

# Information Systems for Sporadic Population Health Outreach Activities in Developing Countries

## Effective screening, data collection and tracking of patient population

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**Abstract**—with majority of population being deprived of quality healthcare because of its inaccessibility and unaffordability, outreach initiatives have been used since a long time to provide healthcare in sporadic fashion. Even though the intent of such “healthcare camps” is to help bring down the burden of disease in the community, the sporadic events mostly fail to deliver many important components of healthcare delivery to an individual because of the absence of linkage between care continuum including promotion of prevention, screening, diagnosis, treatment and surveillance. We propose an IT platform that effectively allows linkage between population health and individual health to make the outreach initiatives more effective and accountable for both the care givers and care receivers. The proposed solution uses a cloud platform and mobile phone that can be availed to great effect in planning, managing and organizing health initiatives and medical camps with focus on better patient engagement and handholding.

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### I. INTRODUCTION

Healthcare continues to remain unaffordable and inaccessible in most parts of developing and underdeveloped countries. Especially in countries like India where private funding makes approximately 81% of spend on healthcare [1], healthcare facilities tend to concentrate in economically prosperous urban areas. Owing to the challenges in existing healthcare infrastructure in emerging markets, patients (especially those in rural areas) fail to acknowledge that they have a health issue and they enter the care pathway at a late stage of disease. It becomes complex and unaffordable to manage the disease thereafter. In order to stimulate healthcare seeking behavior, camps are organized by Healthcare Providers, NGOs (Non-governmental Organizations), MedTechs (Medical Technology companies), Health Insurance providers and Govt. bodies. These camps are often targeted to a specific disease e.g. cancer, cardiac, diabetes, maternal health, etc. and they are expected to raise awareness of targeted diseases by enabling proper care delivery for early detection and prevention of diseases. Even before executing the health camp initiative, the organizer needs to engage in activities like site selection based on demography analysis, spreading awareness through localized content, KOL (Key Opinion Leader) management, local recruitment of health workers amongst others.

Such focus on end-to-end need is often complemented by value offerings like access to information, mobile health solutions, telemedicine network, mobile outreach vans, micro-insurance schemes, etc. [2].

Nationwide camps screen thousands of progressive & chronic patients. But once these patients leave the camp it is a challenge to track and handhold the patient to tertiary care centers. The ratio of chronic patients identified to those who actually receive follow-up treatment or undergo surgical intervention is very low. Even though camps have been actively used as a sporadic healthcare delivery mechanism, there is lack of proper management & patient engagement. The existing population health management system is seen as fragmented and disconnected. Therefore, there is an unmet need for an information system that is proactive and preventive – something that is intelligent and collaborative. Smart information technology (IT) platform is needed for capturing, tracking and managing patient data so that patients may be handhold through this unique collaborative care methodology. For a deeper understanding of information needs of healthcare camps, a deep dive study was conducted over various camps.

### II. APPROACH AND METHODOLOGY FOR DESIGNING THE OUTREACH FRAMEWORK

#### A. Design techniques used for insight collection

- a) Ethnographic research and observational studies with healthcare providers and Medtechs to understand their pain points in population health management, spreading disease awareness and organizing screening camps, spreading disease awareness and organizing screening camps.
- b) Field studies and primary research at health camps, in-depth-interviews with primary stakeholders, usability studies on data management and data collection protocols.
- c) Capturing the patient journey across the care continuum by plotting the clinical experiences at critical touch points across 50+ PHCs (Primary Health Centers), CHCs (Community Health Centers), District Hospitals & Tertiary Care Centers, 70+ interactions with individuals.

- d) Gap analysis to come up with innovation targets for designing a solution that improves patient experience, patient engagement and patient health via education, communication, co-ordination between care team & patient, adherence to clinical guidelines and acquiring data.

#### B. Identified needs

- A typical patient in a rural set-up has to interface with multiple touch points across the care continuum to avail healthcare e.g. Visit a primary health center for screening, carry out repetitive tests at referred multiple specialty hospitals, and finally having to follow up with tertiary care centers for further care. The high out-of-pocket expenses, load of self-management of their own health and the complexity in the system result in the patient dropping out of the care continuum without opting for tertiary care.
- Poor communication with the patient on their health status.
- Lack of monitoring and measuring of clinical and cost metrics.
- For the organizer, it is difficult to detect geographic zones, and analyze population demographics where awareness sessions and screenings need to be conducted.
- Lack of a smart way to manage/analyze the vast patient data due to manual data capture.
- There is a need to establish precise patient registration and define precise numerators during patient enrolment
- Poor patient tracking & follow-up management for tertiary care post screening.
- Difficult to understand at which all touch points the patient retention & conversion is an issue.
- Challenging for the organizer to gauge camp effectiveness.
- Lack of an ecosystem for the organizer to manage recruitment of volunteers and health workers, onboard KOLs, develop and manage the publishing content.
- Lack of infrastructure and solutions to capture and manage patient data for better clinical and business outcomes provided by the drop down menu to differentiate the head from the text.

#### III. INFORMATION SYSTEM SOLUTION

The Wipro outreach solution enables conduct of healthcare initiative activities like awareness and screening in the healthcare camps by facilitating site selection and demography analysis, better capture of data, efficient tracking and management of patients, effective KOL management, training and recruitment to handhold the patient throughout the care continuum.

A unique framework was proposed to address the challenges and enhance patient engagement. Using this framework, healthcare providers could systematically plan, execute, and manage all their outreach activities. With a gamut of tools that can be leveraged pre-event, during the event and post-event, the framework offers an end-to-end experience (Fig. 1).

Pre-event, the framework assists the organizer to select the target sites for patient outreach initiatives, understand patient demographics, and engage local crew for event management.

During the event, the healthcare provider can use the framework to capture, manage, store and analyze patient data and vitals (with the patient's consent). This data can be used to identify and diagnose progressive and chronic patients. The data is stored in the cloud and updated every time the patient undergoes further treatment. Post-event, progressive and chronic patients can be tracked and followed up to provide them with tertiary care at discounted costs through a network of hospital tie-ups. The framework can be used for other ongoing activities such as physician relationship management. It also offers sophisticated tools for analytical reporting that can be used to calculate the ROI of the campaign.

The solution can be customized to identify patients with a predisposition to cardiac disease or diabetes, and classify them as 'At Risk' or 'Chronic'. It offers the ability to connect and follow up with them through SMS and call center facilities to facilitate treatment adherence, scheduling appointments and supply of medicines at the patient's doorstep.

Wipro's Cloud Content (WCC) platform was leveraged to enhance the scalability of the solution. The patients are registered digitally using a mobile application. The vitals and other medical data of progressive and chronic patients are captured, stored, and categorized systematically in the Wipro Cloud using an intelligent mobile app post patient consent.

Subsequently, patient details and records can be viewed via a Web portal with built-in intelligence to analyze patients' vitals. Integrating the solution with an SMS gateway solution and call center also allows the healthcare providers to send alerts to patients by SMS and follow up with them for further diagnosis and treatment.

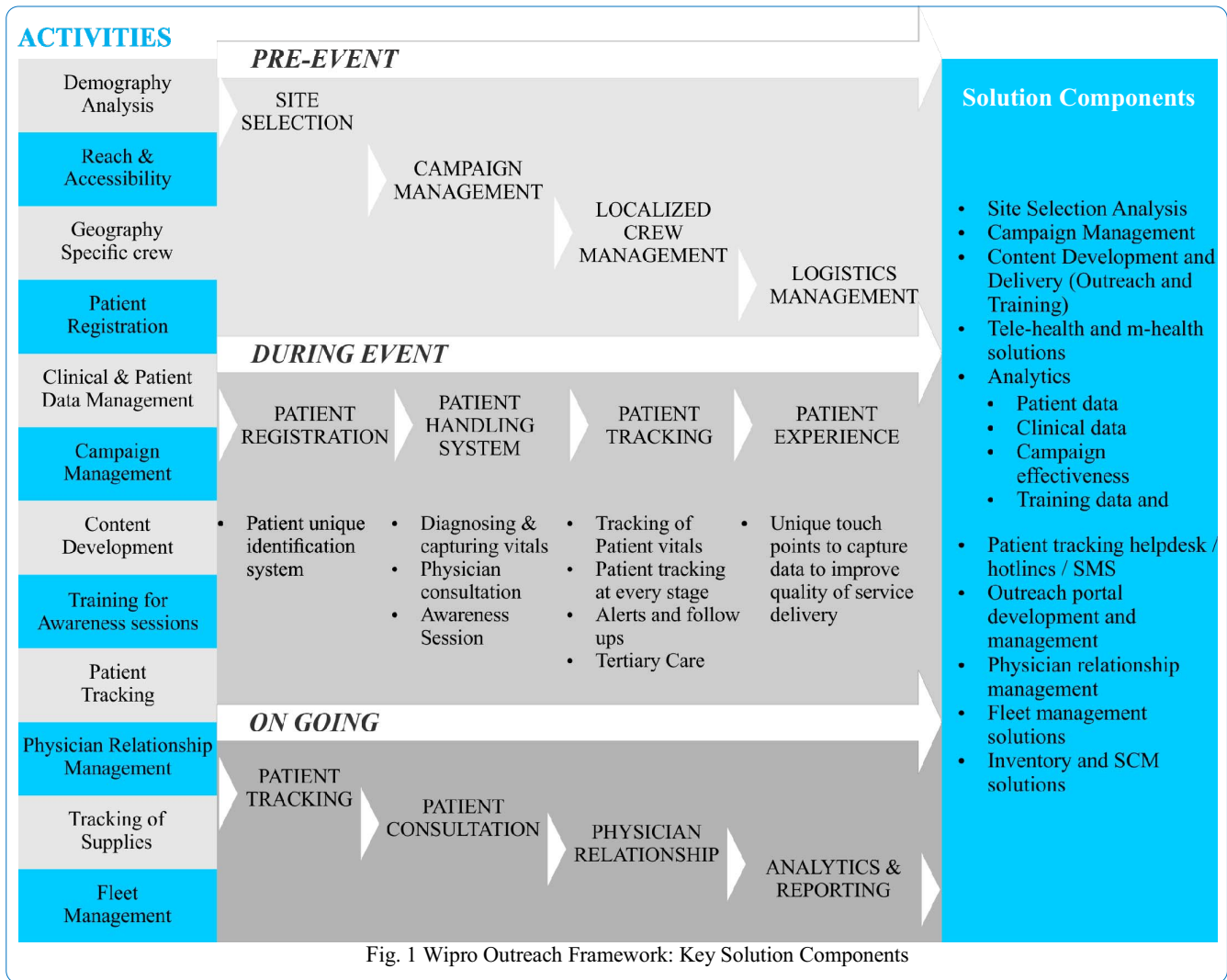


Fig. 1 Wipro Outreach Framework: Key Solution Components

A. Solution components

a) Mobile Application

- Mobile Application to register patient and enter patient vitals intuitively
- Built in logic to identify progressive and chronic patients (L1, L2, L3 Patients)

- System establishes precise patient enrolment attributes and patient-provider attributes specific to therapy
- Currently application is Android based, will be scaled to support other iOS in future

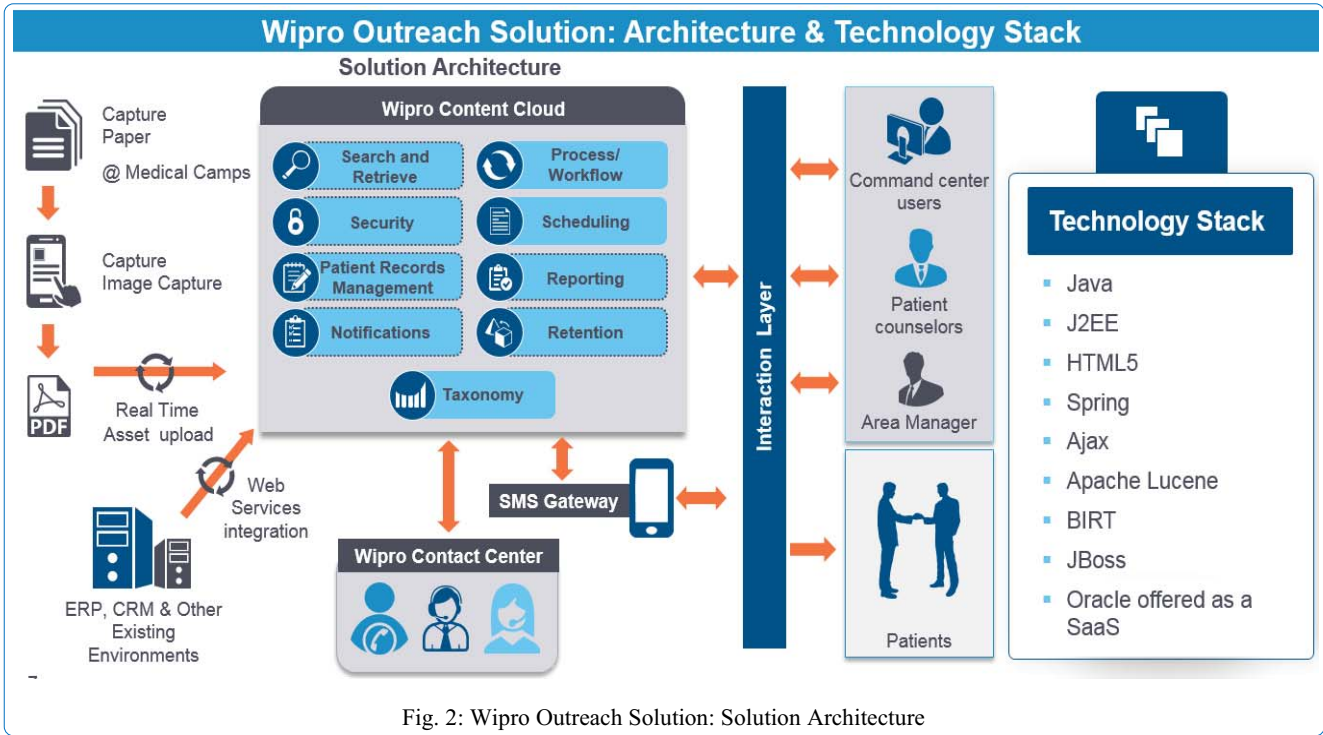


Fig. 2: Wipro Outreach Solution: Solution Architecture

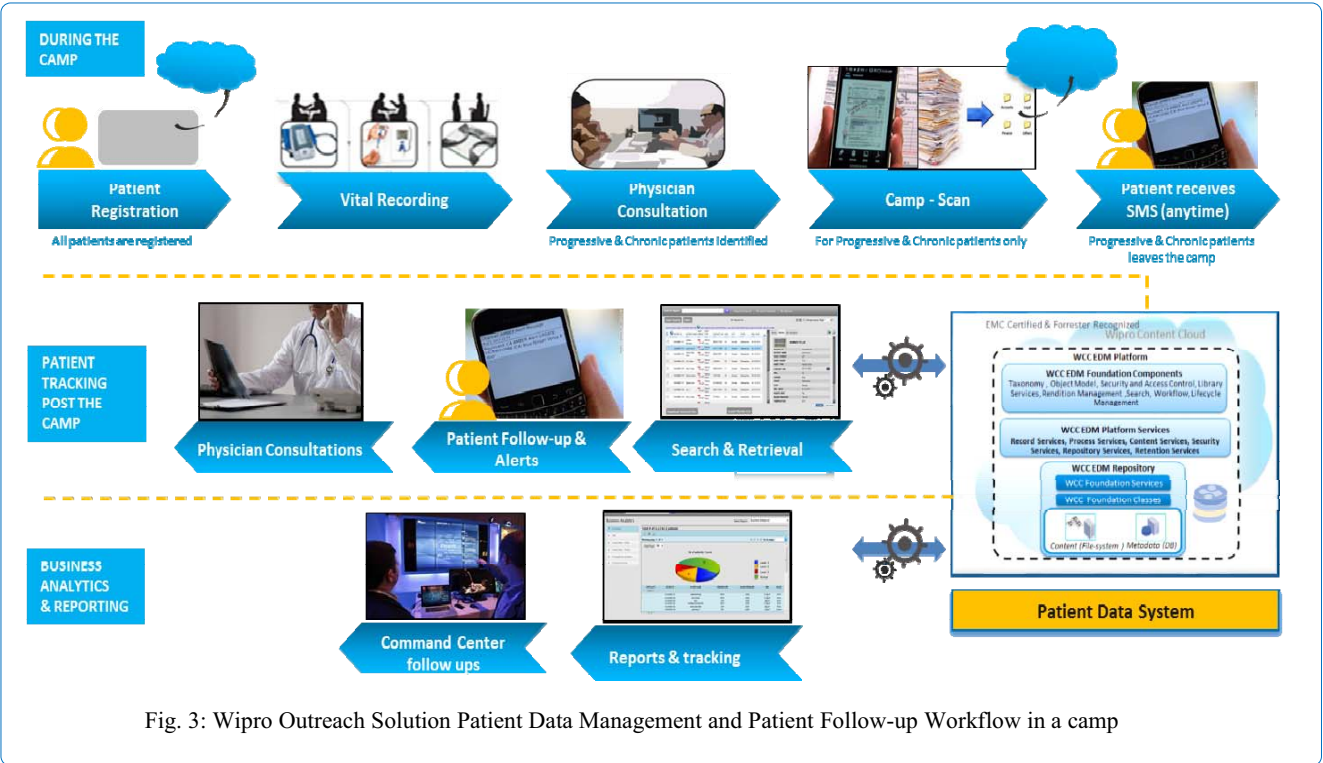


Fig. 3: Wipro Outreach Solution Patient Data Management and Patient Follow-up Workflow in a camp

*b) Web Portal*

- All task flows (Camp, Physician & Patient)
- Hosting and management of portal to store and view patient vitals post patient consent
- Built in logic to highlight patient's progress
- Built in alerts to feed into SMS gateway and Contact Center gateway
- Patient education through SMS in the current state and integrating to IVR (Interactive Voice Recognition) in the future state
- System establishes adherence to basic clinical practice guidelines through SMS and Contact Centre
- Integration with existing systems e.g. ERP, CRM, etc.

*c) Wipro Cloud*

- Hosting and Managing of the cloud where patient vitals & images are stored
- Six megabytes of storage space is allocated per patient
- Storing patient vitals of progressive (L1, L2, L3) and chronic patients
- Data archived for 2 years

*d) SMS Gateway*

- SMS gateway for progressive and chronic patients during/post camp once vitals are stored in the cloud
- Pre-defined templates managed by the system as indicated by healthcare provider empaneled counselor and built in logic in the system for visit schedules and adherence to care plan

*e) Contact Center*

- Five minutes per call in Hindi and English to consult patients on which hospital and type of test/treatment to be followed upon
- Maximum of 6 follow-up calls to each patient/year/therapy
- Calls managed by non-physicians who route calls to technical and clinical team based on the requirements
- Built in logic to identify the total number of outgoing calls per day by the system

*f) Health Analytics*

- Population Stratification (disease wise, geography wise, patient type, therapy type, amongst others)
- Effectiveness of healthcare delivery at tertiary care centers
- Track therapy specific outcomes
- Business Analytics built-in to generate reports on total number of camps, total footfall, categories of progressive and chronic patients, tracking patients (for patient pipeline management using the reports), patient specific details specific to a vital record and others
- It makes health management a collaborative effort and reduces the load on the patient to self-manage the disease across the care continuum, from being diagnosed to receiving relevant tertiary care.
- It seamlessly connects patient to subsidized tertiary care for post treatment (appointment scheduling, viewing of screening and diagnosis reports etc.)It provides meaningful insights on patient behavior, based on the various therapies and devices they choose
- It helps digitization of camp data, which was thus far handled manually

- It helps the camp organizer to track and follow up on patients
- It enables the organizer to measure and improve return on investment from the health camps

The workflow of the Outreach Solution during the camp and post the camp broadly consists of four steps: Digitized Patient Enrolment, Patient Follow-up, Hand-holding Patient to Tertiary Care set-up, and Patient Tracking (Fig. 3). At first the patient is digitally enrolled into the Outreach System at the camp, wherein the patient contact details and history are fed into the system intuitively, in a digitized manner. Post screening the patient, the vitals and other parameters measured are synced into the system, along with physician consultation. Once the chronic and progressive patients are identified at the camp, only for those patients the reports and prescription details are fed into the system. The patient leaves the camp and receives an SMS alert on his/her mobile phone with the Outreach enrolment details. Based on the records in the system, using search and retrieval options, chronic and progressive patients are tracked and followed up using SMS alerts and notifications, helpline command center and telephonic consultations for further treatment. The back-end analytics engine is used to generate various reports by slicing and dicing the data, which provide insights into effectiveness of the camp.

#### IV. DISCUSSION

The proposed solution for healthcare outreach activities has many potential benefits for the healthcare provider and it can be used to great effect in planning, managing and organizing health initiatives and medical camps with focus on better patient engagement and handholding to tertiary care.

The Wipro Outreach solution is highly scalable and holds much promise for the future. Healthcare providers, NGOs, Med Tech companies, health insurance providers, and governments are actively organizing healthcare camps in emerging markets, in order to raise awareness of various diseases and to ensure delivery of healthcare for the early detection and prevention of diseases. Thousands of patients are screened in these camps, and progressive and chronic patients identified. Wipro's cloud-based Outreach solution allows organizers to track patients and facilitates their access to tertiary care centers. It also enables scalability across chronic diseases such as diabetes, cardiac-related issues, etc. The solution can be used in all emerging markets that have low access to healthcare and poor healthcare infrastructure.

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