



## Automated Reminder System for Cervical Cancer Patient

Pooja Tetu, Tejashree shendre, Utkarsha Ghyar, Vaishnavi Giri

*RG CER, Information Technology, Nagpur, Maharashtra, India;*  
*RG CER, Information Technology, Nagpur, Maharashtra India;*  
*RG CER, Information Technology, Nagpur, Maharashtra India;*  
*RG CER, Information Technology, Nagpur, Maharashtra India;*

Email: { [poojatetu@gmail.com](mailto:poojatetu@gmail.com) , [shendretejashree@gmail.com](mailto:shendretejashree@gmail.com), [utkarshaghyar@gmail.com](mailto:utkarshaghyar@gmail.com), [girivaishnavi@gmail.com](mailto:girivaishnavi@gmail.com) }

**Abstract**

Cervical cancer is one of the leading cancer killers among women all over the world. Cervical cancer is the most common female cancer in developing countries, a woman dies of cervical cancer every two minutes. Its contribution to cancer burden is significant across all cultures and economies. However, in India this disease is still killing up to 8,000 women annually. Fortunately, this cancer is preventable by screening for premalignant lesions but this is rarely provided and hardly utilized. So, to make them take screening test daily reminder must be send and aware them about the cervical cancer. The aim of this process is to assess the knowledge of cervical cancer screening among India women. An automated reminder is designed to send an automated message to the patient and remind them about the test and encourage them to take regular test. These result in use of taking regular check-up and get knowledge about the cervical cancer. These helps to reduce the painful death of the women and get aware about the symptoms and causes of the cervical cancer.

**Key Words:** Cervical cancer, premalignant lesions, Pap smear test

**1. INTRODUCTION**

India is 3<sup>rd</sup> largest HIV epidemic in the world. India has a population of 453.02 million women ages 15 years and older who are at risk of developing cervical cancer. Current estimates indicate that every year 122844 women are diagnosed with cervical cancer and 67477 dies from the disease. Cervical cancer ranks as the 2<sup>nd</sup> most frequent cancer among women in India and the 2<sup>nd</sup> most frequent cancer among women between 15 and 44 years of age. About 5.0% of women in the general population are estimated to harbour cervical HPV-16/18 infection at a given time, and 83.2% of invasive cervical cancers are attributed to HPVs 16 or 18.<sup>[10]</sup>

Amongst the HIV positive population of India, the women population is highly prone to CERVICAL CANCER. Due to the similar symptoms of HIV positive and normal women HIV positive women ignore the symptoms that causes the cervical cancer. The patients are especially at risk for cervical cancer – 15% of women with cervical cancer were reported not to have appropriate follow-up of abnormal results and 27% were reported to have had delayed or no referral for colposcopy. Surprisingly in Ethiopia, only 1% of age eligible women receive effective screening for cervical cancer and 90% of women have never had a pelvic examination at all.

Given the complexity of the guidelines and lack of a single resource for evidence-based recommendations for cervical cancer screening and surveillance, an automated system that provide comprehensive guidance would be clinically useful. Therefore, we developed a system for deployment at the point of care. In order to solve this problem, an automated web application is being developed that acts as a remainder for the women to attend the routine test to reduce the painful effect of cervical cancer.

**2. LITERATURE SURVEY**

Over the past 50 years, there have been many studies attempting to assess whether a particular infection—such as gonorrhoea, syphilis,

chlamydia, or genital herpes—was the sexually transmitted agent that led to cervical cancer. HPV causes cervical cancer, by showing that when inoculated into cell culture systems, HPV causes the cells to grow in an “out-of-control”, cancer-like fashion and that these out-of-control cells can then cause cancer when injected into mice. Thus, while definitively proving that an infectious agent causes a disease can be quite difficult, based on a large number of studies, there is now widespread consensus among cancer researchers that high-risk types of genital HPV clearly play a causative role in the development of cervical cancer, and probably other types of anogenital cancer, such as cancer of the penis and anus.<sup>[7]</sup>

**Table 1. Crude incidence rates of HPV-related cancers**

	Male	Female
Cervical cancer	-	20.2
Anal cancer	0.0-0.6	0.1-0.4
Vulva cancer	-	0.2-0.5
Vaginal cancer	-	0.2-0.8
Penile cancer	0.3-1.8	-
Pharynx (excluding nasopharynx)	4.9	1.1

**Table 2. Burden of cervical cancer**

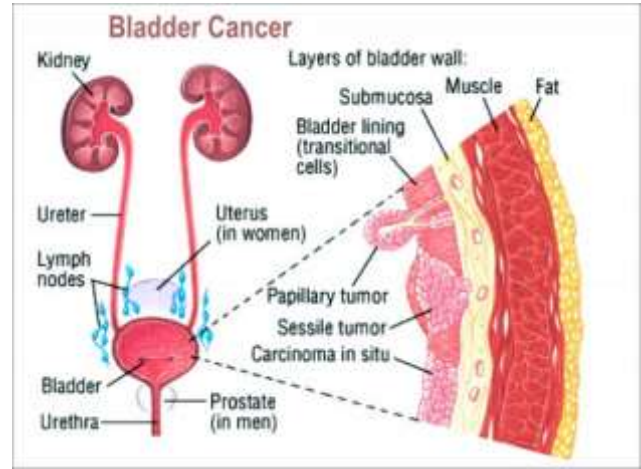
	Incidence	Mortality
Annual number of new cases/deaths	122844	67477
Crude rate	20.2	11.1
Age-standardized rate	22.0	12.4
Cumulative risk 0-74 years (%)	2.4	1.4
Ranking of cervical cancer (all years)	2nd	2nd
Ranking of cervical cancer (15-44 years)	2nd	2nd

**Table 3. Burden of cervical HPV infection India**

	No. Tested	% (95% CI)
HPV prevalence in women with normal cytology	35349	7.0 (6.7-7.2)
HPV 16/18 prevalence:		
Normal cytology	8845	5.0 (4.6-5.5)
Low-grade cervical lesions	177	28.2 (22.1-35.3)
High-grade cervical lesions	253	62.8 (56.7-68.6)
Cervical cancer	2006	83.2 (81.5-84.8)

**Cervical Cancer Screening**

The majority of cervical cancers develop through a series of gradual, well-defined precancerous lesions. During this lengthy process, the abnormal tissue is easily detected by the Pap test. In the majority of women, the abnormalities will clear up without treatment, but in some instances a few of these abnormal cells will develop into cervical cancer. Early detection of the disease through the use of a Pap test is directly related to survival. The five years relative survival rate for cervical cancer is 88 percent for women with an early diagnosis of localized disease. For women initially diagnosed with later stage cervical cancer, the survival rate is only 13 percent. Studies have found that the risk of developing invasive cervical cancer is 3-10 times greater in women who have not been screened. Risk also increases with longer duration following the last normal Pap test.



**Programs to Increase Public and Health Care Provider Awareness**

While better understanding of the prevalence of HPV and its relationship to cancer will support better prevention efforts, messages to educate the general public about HPV will need to be clearly crafted to avoid undue anxiety, competition with other public health prevention messages, and the possibility because of the stigma associated with STD and undermining Pap smear screening programs.

The issues around HPV are complex ones for health care providers who must convey messages that are both accurate and helpful to patients with concerns, often in time-constrained clinical settings. In addition, because genital HPV infection is a minor health problem for the vast majority of infected people, proper education and counselling may be as important as treatment. More cost-effective means to convey this information is an important priority.



**Programs to Assess Burden of Infection**

Monitoring systems to provide information about rates of various types of Pap smear abnormalities and of type-specific genital HPV infections in targeted populations will be important in planning and evaluating vaccine programs, as well as in tracking the distribution of HPV infection in the population. Such studies may be particularly useful in clarifying rates and types of infections in men about which far less is known than for infections in women.

Economic assessments of the costs resulting from HPV infection are limited and not available for all populations. Furthermore, existing analyses address only direct medical costs (the costs of actually providing care), and there is virtually no information on indirect costs (those resulting from lost productivity or premature death of someone with a medical problem) or intangible costs (such as anxiety and distress in personal relationships). Such information is critical in determining the potential public health and societal benefit of various prevention programs.

**Table 4. Time Trends in AARs of Cervical Cancer Cases, 1990-2003**

Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990	29.2	27.8	21.8	34.7	28.8	18.0
1991	27.5	33.9	24.6	33.4	25.9	19.5
1992	26.1	31.1	21.1	30.9	28.0	18.8
1993	29.6	27.8	21.1	32.3	30.3	17.3
1994	24.6	30.1	22.3	29.9	26.4	15.9
1995	25.2	30.9	20.6	27.9	25.1	15.1
1996	21.7	23.8	21.3	27.0	22.7	16.3
1997-98	21.9	21.9	24.1	26.7	22.1	18.2
1999	21.1	24.1	25.0	31.5	19.4	17.7
2000	25.3	22.6	23.8	33.1	21.5	17.2
2001-03	18.1	19.1	18.7	24.8	17.6	13.0
APC	-3.17*	-3.87*	-0.18	-1.61	-3.96*	-1.72
95% CI	-4.7,-1.6	-5.6,-2.1	NS	NS	-5.2,-2.7	NS

APC, annual percentage change \*significant at 5% level

**Table 5. Age Specific Rates of Cervical Cancer in 1990 and 2001-03 and MAPC%**

Variable	Age	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990	<35	2.15	3.35	2.10	2.05	2.44	1.45
	35-45	38.15	36.00	31.60	54.60	53.40	26.25
	45-65	92.27	99.63	69.22	115.45	84.61	52.27
	>=65	82.07	34.97	51.17	70.91	64.97	57.81
2001-03	<35	1.98	2.75	2.01	1.88	2.42	1.17
	35-45	19.11	23.95	20.15	26.46	20.10	16.67
	45-65	50.30	59.59	56.95	81.10	53.99	38.70
	>=65	72.00	62.41	63.09	73.79	52.33	44.24
MAPC%	<35	-0.59	-1.28	-0.29	-0.58	-0.08	-1.37
	35-45	-3.57	-2.39	-2.59	-3.68	-4.45	-2.61
	45-65	-3.25	-2.87	-1.27	-2.13	-2.58	-1.86
	>=65	-0.88	5.60	1.66	0.29	-1.39	-1.66

MAPC%, mean annual percentage change

**Table 6. Percentage of Cervical Cancers by Method and Duration of Period of Diagnosis**

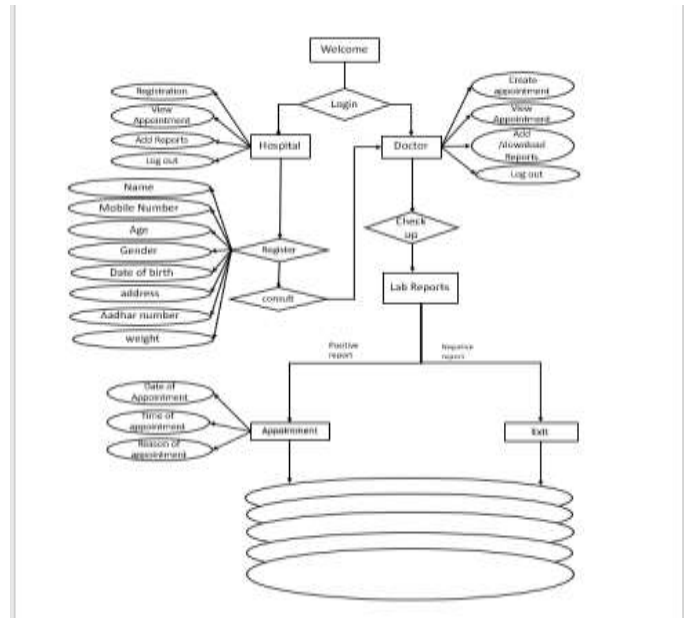
Year	Bangalore	Barshi	Bhopal	Chennai	Delhi	Mumbai
1990-96						
Microscopic	89.6	93.8	84.7	85.0	80.2	83.0
Clinical	8.4	5.9	14.5	13.6	17.8	11.3
Others	2.0	0.3	0.7	1.4	2.0	5.6
Total	2,523	388	537	3,320	5,153	4,125
2001-03						
Microscopic	90.0	93.9	96.0	89.9	80.9	90.5
Clinical	6.4	5.3	4.0	8.4	18.2	5.6
Others	3.6	0.8	0.0	1.7	0.9	3.9
Total	1,151	131	278	1,419	2,241	1,792

The AARs for cervical cancer by different years and registries are shown in Tables 4 respectively. For all the registries, except Barshi registry, the MAPC% was found to be maximum for the age group of below 35 years. This suggests that the rise in cancer incidence rate was relatively higher in younger age group as compared to other age groups. For Barshi, the maximum MAPC% was found to be for the age group of 45-65 years which indicates that the changes which we are observing in Barshi registry are mainly due to rise seen in the age group of 45-65 years. However, in the case of cervix cancer, the overall decrease in the rates, over the years, can be attributed to major reduction in the rates of 35-45 years and 45-65 years age group cases (Table 5). The common method of diagnosis for cervix cancer was also by microscopic confirmation (Table 6). For both sites, in the period of 2001-03, there appears to be a slight shift in the age distribution when compared to that seen in the period of 1990-96. In the cervix cancer the shift was from 42.6 years to 44.5 years. According to 2001-03 data, in 10% of the women the age at occurrence of breast cancer/cervix cancer was below 36.5 years/37.8 years. For both the sites, about 90% of the cases were found by the age of 70 years.

### 3. PROPOSED WORK

The application was designed to send reminder to the patient. The application sends a notification/reminder about the check-up with the help of scheduler. The scheduler is set in such a way that it sends a reminder just three days before the appointment date. Further for convenience of the patient/doctor we provide a function of uploading and downloading the patient medical record in the system itself. There is need to improve the public knowledge. As both the vaccination and screening are the new standards for prevention of cervical cancer, it can be possible by providing the awareness messages.

#### I. Modules A. Graphical User Interface



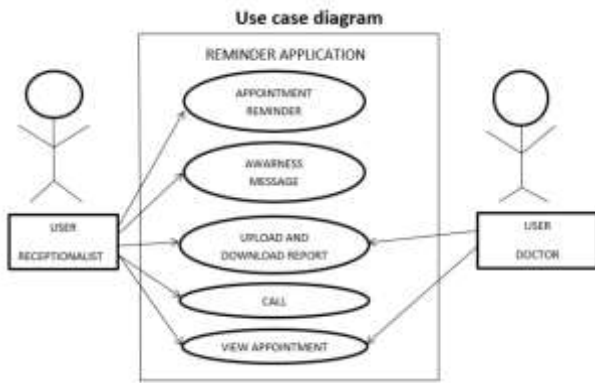
In our application to design the front end of the application we used asp.net.

ASP.NET is an open-source server-side web application framework designed for web development to produce dynamic web pages. It was developed by Microsoft to allow programmers to build dynamic web sites, web applications and web services.

#### B. Scheduler

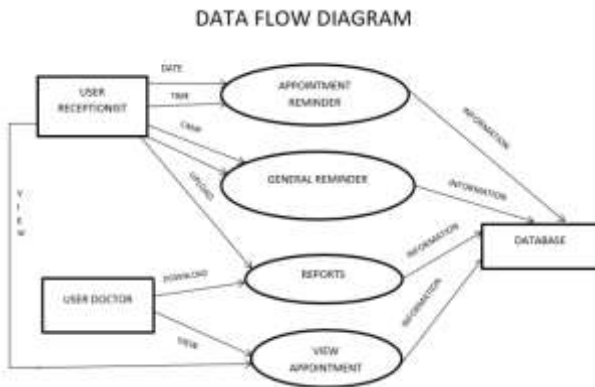
RadScheduler is populated via Web Service binding. This allows entirely client-side interaction with the control. For example, navigating through dates or opening the advanced form does not cause a post back. Select a day from the calendars to quickly go to this date in RadScheduler. Use the checkboxes in the sliding panes in the bottom left corner to filter appointments by resources. You can see how a grouped RadScheduler is behaving when you click on the "Group" button and you can filter the appointments by their resources by checking and unchecking the Checkboxes below the calendar.

Easily enable users to create and manage appointments in a rich and familiar, Outlook-like manner with RadScheduler for ASP.NET AJAX. Rest assured they will always be able to access their task data no matter the browser or device they use. Bind the control to any data source - as simple or as powerful as you prefer. Quickly configure the control to best match your scenario thanks to its 20 built-in skins, templates, custom attributes, resources and localization. RadScheduler and 90+ other controls are part of UI for ASP.NET AJAX, a comprehensive tool set that takes care of the common functionality of your application. Thus, leaving you with more time to work on the business logic of your application.



C. Database

In our application we use SQL server 2012 (version-11.0, code name - Denali). MS SQL Server is a relational database management system (RDBMS) developed by Microsoft. This product is built for the basic function of storing retrieving data as required by other applications. It can be run either on the same computer or on another across a network. SQL Server Management Studio is a workstation component\client tool that will be installed if we select workstation component in installation steps. This allows you to connect to and manage your SQL Server from a graphical interface instead of having to use the command line.



D. Awareness message

Sending an SMS or MMS is one of the most common tasks performed on the Twilio Platform. Sending a message is as simple as Posting to

the Messages resource. We'll outline required and optional parameters, messaging services, alphanumeric sender ID, rate limiting, and handling message replies below.

POST Parameters

The 'To' parameter is required in your POST to send the message: *The destination phone number for SMS/MMS or a Channel user address for other 3rd party channels. Destination phone numbers should be formatted with a '+' and country code e.g., +16175551212 (E.164 format). If you are sending messages while in trial mode, the 'To' phone number must be verified with Twilio. You can verify your phone number by adding it to your Verified Caller IDs in the console.*

*The 'From' parameter is required in the POST:* A Twilio phone number (in E.164 format), alphanumeric sender ID or a Channel Endpoint address enabled for the type of message you wish to send. Phone numbers or short codes purchased from Twilio work here. You cannot (for example) spoof messages from your own cell phone number. *The 'MessagingServiceSid' parameter is required in the POST:* The 34-character unique id of the Messaging Service you want to associate with this Message. Set this parameter to use the Messaging Service Settings and Copilot Features you have configured. When only this parameter is set, Twilio will use your enabled Copilot Features to select the 'From' phone number for delivery.

There is a slight difference in API response when specifying the MessagingServiceSid parameter. When you only specify the 'From' parameter, Twilio will validate the phone numbers synchronously and return either a queued status or error. When specifying the MessagingServiceSid parameter, Twilio will first return an accepted status. Twilio then determines the optimal 'From' phone number and any delivery errors will be sent asynchronously to your StatusCallback URL. *The 'Body' parameter is required in the POST:* The text of the message you want to send, limited to 1600 characters.

4. RESULT AND DISCUSSION

The reminder is send to the patient for the check-up using the scheduler. The scheduler sends message to patient from three days before the appointment date. A day before the appointment a call is also made to remind them and motivate them to take the test. Awareness message is send to motivate the patient, which includes information of various programs being held for cervical cancer, camps and awareness programs. When the patient comes for the next appointment they do not have to carry there reports or file. The doctor uploads and downloads the patient medical record in the system itself.

Automated Reminder System For Cervical Cancer Patient

Note : \* Marked is Mandatory | Back To Home

Personal Details

Name \*  Adhar number \*

Mobile Number  Weight \*

Date of Birth \*  Gender \*

Age \*  Address \*

SR.NO.	PATIENT NAME	MOBILE NUMBER	ADDRESS	DELETE
1	vaishnavi gini	9011072585	12,jaytala, nagpur-23	<input type="button" value="X"/>
2	poonj tesu	9970772051	nagpur	<input type="button" value="X"/>

Activate Windows  
Go to PC settings to activate Windows.

Automated Reminder System For Cervical Cancer Patient

DASHBOARD REGISTRATION VIEW APPOINTMENTS ADD/DOWNLOAD REPORTS LOG OUT

Note : \* Marked is Mandatory

Search Patient

Search Name \*

Add Reports

Report Name \*  Upload Report  No file chosen

Activate Windows  
Go to PC settings to activate Windows.

SR NO.	PATIENT NAME	REPORT TYPE	UPLOAD DATE	DOWNLOAD

## 5. CONCLUSION

Though cervical cancer is the leading cancer among women in India, our study has shown that they are ignorant about this completely preventable disease. Hence, reminder reminds about the regular schedule for screening test and will prevent the women from the painful death. Also, utilization of the services of media like television, newspaper and radio can have massive impact in improving the knowledge.

## REFERENCES

- [1] Hughes, C. (2009). Cervical cancer: prevention, diagnosis, treatment and nursing care. (Cover story). *Nursing standards*, 23(27), 48-56.
- [2] Lindau, S., Tomori, C. C., McCarville, M. M., & Bennett, C. C. (2001). Improving Rates of Cervical Cancer Screening and Pap Smear Follow-Up for Low-Income with Limited Health Literacy. *Cancer Investigation*, 19(3), 316
- [3] Everett T, Bryant A, Griffin MF, Martin-Hirsch PP, Forbes CA, Jepson RG. Interventions targeted at women to encourage the uptake of cervical screening. *Cochrane Database Syst Rev*. 2011;(5):CD002834.
- [4] Curtis P, Morrell D, Hendrix S, Mintzer M, Resnick JC, Qaish BF. Recall and treatment decisions of primary care provider in response to Pap smear reports. *Am J Prev Med*. 1997;13(6):427-31.
- [5] ACOG Practice Bulletin Number 131: screening for cervical cancer. *Obstet Gynecol*
- [6] Yeole BB, Jayant K and Jussawalla DJ (1989). Declining trend in cervical cancer incidence in Bombay, India (1964-1985). *J Surg Oncol*, 42, 267-71
- [7] Time Trend in Breast and Cervix Cancer of Women in India – (1990-2003), Ramnath Takiar\*, Atul Srivastav
- [8] www.cancer.gov
- [9] [www.digitalindia.gov.in](http://www.digitalindia.gov.in)
- [10] India: Human Papillomavirus and Related Cancer, Fact Sheet 2017