the study

The study was carried out in a VIAC clinic located at the United Bulawayo Hospitals. The VIAC clinic was incorporated into an already existing Family Planning clinic. The clinic has been functional since June 2009 and has four rooms. One room was for data capturing, counseling for VIAC, contraception and HIV, and testing for HIV. The second room was a procedure room for VIAC and cryotherapy. The third room was a small theatre for LEEP and the fourth room was a toilet. The clinic employed four midwives trained in counseling, VIAC, cryotherapy and family planning. Registrars, gynaecologists and junior doctors trained in VIAC, cryotherapy and LEEP also worked in this clinic.

The duration of the training course was 14-21 days. All nurses were expected to master VIAC and cryotherapy. Doctors were expected to master skills to perform VIAC, cryotherapy, LEEP, cautery, cone and punch biopsy provided they worked in institutions where complications of those procedures can be dealt with adequately. The participants were trained by two gynaecologists and two senior registrars. The learning approach used continual assessment of the participant learning, where the clinical trainer regularly informs the participants of their progress in learning new information and skills. Training and assessment were competency based.

The guideline followed by the clinic was that those who were HIV negative were screened for cervical cancer every 3 years while those who were HIV positive were screened once a year.² The

recommended optimal age for screening was defined as 30-39 years of age, expanding to 18- 65 years as resources permitted. Those women who received cryotherapy or LEEP were reviewed 4 weeks post treatment and then a year later. Figure 1 shows the flow of patients in the VIAC clinic. Patients with cancer of the cervix were referred to the gynecology clinic at the local referral hospital.

2.3 Study population

The study population included all women (4641) who were screened during the period 2010 – 2012 were included. No pregnant women are screened at the clinic.

2.4 Data collection

Data was collected by the researcher and three research assistants (another doctor and two clerks) from patients' electronic medical records and captured in an Excel spread sheet. Data was collected to calculate the following variables:

1. Proportion of VIAC positive women
2. Proportion of women offered and accepted immediate post VIAC treatment
3. Proportion of women who postponed treatment versus number of women who accepted it immediately
4. Proportion of women who developed complications during treatment
5. Proportion of women who developed complications after treatment (up to 6weeks)
6. Proportion of women satisfied with the service
7. Proportion of women supported by their spouses by abstaining from sex for four weeks following treatment
8. Proportion of women found with invasive cervical cancer on first VIAC examination
9. Proportion of women returning for review after 12 months post treatment.
10. Proportion of women found VIAC positive on follow up after treatment.

On arrival at the clinic patients were counseled for VIAC and HIV testing. At the end of the VIAC procedure patients were presented with their results and at the same time they were asked if they were satisfied with the decision they made to be tested. This was recorded in their notes and used to calculate the proportion of women satisfied with the service.

2.5 Data analysis

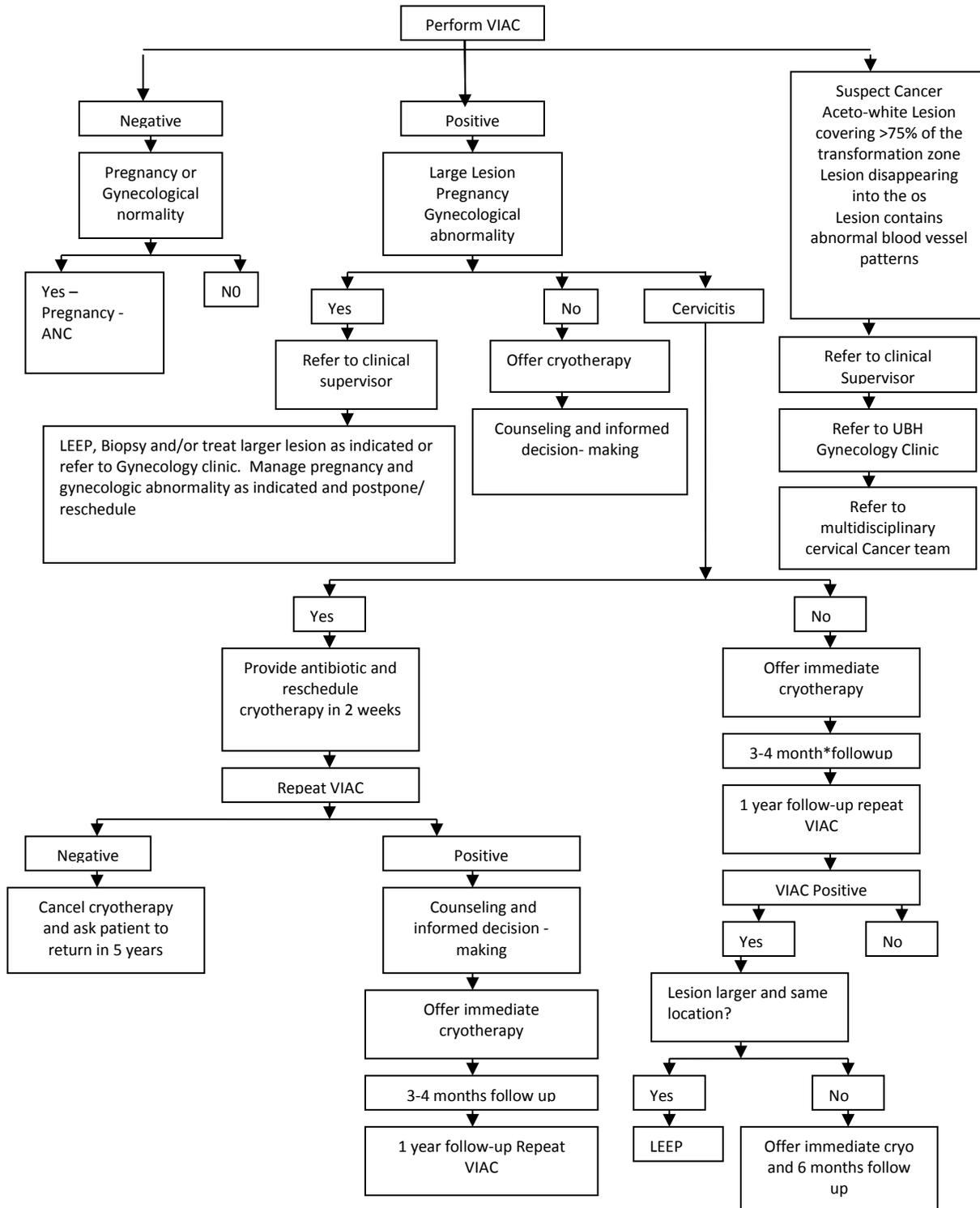
Data was analyzed using Excel and Epi-Info software to generate tables and calculate frequencies, proportions, means and standard deviation with 95% confidence intervals.

2.6 Ethical considerations

Permission was obtained from the Health Authority of United Bulawayo Hospitals to conduct the research and ethical approval was obtained from the Health Research Ethics Committee of Stellenbosch University (Ref No HREC S13/02/036). Since there was no direct contact with the women and only the electronic medical records were used, there was a waiver of informed consent.

Figure 1: Clinical protocol for Zimbabwe safety, acceptability and feasibility project

CLINICAL PROTOCOL FOR ZIMBABWE SAFETY, ACCEPTABILITY AND FEASIBILITY PROJECT



3.0 RESULTS

Two nurses screened 4641 women using the protocol shown in Figure 1 from 1st January 2010 to 31st December 2012. All ages in the targeted range were represented and the mean age was 39 (SD 11.3) years as shown in Table I. Most patients (61.2%) attended the clinic with one or more of the following complaints: lower abdominal pain, vaginal discharge, vaginal bleeding, backache, dyspareunia or vaginal itchiness. Only 17.4% of women reported ever having had a Pap smear before. More than half (52.5%) of those screened tested HIV positive, some of them came to the clinic with their results while others were screened at the clinic on the VIAC day, while 10% did not know their HIV status meaning that they had refused testing. The mean age of sexual debut was 18 (SD 3.7) years and contraception was used by 61.9% of these women.

Overall 10.8% of the women were VIAC positive and 195/501 (38.9%) of those testing positive had suspected cancer or other problems requiring referral to a gynaecologist (see Figure 2). The large number of referrals to the gynaecologist could have been due to the fact that this was a new clinic and many symptomatic women were able to access the service for the first time. As shown in Table II 85/501 (17.0%) of VIAC positive women were eligible for immediate treatment with cryotherapy and of these 98.1% received cryotherapy during the project period. On the other hand 221/501 (44.1%) of VIAC positive women were eligible for immediate treatment with LEEP and of these 100% received LEEP during the project period. All the treated patients were followed up immediately after treatment and only one of the women treated experienced complications. With respect to their husbands or partners 97.7% of women who had received cryotherapy and 98.6% of those receiving LEEP were able to negotiate abstaining from sex in their relationships for 4 weeks. After treatment 97.7% were satisfied with their decision to be treated with cryotherapy while 98.6% were satisfied about their decision to be treated with LEEP.

One year later 96.4% of the women who had received LEEP treatment came back for review and 100% of the women who had received cryotherapy. At one year after treatment the VIAC positive rate was low, at 1.2% after cryotherapy and 3.2% after LEEP.

Figure 2: Patient flow in VIAC clinic

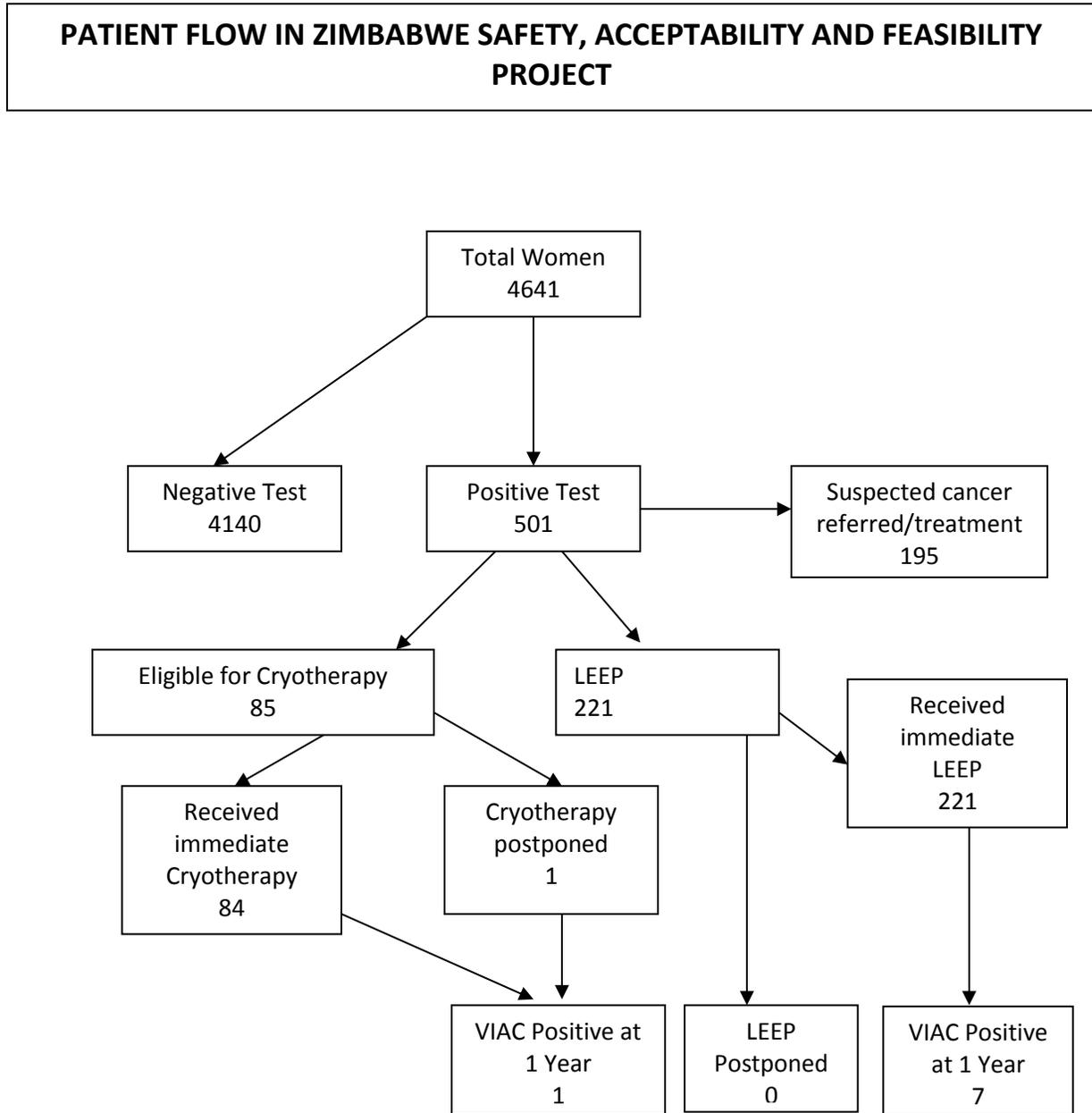


Table I: Programmatic factors and cervical cancer risk factors in relation to VIAC positive results (N=501)

Marital status		
Variable	Frequency	Percentage
-Single	69	13.7
-Married	317	67.3
-Widowed	89	17.4
-Divorced	28	5.4
Previous Pap smear done		
Variable	Frequency	Percentage
-Yes	87	17.4
-No	414	82.6
HIV Status		
Variable	Frequency	Percentage
-Positive	263	52.5
-Negative	188	37.4
-Unknown	50	10.0
Initial complaints		
Variable	Frequency	Percentage
-Vaginal bleeding	47	17.7
-Vaginal discharge	41	7.5
-Lower abdominal pain (LAP)	107	40.2
-LAP and lower back pain	52	19.5
-LAP and watery discharge	1	0.4
-Lower back pain	6	2.3
-Heavy menstruation	1	0.4
-Post-coital bleeding	1	0.4
-Watery vaginal discharge	6	2.3
-LAP and vaginal bleeding	3	1.1
-Dyspareunia	1	7.9
Use of contraceptives		
Variable	Frequency	Percentage
-Condoms	87	30.5
-Oral contraceptives	102	35.8
-Levonorgestrel implant	27	9.5
-Tubal ligation	10	3.5
-Depot progesterone injection	44	15.4
-Intra-uterine contraceptive device	15	5.3

Table II: Selected clinical and programmatic outcomes

	N	%
Screening (N=4641)		
VIA test positive	501	10.8
Satisfied with their decision to be tested	4641	100.0
Cryotherapy (N=85)		
Accepted immediate offer of cryotherapy	84	98.8
Total cryotherapy performed among those eligible	84	98.8
Treatments postponed due to staff or facility related issues	0	0.0
Delayed treatment due to patient	1	1.9
Clinic visit for perceived problem	0	0.0
Major complications (bleeding, shock, hospitalization)	0	0.0
Satisfied with their decision to be treated	84	97.7
Complied with post cryotherapy instructions	82	97.7
Attended follow up after 1-year	85	100.0
Tested positive at 1-year	1	1.2
LEEP (N=221)		
Accepted immediate offer of LEEP	221	100.0
Total LEEP performed among those eligible	221	100.0
Treatments postponed due to staff or facility related issues	0	0.0
Delayed treatment due to patient	0	0.0
Clinic visit for perceived problem	0	0.0
Major complications (bleeding, shock, hospitalisation)	1	0.5
Satisfied with their decision to be treated	218	98.6
Complied with post LEEP instructions	218	98.6
Attended follow up after 1-year	213	96.4
Tested positive at 1-year	7/213	3.2

4. DISCUSSION

The VIAC test rate was positive in 10.8% of all the women screened. Of those eligible, 17.0% received immediate cryotherapy, 44.1% received immediate LEEP, 1.9% delayed treatment and 37.0% were referred to a gynaecologist. No major complications were recorded after cryotherapy or LEEP. Among those treated 99.5% expressed satisfaction with their experience. Only 2.6% of those treated at the clinic were VIAC positive one year later. Therefore, a single-visit approach to preventing cervical cancer using VIAC and immediate treatment with cryotherapy or LEEP can be safe, acceptable and feasible with good outcomes even in a low resource setting such as Bulawayo, Zimbabwe.

Most of the patients came in late for screening, hence the large number of them that had advanced disease. The reasons for delay in screening were most likely due to the fact that this was the first VIAC screening clinic in the area.

The safety and effectiveness of VIAC, cryotherapy and LEEP performed by nurses and junior doctors in this study was also seen in studies from Zambia, Ghana, India and Thailand.^{9,11,16} The need for such task shifting to nurses and junior doctors in our setting is important because health care resources are constrained, infrastructure is limited, communication is difficult and physicians are often scarce. As part of routine quality assurance, aceto- white lesions one year post cryotherapy or LEEP is an indication for retreatment or referral. The positive VIAC test among the women who returned post cryotherapy and LEEP was 1.2% and 3.2% respectively. Given that the negative predictive value of VIAC has repeatedly been reported as 96% or greater, at least in primary care, the low test positive rate measured here is an important assurance to policy makers that cancers were prevented at the initial screening.^{18,19,20}

The approach evaluated in this study was also acceptable to women and there was good adherence to the programmatic requirements for follow up and abstinence. Adherence to post procedure instructions and follow up was higher than a similar study in Ghana, which might be due to the emphasis on counseling in this clinic in Bulawayo.⁹ A further study should look into the factors which resulted in a good follow up rate, as this is often cited as a hindrance to effective screening programmes in developing countries.²⁰

Feasibility of sustaining and providing the service was also good and even in Zimbabwe it was possible to obtain the gas supply for cryotherapy, as well as the consumables necessary for VIAC and LEEP in this urban setting. There were no service-related treatment postponements and the clinic staff and facility were able to meet the demand for the service. VIAC with immediate cryotherapy or LEEP has also been shown to be cost-effective in other settings.¹⁹

Mortality reductions of over 25% are predicted if at least 70% of targeted women are tested in each 5–10 year screening cycle. It is not possible to calculate an accurate population coverage rate from the data in this study. However over time there will be need to assess if population coverage rates, needed to lower cervical cancer morbidity or mortality rates, can be achieved using this approach. Some of these women never could afford cervical cancer screening and they wanted to be screened they then felt that if they presented with complaints then they had higher chances of being screened since the test was offered for free.

While the results indicate that a “single visit approach “ based on VIAC, cryotherapy and LEEP performed by trained nurses and doctors respectively is safe, acceptable and feasible more work is need to assess population coverage, cost, sustainability and quality assurance.^{8,9,10} The findings reported in the study support the viewpoint that this approach should be considered an alternative to prevention programmes based on cytology in areas where technical, infrastructural, and financial barriers exist.^{8,9,10}

Although not the focus of this study Zimbabwe may need to consider the cost-effectiveness of embarking on immunization against HPV among 9-12 year olds to prevent cervical cancer. This approach has recently been adopted in South Africa.

5. CONCLUSION

The results indicate that a single visit approach based on VIAC, cryotherapy and LEEP performed by trained nurses and junior doctors respectively is safe and feasible in this low resourced urban setting in Zimbabwe. This approach was also acceptable to the women and there was good adherence to the programmatic requirements for follow up and abstinence. The treatment outcomes 1-year later were favorable with an overall VIAC positive test rate of only 2.6%. Policymakers in this and similar low resource settings should consider prevention programmes for cervical cancer based on this approach rather than adopting models from more developed countries.

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Appendix 1: Client post Cryotherapy instructions

The health provider found a pre-cancer spot on your cervix. We destroyed this pre-cancer spot with freezing treatment called cryotherapy, which should make the cervix healthy again.

Expectations

After treatment, certain symptoms might occur. These symptoms disappear within two to four weeks. Do not let these symptoms worry you.

- Your vagina will probably have some watery discharge.
- You may feel pain of the type that is felt during periods.
- You could also experience a little bleeding, but not as much as you experience during monthly periods.

To allow the cervix to come back to being healthy again after cryotherapy avoid the following:

- Sexual intercourse for a month, because you could be injured or get infected while it is healing. If you cannot abstain for one month, then ask your partner to use a condom. However, it is good to wait until you heal.
- Putting anything for example tampons fingers, tissue, cotton, cloth, medicine, herbs, into your vagina for a period of one month.
- Heavy work for a few days.

The following are danger signs and you need to come back as soon as possible:

- Foul smelling discharge (smelly pus in your vagina)
- Bleeding in excess of the normal amount during menstruation
- Very painful lower stomach pains.
- A fever.(You feel hot and cold, shiver)

When should you come back for review?

You will need to go back for review after six weeks. Bring your client card with you.

Appendix 2: Cryotherapy Machine Instructions from Wallach

Secure the pressure gauge block to the cylinder. The hand wheel should be hand-tightened only.

1. Open the gas cylinder and observe the gas pressure. Gauge needle should move to the green area. Note: Green area denotes proper pressure for operation. Yellow area denotes the cylinder pressure is too low for operation and cylinder needs to be changed. Red area denotes excess pressure. If the needle is in the red area, follow 'Venting the Cylinder' instructions below.
2. Choose appropriate sterilized cryotip with clear shield and screw onto end of machine. Hand-tightened only. Do not use tools to tighten.
3. To see if apparatus is working, depress freeze trigger for several seconds. Tip should frost and smoke. Release freeze trigger and depress defrost trigger. Frost should disappear within 3-4 seconds. Note: Freeze trigger will automatically remain in the depressed position. You do not need to hold it down during the procedure. Depressing the defrost trigger will release the freeze trigger.
4. Apply cryotip to moistened treatment area. It is recommended that a lubricant be applied to the treatment site. Depress the freeze trigger to freeze tissue.
5. When finished with treatment shut off gas cylinder valve. Note: If treatment requires more than one tip, it is not necessary to shut off the gas cylinder valve while changing tips. Simply unscrew the tip presently in use, and replace with desired tips.
6. To reduce concentration of nitrous oxide in the immediate cryosurgical area, you may vent the exhausting the gas by attaching one end of the scavenger hose to the exhaust port at bottom of the pressure gauge block. The other end of the hose goes a discharge location. Hose must have a minimum internal diameter of 6mm.

Venting the Cylinder

1. Close gas cylinder master valve first
2. Slowly loosen hand wheel nut on attachment to gas cylinder. This releases residual gas in the feeder hose. When hissing sound stops, remove the pressure gauge block.
3. Point the cylinder opening away from you and slowly open the cylinder master valve just enough to hear gas steadily released. After approximately 15 seconds, close the valve.
4. If the cylinder is being vented to reduce overfilled condition, reweigh the cylinder before proceeding. Reconnect the pressure gauge block. Open the gas cylinder valve and observe the gas pressure. The gauge needle should point to the green area. Repeat the procedure if it still points to the red area.

Cryosurgical Unit Cleaning Instructions

The cryosurgical unit can be wiped down with isopropyl alcohol (10%) but NOT chlorine solution. This wipes down procedure can include the black plastic handle, insulation shaft, white silicone gas hoses, gauge block and gas cylinder connector. Other methods include

heat, fluid (cold soaking) or steam are not recommended. NOTE: Moisture in lines and orifices of the cryoprobe, cryotip, and cryoconsole can cause sputtering, poor freeze, and other malfunctions. Whenever using fluids or steam to clean or sterilize, all gas lines and cryotip orifices must be plugged or corrosion may result. Plugs are available from the manufacturer.

Cryotip Cleaning Instructions

1. Remove the disposable shield from the cryotip and discard.
2. Plug the cryotip before cleaning and sterilizing with silicone plug.
3. Scrub the cryotip to remove blood and particles
4. Rinse with water
5. Cryotips can be steam sterilized by pre-vacuum or gravity with a cycle temperature of 135 degrees celcius. The cycle time is 10 minutes with drying time of 10 minutes. NOTE: at no time should chlorine mixtures (bleach) or iodine-based products be used for soaking or cleaning cryotips. Cryotips will degrade if exposed to such solutions.
6. Attach new disposable plastic shield to the cryotips, ensuring that the tabs on the shields are correctly fitted into the groove on the metal tip.

Appendix 3: Client Information on LEEP

What is LEEP (Loop Electrical Excision Procedure)?

This is a procedure whereby a small wire is used to remove the pre-cancer spot from the cervix which is then sent to the laboratory for evaluation.

Expectations after LEEP

After LEEP a woman will have brown, black, or blood-tinged discharge from her vagina for about 2 weeks.

To allow the cervix to come back to being healthy again after LEEP avoid the following:

- Sexual intercourse for one month, because your cervix could be injured or get infected while it is healing. If you cannot abstain for one month weeks, then ask your partner to use a condom. However, it is good to wait until you heal.
- Putting anything for example tampons, fingers, tissue, cotton, cloth, medicine, herbs into your vagina for a period of one month.
- Heavy work for a few days.

The following are danger signs and you need to come back as soon as possible:

- Foul smelling discharge (smelly pus in your vagina).
- Bleeding in excess of the normal amount during menstruation.
- Very painful lower stomach pains.
- A fever. (You feel hot and cold, shiver)

When should you come back for review?

You will need to go back for review after six weeks. Bring your client card with you.

Appendix 4 Tips for LEEP Operators

1. In order to remove the entire lesion and transformation zone with one pass, always choose a loop electrode that is greater than the width of the lesion and transformation zone that is to be removed; otherwise the lesion should be removed with multiple passes.
2. The depth of the loop (height from the cross bar to the tip of the wire which) should be at least 5mm.
3. Power setting for different size electrode balls
 - A. 3mm-30watts
 - B. 5mm-50watt
4. Power settings for different size electrodes
 - A. 1.0x1.0 cm-30 watts
 - B. 1.5x0.5cm-35 watts
 - C. 2.0x0.8cm-40 watts
 - D. 2.0x1.2cm-50 watts
5. Steps to obtain cervical anesthesia
 - a. Equipment: 5ml syringe, 25 or 27 gauge needle
 - b. At each 4 different sites around ecto-cervix (3,6,9,12o'clock) inject 1ml of lignocaine, try not to exceed a total of 5ml.
 - c. The injection is placed 1-2 mm deep into the ecto-cervical stroma, at the periphery of the lesion and transformation zone.
 - d. A mixture of 1% lignocaine and vasopressin (not more than one pressor unit) or 1% lignocaine and epinephrine 1:100000 may be used to decrease bleeding. The mixture of lignocaine and adrenalin may cause leg cramps and palpitations; however, this can be avoided if infiltration is sub-epithelial.

Tips on the LEEP procedure

1. Make a false (practice) pass with no electrical current before excising the lesion
2. At the beginning of excision, introduce the loop electrode 5mm outside the outer boundary of the lesion; do not push the electrode in, but let it cut its own way; the operator should simply provide directional guidance.
3. Throughout the excision the operator guides the loop electrode along, parallel to the surface of the tissue.
4. The lesion can be excised from right to left, left to right, posterior to anterior, but not anterior to posterior. During the latter scenario blood or excised tissue curling downward may obscure the visual field.

Appendix 5: Consent form for cryotherapy/LEEP/Cautery/punch biopsy

Hospital ID number.....
To:.....Clinic/Hospital ZCCPP
I.....ID number.....
Of address
.....
.....

Hereby consent to undergo the following operation/procedure

- Cryotherapy
- Cauterization
- Loop electrical excision procedure
- Punch biopsy

The nature, benefits, side effects alternatives, type of anesthesia, and any extra procedures linked with complications of the above have been clearly explained to me. I also consent to any further procedures as may be found necessary during the course of the above procedure.

Signed.....Date.....

Witness.....Date.....

Appendix 6: FIGO staging cervical cancer

Stage I is carcinoma strictly confined to the cervix: extension to the uterine corpus should be disregarded. The diagnosis of both Stages IA1 and IA2 should be based on microscopy.

Stage IA: Invasive cancer identified only microscopically. Invasion is limited to measured stromal invasion with maximum depth of 5mm and no wider than 7mm.

Stage IA2: Measured invasion of the stroma no greater than 3mm but no greater than 5mm in depth and no wider than 7mm in diameter.

Stage IB: Clinical lesion confined to the cervix or preclinical lesions greater than Stage IA. All gross lesions superficial invasion are Stage 1B cancers.

Stage IB1: Clinical lesions no greater than 4cm in size.

Stage IB2: Clinical lesions greater than 4cm in size.

Stage II

Stage II is carcinoma that extends beyond the cervix, but does not extend into the pelvic wall. The carcinoma involves the vagina, but not as far as the lower third.

Stage IIA: No obvious parametrial involvement. Involvement of up to the upper two thirds of the vagina.

Stage IIB: Obvious parametrial involvement, but not into the pelvic side wall.

Stage III

Stage III is carcinoma that has extended into the pelvic side wall. On rectal examination, there is no cancer-free space between the tumor and the pelvic side wall. The tumor and the pelvic wall. The tumor involves the lower third of the vagina. All cases with hydronephrosis or a non-functioning kidney are Stages 111 cancer.

Stage IIIA: No extension into the pelvic side wall, but involvement of the lower third of the vagina.

Stage IIIB: Extension into the pelvic side wall or hydronephrosis or non-functioning kidney.

Stage IV is carcinoma that has extended beyond the true pelvis or has clinically involved the mucosa of the bladder and/or rectum.

Stage IVA: Spread of the tumour into adjacent pelvic organs.

Stage IVB: Spread to distant organs.