



# AshaConnect: Bridging Healthcare to Every Doorstep

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**Abstract:** Healthcare provision in rural India depends on the activities of Accredited Social Health Activists (ASHA workers), who traditionally utilize paper-based workflows. These workflows were found to be associated with frequent loss of information, travel issues, and poor patient show rates in referral hospitals. This research presents an innovative approach to digitize the process. This approach involves the design and implementation of the web-based health management system, AshaConnect. The system includes role-based portals for ASHA workers and hospitals, thus allowing for electronic patient registration, longitudinal tracking of health status, online appointment scheduling, and automatic exchange of reports between two parties. The solution has been built using technologies including Node.js, Express.js, SQLite, and web-native programming. It was built with three-tier RESTful architecture. The new software has been evaluated against the existing paper-based workflow by comparing the performance of both systems in eight aspects. The results showed that AshaConnect can bring substantial improvement in record keeping, hospital readiness, and patient care coordination. Overall, the proposed solution appears to be able to replace ASHA worker workflow fully.

**Keywords:** ASHA worker; rural healthcare; digital health; patient management; appointment booking; hospital coordination; health records; Node.js; SQLite

## I. INTRODUCTION

The public health system in India functions with the help of Accredited Social Health Activists (ASHA workers), who have been employed by the Indian government under the scheme of National Rural Health Mission (NRHM) since 2005. Every ASHA worker caters to the health care needs of a population of about one thousand persons, and acts as the crucial link between the community and the formal health care setup. Despite their strategic importance, ASHA workers continue to function in a completely manual way using paper-based methods. Data of patients has been entered into physical records, information on health issues has been communicated either verbally or via handwritten referral forms, and hospital appointments have been set up through personal visits or phone calls. Such processes lead to inherent inefficiencies such as data loss, late reporting, and frequent non-compliance by patients with subsequent follow-up, which reduce the efficacy of the ASHA programme.

The present paper introduces AshaConnect, an internet-based application designed and developed to automate the entire working process of ASHA workers. It offers role-based portals for both ASHA workers and hospital employees allowing patients' enrolment, monitoring their medical status, scheduling hospital visits online, and exchanging information on medical records electronically. The rest of this paper is organized as follows: Related Literature will be discussed in Section II; Problem Statement in Section III; Proposed System in Section IV; Architecture and Methodology in Section V; Features of the System in Section VI; Advantages in Section VII; and Conclusion in Section VIII.

## II. LITERATURE SURVEY

A wide range of studies has been conducted on the role of CHWs in LMICs. For instance, Bajpai et al. have observed the shortcomings in the provision of rural healthcare services in India, pointing out the absence of information technology tools for data collection and management among CHWs. Singh and Cumming have studied the emerging role of ASHA workers under NRHM and found the inefficiency of ASHA workers' work due to the lack of information technology in recording and monitoring patients' health records. The authors have found that communication between ASHA workers and hospitals is informal and lacks structure, which often leads to mistakes in the treatment process.

In terms of international research, Karlsson and Nielsen have conducted an analysis of digital health interventions in LMICs, listing the basic design principles for such interventions. According to the authors, such digital interventions should be characterized by a simple interface, the ability to function without internet connection, the need for low network bandwidth, and role-based access control. Nevertheless, this paper does not provide the necessary analysis of the functioning of ASHA workers in India and a particular solution to support their bidirectional referral model.



A global analysis of Community of Health Worker (CHW) programs conducted by the World Health Organization (WHO) highlighted the problems encountered by CHWs while collecting and reporting data. While stressing the significance of using technology in this situation, the study made no mention of any technological solutions to the problem. In a more recent article, Ranjit and Sharma proposed a mobile application design to help monitor maternal health in rural India; however, the proposed system covered only some parts of the ASHA workflow and did not include hospital components or doctor feedback for the ASHAs.

It is evident from all the reviewed literature that there is a strong need to develop a holistic digital platform for the ASHA workers which would integrate patient registration, monitoring, appointment scheduling, and closed-loop reporting from the hospitals back to the ASHA workers. AshaConnect addresses the above-stated need. Table I contains an overview of the important literature that was reviewed and what shortcomings it has pointed out.

TABLE I. Literature Review Summary

Study	Year	Focus	Gap Addressed
<i>Bajpai et al.</i>	2008	Rural health service gaps	No digital ASHA tools proposed
<i>Singh &amp; Cumming</i>	2013	ASHA role expansion	No technical implementation
<i>Karlsson &amp; Nielsen</i>	2017	Digital health, low-resource	General; not India-specific
<i>WHO</i>	2007	CHW overview	No software solution
<b>AshaConnect</b>	2026	End-to-end ASHA platform	Full digital workflow covered

### III. PROPOSED SYSTEM

AshaConnect was suggested as a web-based platform to make the whole process of ASHA workers digital. The system was built around a closed-loop care model. This means that the ASHA worker collects patient data, sends it to the hospital before the consultation, and then gets it back as a structured medical report after the doctor has looked at it. The ASHA worker, the hospital (including the consulting doctor), and the patient were the three main stakeholders.

The system workflow was defined as an eight-stage process. In the first stage, an ASHA worker registers on the platform and authenticates using a unique ASHA worker ID and password. In the second stage, patient demographic information, including name, age, gender, contact details, and full address — comprising village, taluka, district, state, and optional PIN code — is entered into the system. In the third stage, disease history, vaccination records, and current medications are recorded. In the fourth stage, vital signs — including temperature, blood pressure, blood sugar level, and pulse rate — are logged alongside free-text symptom observations. In the fifth stage, the system automatically computes a health status indicator (Stable, Needs Attention, or Critical) based on the recorded vitals, and generates personalised diet, exercise, and hygiene recommendations. In the sixth stage, the ASHA worker selects a registered hospital, chooses an available appointment date and time slot, and submits the booking, which becomes immediately visible on the hospital's dashboard. In the seventh stage, the consulting doctor reviews the pre-loaded patient profile and, following the consultation, enters a diagnosis, prescribed medications, clinical notes, and a follow-up date. In the eighth stage, the completed report is automatically made available in the ASHA worker's dashboard, closing the care loop.

TABLE II. Comparison: Existing System vs. AshaConnect

Aspect	Existing	AshaConnect
Record Keeping	Manual / Paper	Digital / Secure
Data Loss	Very High	Eliminated
Patient History	Difficult	Instant Access
Appointment Booking	In-person / Phone	Online
Hospital Preparation	Not Possible	Advance Data
Doctor Feedback	Manual Handover	Automatic
ASHA Travel Burden	High	Reduced
Follow-up Tracking	Memory Dependent	System Tracked



#### IV. SYSTEM ARCHITECTURE AND METHODOLOGY

##### A. Research Methodology

AshaConnect has been developed following an iterative, requirements-based approach. In Phase I, field requirements were elicited based on existing documentation about the work processes of ASHAs, official government program guidelines, and relevant research studies reviewed in Section II. Functional and non-functional requirements were then formulated based on this analysis. Phase II involved the design of the system, specifying the data model, API specification, and UI design for each stakeholder role. This design was checked against the requirements to confirm comprehensiveness prior to the implementation process. Phase III consisted of the iterative implementation of the system, which included the design and testing of the authentication module, patient management module, health monitoring module, appointment management module, and report exchange module, respectively. In Phase Four, the performance of the new system was assessed using eight factors, as presented in Table II, in comparison with the old manual process. The functionality of the new system to solve each of the six issues identified in Section Three was qualitatively assessed. This phase did not include a user trial, as the emphasis was on assessing the functionality of the new system.

##### B. Three-Tier Architecture

AshaConnect was developed in a three-tier architecture system as a web application. The presentation layer of the system was created in HTML5, CSS3, and JavaScript. There was no frontend framework used here, since this decision maximizes device compatibility. The application layer was created using Node.js together with Express.js, where all business logic and session management were done. The database layer of the system was created in SQLite.

TABLE III. Technology Stack

<b>Backend</b>	Node.js + Express.js
<b>Database</b>	SQLite (better-sqlite3)
<b>Frontend</b>	HTML5 / CSS3 / JavaScript
<b>Auth</b>	bcryptjs + express-session
<b>Architecture</b>	Three-tier RESTful

##### C. Database Schema

The relational database schema included eight tables such as asha\_workers, hospitals, patients, patient\_diseases, patient\_vaccinations, patient\_medications, vitals\_log, appointments, and doctor\_reports. The foreign keys were used to maintain referential integrity. WAL mode was utilized for supporting concurrent access. Bcrypt hashes were employed to store passwords; therefore, no plain text passwords were saved in the database.

##### D. API Design

The backend API design was organized using a RESTful architecture. It was divided into three routes. These include /api/auth, which dealt with ASHA and hospital user authentication; /api/asha, which exposed routes for creating patients, logging vital signs, making appointments, and doctor report retrieval; and finally, /api/hospital, which exposed routes for retrieving appointments, accessing patient information, and submitting doctor reports. Role-based middleware was used on all routes that were restricted from any cross-role access.

#### V. FEATURES

##### A. Authentication and Access Control

Two different registration and login pages have been used for the ASHA workers and hospitals. Unique ASHA worker ID's have been given to ASHA workers, and the hospitals have been given their registration numbers. Passwords have been encrypted before storing them using bcryptjs. Session management has been done using express-session, along with session storage in SQLite database. Middleware has been used based on role that restricts access to each other's API routes.

##### B. Patient Registration and Management

The patient's profiles will include complete demographic information such as his/her name, age, gender, and contact number. In addition to these, the patient's address will be captured, which includes details about the village, taluka,



district, state, and optionally PIN Code. The patient profile will have a link associated with the profile of the ASHA worker who registered this profile.

### ***C. Disease, Vaccination and Medication***

The application allowed for the recording of multiple diseases for one patient at a time such as diabetes, tuberculosis, hypertension, pregnancy, menopause, anaemia, malaria, asthma and malnutrition. Vaccination records were maintained for nine common vaccines such as BCG, OPV, DPT, hepatitis B, MMR, typhoid, COVID-19, TT vaccine, and influenza. Medication along with doses and frequency of administration was recorded.

### ***D. Vital Parameters and Health Analysis***

The four vital parameters recorded during each visit by an ASHA worker were temperature in Fahrenheit, blood pressure in the form of systolic/diastolic reading in mmHg, blood sugar level in mg/dL and pulse rate in beats/minute. Symptoms were recorded in natural language. Health condition was calculated based on these values as stable, needs attention or critical. Based on disease, personalized advice on dietary requirements, exercise and hygiene practices was recommended.

### ***E. Appointment Booking***

The ASHA worker was given a list of registered hospitals near him/her with their distance marked out. A seven day calendar was shown from where dates could be selected and a grid showing both free and occupied slots was given. The booking process was instantaneous with the appointment information appearing instantly in the dashboard of the relevant hospital along with the patient's medical record.

### ***F. Hospital Dashboard and Doctor Report***

The hospital workers had a dashboard which contained the list of patients that had appointments along with the name of the ASHA worker referring them and their medical records. After consultations were done, the doctor would use a standardized format to add diagnosis, prescribed medication, clinical notes and follow-up details into a form. The report thus filled was then stored instantly in the Dashboard "Doctor Report" of the ASHA worker.

## **VI. ADVANTAGES**

### ***A. ASHA Workers***

- The system has helped eliminate the threat of data loss through the use of electronic records.
- Unneeded trips to the hospital for exchanging information were found to be greatly minimized.
- Appointments could easily be scheduled while out in the field without having to physically go to the hospital.
- Reports and further instructions from the doctors could be received instantly without relying on verbal instructions.

### ***B. Hospitals and Doctors***

- Patient history including medical reports were available before the consultation began.
- Time wasted collecting data from patients during consultations could now be minimized.
- Instead of making verbal handovers, the reports could now be sent digitally.

## **VII. CONCLUSION**

AshaConnect was developed as a multi-layered digital solution which overcame the inefficiencies of the current ASHA worker management process. AshaConnect overhauled the inefficient paper documentation by providing a safe and efficient storage of all data; removed the need for traveling to set up appointments and to send reports to the concerned hospital; and provided feedback to the hospitals from ASHA workers by means of digital reporting.

A comparative analysis was done for eight different operational parameters of the proposed solution and it was found that in each case, the new solution performed significantly better compared to the current manual process. The selected software architecture, role-based access control, and use of lightweight technology were deemed suitable for use in rural areas with minimal infrastructure.

The future work includes the development of a mobile app for ASHA workers in areas where desktops may not be available; integration with the database at national levels, particularly for Ayushman Bharat; localization of the



application in local languages such as Marathi and Hindi; sending reminders by SMS for upcoming appointments; and developing an analytics dashboard for district level healthcare administrators.

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