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HPV and Cervical Cancer Control Programs: Effective Translation of Knowledge into Practice

Rajamanickam Rajkumar

Abstract

Cervical cancer is a major cancer affecting 5.3 million women annually, worldwide, and is responsible for about 2.7 million deaths per year. More than 85% of the incident cases occur in developing countries. Cervical cancer is a totally preventable cancer, if diagnosed in the precancer stages and treated effectively. HPV vaccination has been introduced in many countries. Effective screening and treatment programs are available in many health settings. Posttreatment histopathological follow-up is done for 3–5 years. Cure from precancer condition and prevention of invasive cervical cancer are thus attained. But the main hurdle in achieving the above ambitious goal is the lacunae and deficiencies in conversion of knowledge into practice by the women who are otherwise well informed about the prevention of cervical cancer, as result of massive inputs in the field of health education. Thus, the screening participation and compliance to precancer treatment remain low. This barrier in translational knowledge should be overcome efficiently. **The author, from his vast experience in planning and implementing one of the largest cervical cancer screening programs in India, has conceptualized “the STAR model P6 principles of Raj” for successful conversion of “knowledge into practice.”**

Keywords: cervical cancer, screening, treatment, low participation, translational knowledge to practice

1. Introduction

Cervical cancer is the fourth common cancer among women in the world, and it accounts for about 530,000 new cases and 270,000 deaths annually, as reported in 2012. About 85% of these cases occur in developing countries. It represents 12% of incident cancers in women and 7.5% deaths due to cancer in women.

In a developing country like India, about 122,000 new cases of cervical cancer and about 67,400 deaths due cervical cancer are reported, every year, as per data of 2017. It is the second most frequent cancer among women of reproductive age group.

India also has the highest age standardized incidence of cervical cancer in South Asia at 22, compared to 19.2 in Bangladesh, 13 in Sri Lanka, and 2.8 in Iran [1, 2].

2. The role of HPV

HPV is a necessary cause for cervical cancer [3].

More than 115 types of HPV are present and 18 are high-risk carcinogenic types for cervical cancer. Other than this, HPV-16 is the most common high risk in cervical cancer [4].

In cervical cancer cases, HPV prevalence was in the range of 87.8 to 96.67%, in a study in India. In women without cervical cancer, HPV prevalence varied from 7.5 to 16.9%.

The worldwide prevalence of HPV infection, in normal woman, is between 9% and 13%.

3. HPV infection worldwide

HPV is associated with 50,000 new cases of cervical cancer and 250,000 associated cervical cancer deaths, worldwide, each year [5]. It also causes vulvar, vaginal, anal, and penile cancers and precancerous lesions of vulva/vagina, genital warts, and respiratory papillomatosis [5–7]. HPV infections are asymptomatic, and generally, individuals are not aware of being infected, thus facilitating the spread easily and unknowingly [5].

At least 50% of men and women will acquire genital HPV infection during their lifetime [8].

All sexually active women are infected with HPV at least once during their lifetime, and the highest prevalence is seen soon after the onset of sexual activities [9, 10].

A majority of episodes of type-specific HPV infection resolve spontaneously within 2 years, but this may be followed by an infection with a new type [7].

HPV transmission exclusively occurs following skin-to-skin contact with an infected partner. Sexual intercourse is not necessary, and the virus can be transmitted through sexual foreplay [5].

HPV can only replicate in the stratified squamous epithelium. HPV infection is the most common sexually transmitted diseases [11]. The major risk factor for HPV infection is sexual behavior, including early age of onset of sexual activity, multiple sexual partners, and coinfection with HIV [12].

Although the determinants of risk for persistent infection and progression to invasive diseases are not fully understood, persistence appears to be related to HPV type and concurrent infection with multiple virus types [12].

The prevalence and distribution of HPV types in the general population as well as in cervical neoplasia vary with geographic region and by the grade of disease [13].

4. Screening for cervical cancer

Secondary prevention involves screening for precancerous lesions and treating them. The three screening modalities are cytology, visual inspection, and HPV test.

5. Prevention of cervical cancer

HPV is necessary for the development of cervical cancer. Therefore, preventing HPV infection can prevent cervical cancer. This can be achieved by complete abstinence from sexual activity or by a vaccine [14].

Primary prevention involves a risk reduction approach through behavioral intervention for sexual and healthcare-seeking behavior or through mass immunization against high-risk HPV [15].

The objective of cervical screening/secondary prevention is to prevent invasive cervical cancer from developing by detecting and treating women with CIN2/3 lesions, and the effectiveness is determined by reduction in incidence and mortality.

The critical components of a screening program are an acceptable good-quality screening test, prompt diagnostic investigations, appropriate treatment, and posttreatment follow-up [16].

There is a strong support from nonexperimental studies in developed countries such as Denmark and Finland that the incidence and mortality of cervical cancer can be reduced by screening [17].

Ensuring high levels of participation and sufficient healthcare infrastructure and human resources are important for a screening program to succeed [18]. It is also important for screening to be guided by equity considerations for those who are more vulnerable or with lesser access to healthcare services because of social, economic, or demographic factors [19].

Recent screening recommendations for specific age groups as per the American Cancer Society (ACS) screening guidelines are as follows: [1, 2].

- At the age of 21 years: Screening is recommended.
- At the age of 21–29 years: Cytology (Pap smear) alone every 3 years.
- At the age of 30–65 years: Human papillomavirus virus (HPV) and cytology contesting every 5 years or cytology alone every 3 years.
- At the age of >65 years: No screening recommended if adequate prior screening has been negative and high risk is not present.

HPV Vaccines that aims to prevent cervical cancer are:

- A bivalent vaccine which protects against subtypes 16 and 18.
- A quadrivalent vaccine which protects against subtypes 16 and 18 plus 6 and 11.
- A 9-valent vaccine which protects against the same subtypes as the quadrivalent plus subtypes 31, 33, 45, 52, and 58 (which cause about 15% of cervical cancers).
- The HPV vaccine is ideally recommended to vaccinate boys and girls at age 11–12 years, but vaccination can begins at age 9.

6. The effect of HPV vaccination

1. Population-level impact and herd effects following the introduction of human papillomavirus vaccination programs

From the abstract: We did a systematic review and meta-analysis of the population-level impact of vaccinating girls and women against human papillomavirus on HPV infections, anogenital wart diagnoses, and cervical intraepithelial neoplasia grade 2+ (CIN2+). Our results show compelling evidence of the substantial impact of HPV

vaccination programs on HPV infections and CIN2+ among girls and women, and on anogenital warts diagnoses among girls, women, boys, and men, programs with multi-cohort vaccination and high vaccination coverage had a greater direct impact and herd effects.

Ref: *Population-level impact and herd effects following the introduction of human papillomavirus vaccination programmes: updated systematic review and meta-analysis*

Drolet M, Bénard É, Pérez N, Brisson M, on behalf of the HPV Vaccination Impact Study Group. *The Lancet*. Open access

2. Human papillomavirus (HPV) vaccination significantly reduces the frequency of genital HPV 16 and 18 infections and cervical intraepithelial neoplasia grade 2+ (CIN2+) in young women and shows signs of herd effects with a reduced frequency of anogenital warts in both young women and men, a recent study showed.

As cited in infectious diseases.

9/16/2019 HPV vaccination programmes reduce HPV infection, precancerous lesions with potential crossover and herd effects | News for Doctor, N.

<https://specialty.mims.com/topic/hpv-vaccination-programmes-reduce-hpv-infection-precancerous-lesions-with-potential-crossover-and-herd-effects-? ...>
1/7.

7. KAP studies reveal the presence of adequate knowledge but inadequate “practice” in the community

7.1 Recent study in India

Results: We observed that despite good knowledge and perception, less than 10 percent of workers have undergone screening. Significant association was seen between the level of knowledge and practice of screening.

Conclusion: It is of utmost importance narrowing of existing gap between the perception and practice of cervical cancer.

Screening should be initiated through introducing more educational programs for workers and encouraging them to participate.

The study cited is from: Khanna D, Khargekar N, Budukh A. Knowledge, attitude, and practice about cervical cancer and its screening among community healthcare workers of Varanasi district, Uttar Pradesh, India. *J Family Med Prim Care* 2019;8:1715–9.

8. How to translate “knowledge” in to “practice”

Author’s experiences in a cervical cancer screening program of the IARC/WHO, In India.

8.1 The development of the STAR model P-6 principles of raj©

The author, having been successful in planning and implementing, such a model, and achieving a reduction in the incidence rate of cervical cancer by 25% and

mortality due to cervical cancer by 35%, in a period of 7 years—2000 to 2007, strongly recommends the STAR model P-6 principles of Raj©.

He has served as the principal investigator for the first 3 years, and the project was done at the Christian Fellowship Community Health Centre Society, Ambilikkai, Dindigul district, Tamil Nadu, India, and was in technical collaboration with the International Agency for Research on Cancer (IARC), WHO.

9. Background

Proof of concept (POC)—The Lancet Publication 2007, the author's paper.

Quote:

Effect of visual screening on cervical cancer incidence and mortality in Tamil Nadu, India: a cluster-randomized trial.

Lancet 2007; 370(9585):398-406.

Rengaswamy Sankaranarayanan, Pulikkottil Okkuru Esmey, Rajamanickam Rajkumar, et al.

10. Summary

Cervical cancer is the most common cancer among women in developing countries. We assessed the effect of screening using visual inspection with 4% acetic acid (VIA) on cervical cancer incidence and mortality in a cluster-randomized controlled trial in India.

11. Methods

Of the 114 study clusters in Dindigul district, India, 57 were randomized to one round of VIA by trained nurses and 57 to a control group. Healthy women aged 30–59 years were eligible for the study. Screen-positive women had colposcopy, directed biopsies, and, where appropriate, cryotherapy by nurses during the screening visit. Those with larger precancerous lesions or invasive cancers were referred for appropriate investigations and treatment.

Cervical cancer incidence and mortality in the study groups were analyzed and compared using Cox regression taking the cluster design into account, and analysis was by intention to treat. The primary outcome measures were cervical cancer incidence and mortality.

12. Results

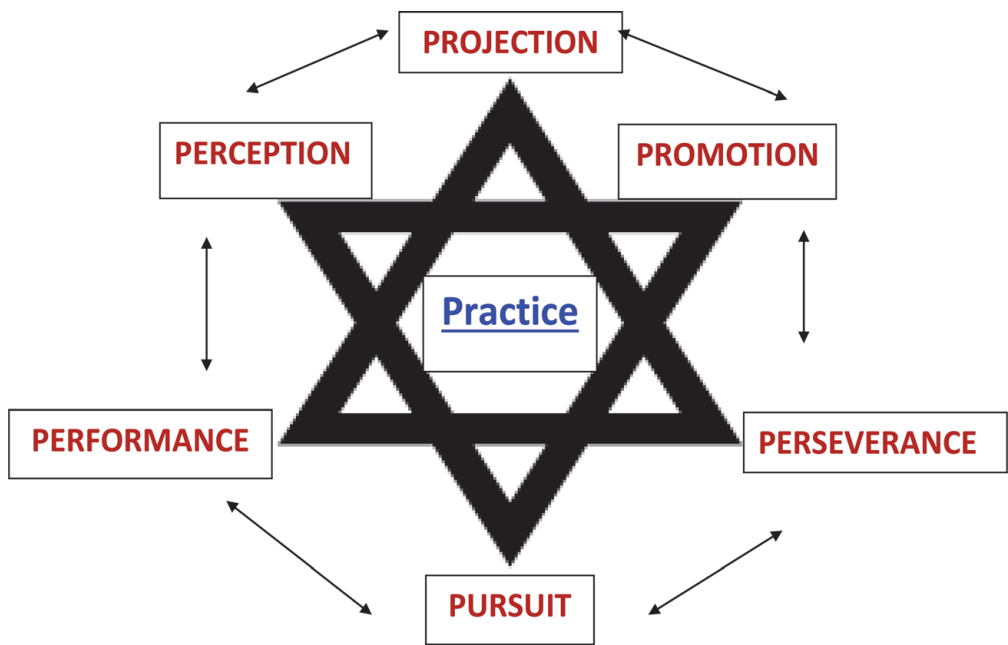
Of the 49,311 eligible women in the intervention group, 31,343 (63.6%) were screened during 2000–2003; 30,958 control women received the standard care. Of the 3088 (9.9%) screened positive, 3052 had colposcopy and 2539 directed biopsy. Of the 1874 women with precancerous lesions in the intervention group, 72% received treatment. In the intervention group, 274,430 person years, 167 cervical cancer cases, and 83 cervical cancer deaths were accrued compared with 178,781 person years, 158 cases, and 92 deaths and in the control group during 2000–2006 (incidence hazard ratio 0.75 [95% CI 0.55–0.95] and mortality hazard ratio 0.65 [0.47–0.89]).

13. Interpretation

HPV vaccination and organized screening, in the presence of good training and sustained quality assurance, are effective methods, for HPV and cervical cancer prevention and control, in developing countries. New and innovative models and effective strategies for health education need to be developed to strengthen the “knowledge translation to action” component of the healthcare delivery systems,

14. Health education: for HPV prevention and control

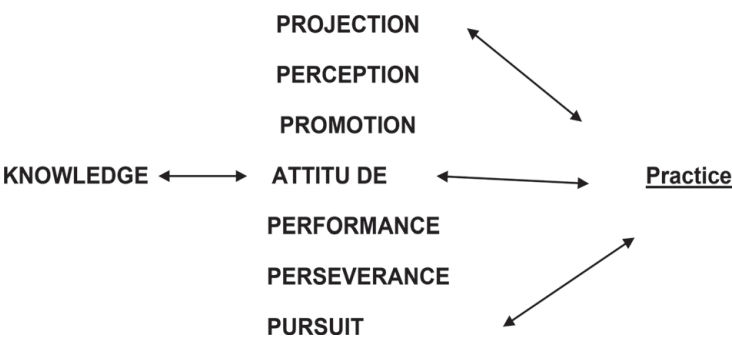
The STAR model P-6 principles of Raj©.



Health education, with special strategies to effect the “practice” in a successful way, is the key, for prevention and control of HPV infections and cervical cancer.

Proposed strategy:
Knowledge transformation through p6 pathway©

Knowledge transformation through p6 pathway®



15. The P6 principles

15.1 P1. Projection

15.1.1 Health education process

It is very important that all the health-related programs have a very strong foundation with the component of health education, may it be to an individual, family, or a community. The healthcare planners, administrators, and providers are responsible for developing various methods, tools, strategies for the delivery of effective health education. In some health programs, it is called information, education, communication strategies. In this process, an idea, theme, concept, facts and figures, health topics, health problems, and solutions are being projected.

15.1.2 Negative projections

These are usually warning projections. For example, tobacco products have scary pictures of lung cancers, and head and neck cancers are printed on the packs. These are meant to arouse a sense of fear and discourage the consumer from using it. But, the feelings and its effect are temporary, resulting in continued habits. The consumers may not like the “advertisement” but likes the advertised. Such “dramatic projections,” are not ideal for health education on sensitive issues like HPV.



Negative projections

15.1.3 Positive/pleasant projections

The messages to be delivered are projected in a positive, attractive way. This is also a temporary appeal to their emotions. Without in-depth analysis, the consumers patronize the messages but on the long run has no permanent implications. The advertisements on the health drinks are such “positive and pleasant projections.” Such projections are not suitable for behavior change targeted HP health education messages.



Positive/pleasant projections

15.1.4 Permanent behavior change projections

These projections are prosperous, progressive, peaceful, and productive. They imply that acceptance and adoption of the advertised message would lead to happy, healthy future. Health education messages in family planning are designed and developed like this. The example of one such advertisement shows a happy family with two children joyfully bonded with love and affection.

The consumer is highly impressed, inspired, and convinced to consider adopting family planning methods to have a small and self-sufficient family, in the future.

Likewise, in HPV-related health education messages, we should have permanent behavior change projections like HPV vaccination, menstrual hygiene, sexual hygiene, and regular periodic screening for cervix cancer, and these are the ideal and apt projections.



Permanent behavior change projections

15.1.5 The permanent behavior change projections model for HPV: cervical cancer prevention and control



Menstrual hygiene



Google images

Sexual hygiene

+

HPV Vaccine



Google images

15.2 P2. Perception

It is the formation of an idea or concept, depending upon the effects of various stimuli received, to perform an act.

15.2.1 Perception process: the i5



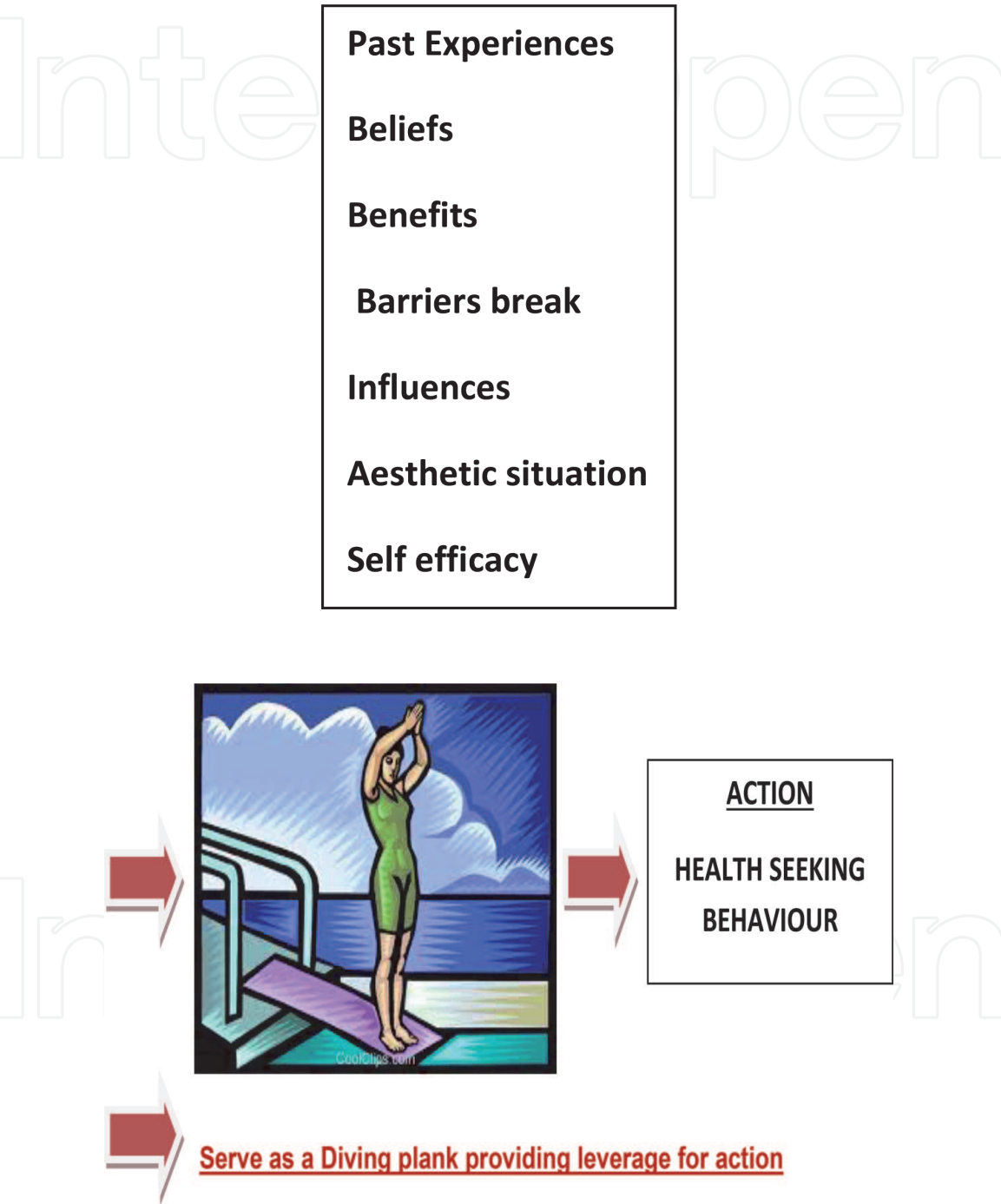
Ignite Imagine Interest Inspire Implement

Ignition: “Don’t let cervical cancer stop you.”
Imagine: End cervical cancer.

Interest: Easy two ways—“get vaccinated, get screened.”
Inspire: Peer group inspires.
Implement: Get vaccination/screening done.

15.3 P3. Promotion

15.3.1 Health promotion model



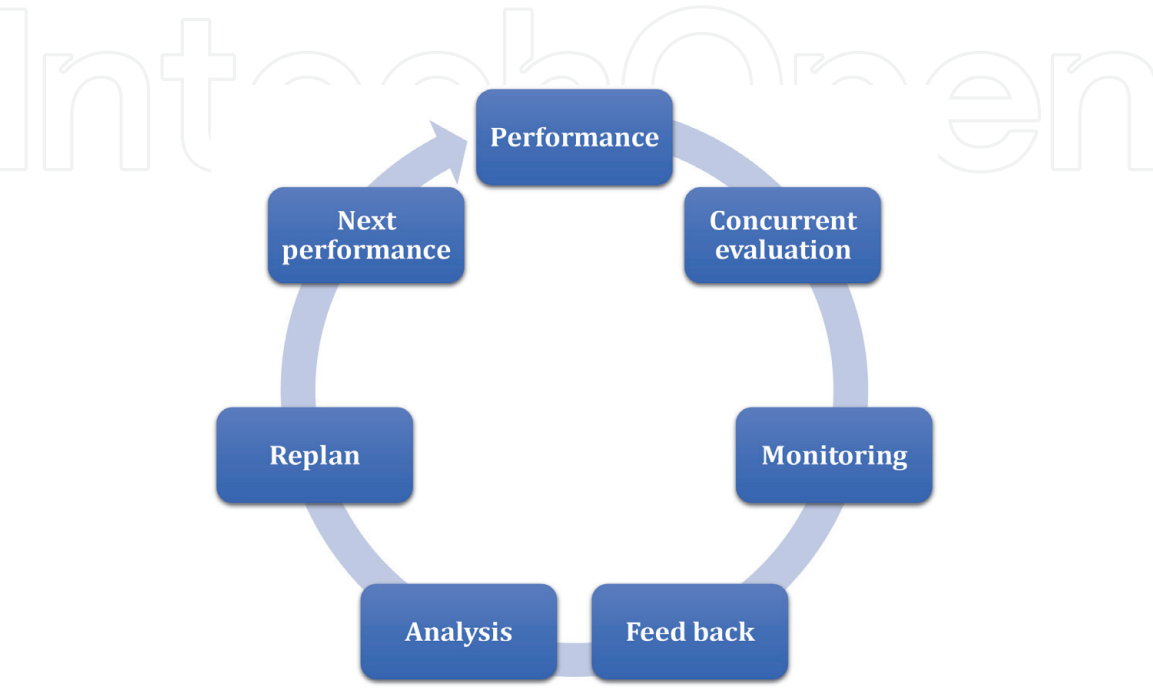
Successful and productive past experiences; beliefs getting renewed and rationalized; benefits accrued both temporarily and permanently; breaking of barriers by several inputs and interventions; positive influence from family, friends, peers, and society; esthetic situations favoring and promoting empowerment by self-efficacy, all these factors serve as a diving plank, providing strong and sustained leverage to effect “action.”

15.4 P4. Performance

15.4.1 Performance

This is a continuous process where each step is evaluated and replanned for better implementation in the next step.

Therefore in every performance, there is a betterment of the next practice. This is depicted in the performance enhancement cycle (PEC).



Performance enhancement cycle (PEC)

15.5 P5. Perseverance

Perseverance is constant, continued efforts and attempts, amidst of many difficulties, until the desired goal is achieved. This is an important process in healthcare delivery, where the health providers make sustained efforts to convince the healthcare recipients to adopt the desired behavior in order to achieve the appropriate and relevant goals. The act of “perseverance” largely depends upon the level and depth of perception of the health problem; the support given by family, peers, and society; and the evaluation of the eventual results and benefits. In the community, we can see the example of a pregnant woman in a family, where everyone realizes the preciousness of pregnancy and has in-depth perception and the family, relatives, community, and society offer all the support needed for the pregnant woman, amidst of many problems and difficulties, for a long period of maternity, and these acts of perseverance eventually result in the successful outcome of a safe delivery, healthy mother, and a healthy child.

In HPV control measures, perseverance is needed for effecting behavioral changes like menstrual hygiene, sexual health, adoption of HPV vaccine and most importantly screening and treatment for precancer status and regular follow-up as needed. Hence, “perseverance” in health education, healthcare delivery, and follow-up is a very important component of the goal-oriented system.



Perseverance in care during pregnancy for safe delivery

The common example of a pregnant woman and her family, community, and society, being offered all support and help for a successful outcome, amidst many difficulties, by acts of perseverance.

15.6 P6. Pursuit



The yacht in pursuit of destination amidst problems

In pursuit of excellence is a requirement by one and all for success and achievements. In the field of healthcare planning, delivery, and implementation, one is in pursuit of excellence in technologies, techniques, strategies, skills, and scientific—social achievements.

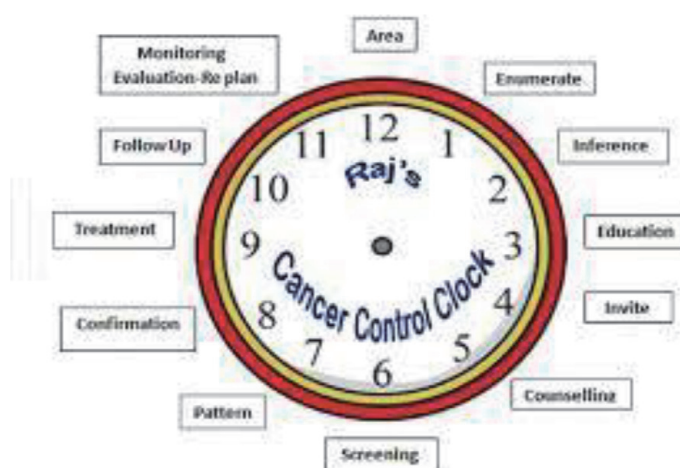
Goals, objectives, and indicators to reach are already fixed, defined, and targeted, in a well-planned health program. The health providers are in “pursuit” of attaining these goals. There would be many difficulties, obstacles, shortcomings, and hurdles in the entire process. But, the goal is clear, and all efforts are made to

overcome these, and the aim is ultimately achieved. The yacht travel which overcomes all difficulties like the sun, rain, storm, and many others, to reach its destination safely, and it's a symbolism of "pursuit."

In the HPV control programs, many such draw backs are seen. For example, illiteracy, ignorance, and poverty, prevent the usage of sanitary napkins. This is overcome by health education and mobilization of resources. The HPV vaccine has obstacles like differing policies, cost of the vaccine, lack of infrastructure to reach the vaccine to the community, and illiteracy and ignorance among the target groups. Screening programs suffer from problems like ignorant community; lack of infrastructure; deficient manpower; nonavailability of techniques, technology, and technicians; and inadequate, inefficient systems in place. Yet, these can be overcome by appropriate and adequate inputs, during the process of pursuit towards the goals by the health planners.

The health programs in the developing world do experience this act of pursuit to achieve goals, and already the results have been seen in reducing the incidence of HPV infections and cervical cancer, especially in the low and limited resource settings of many countries.

16. Raj's cancer control clock



A complimentary model

The Keys for the Cancer Control Clock's 12 hours [20]:

1. **Area**—define a geographic area for your study/services
2. **Enumerate**—the resident population, document the sociodemographic data
3. **Inference**—prevalence of HPV-related diseases—establish registries
4. **Education**—about prevention at individual, family, and community levels
5. **Invitation**—to attend awareness programs, screening, and vaccination
6. **Counseling**—the participants about possible outcomes and solutions
7. **Screening**—acceptable, available, accessible, affordable, answerable, achievable—the A-6 model for screening and vaccination programs

8. **Patterns**—of diseases detected in screening—disclosure of results—individualized, ensure confidentiality and offer solution for health problems
9. **Confirmation**—diagnosis—at screening and follow-up stages
10. **Treatment**—of the HPV infections and related diseases, precancer lesions, and ensure the availability of posttreatment services
11. **Follow-up**—by confirmation of disease free status, counseling, and referrals to the government/private health systems
12. **Monitoring, evaluation, replan**—effectiveness of interventions, health economics, and advocating prevention policies

17. Conclusion

The problem of high incidence of HPV infections and cervical cancer, all over the world, especially in developing countries is of great concern and warrants immediate control measures. Many programs have been planned and implemented and they all show promising outcomes. The HPV vaccine uptake has increased due to various inputs in developing countries. The increased vaccine coverage has shown reduced incidence of cervical precancers in longitudinal studies. The screening programs for cervical cancer have resulted in reduction in the incidence rate of cervical cancer and mortality due to cervical cancer.

18. The STAR model P-6 principles of raj©

This is a time-tested concept of the author, which was found to be very successful in the proof of concept project quoted earlier. Hence, for effective implementation of HPV and cervical cancer screening programs, especially in the phase of translating knowledge into practice, the above model is recommended, for the benefit of health programs in developing countries.

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