Apollo Hospitals and Project Kavach: Insights from How India’s Largest Private Health System Is Handling Covid-19

Apollo Hospitals is India’s largest private integrated health system. Project Kavach, Apollo’s multipronged strategy to handle the Covid-19 pandemic in India, deployed several unique strategies such as an AI-based Covid-19 screener, a 24-7 integrated app for teleconsultations and medication delivery, health monitoring services at home (“hospital at home”), a multi-stakeholder partnership to provide medical care in hotel rooms across the country (“hospital at hotel”), and methods to rapidly update care protocols across its entire system to help reduce spread and mortality.

KEY TAKEAWAYS

A key metric of a nation’s success in mitigating Covid-19 is the number of lives saved. The exact reasons for India’s low mortality rate are not fully known, but early and decisive actions by the public and private sectors played a big role. The key takeaway lessons from our experience are as follows:

» The need for a whole government approach

» Health systems must have a master plan for cooperation at various levels — within system, external stakeholders, state, national

» Effective staff communication
India is one of the world’s largest economies. In health care, India has implemented several far-reaching initiatives such as Ayushman Bharat (health insurance for 110 million households living below the poverty line), national standards for electronic medical records and telemedicine, and the creation of 150,000 Health and Wellness Centres for primary care.

While India has universal health care, more than 70% of care is provided outside the government through a private system comprising some 70,000 hospitals, ranging from facilities as small as 10 beds to large nonprofit hospitals (run by foundations or wealthy families) to publicly held for-profit hospital chains. The for-profit hospitals and clinics cater to middle and upper classes who can pay for service or have third-party coverage or reimbursement (via health insurance, company benefit or government scheme).

**India’s Covid-19 Mitigation Measures**

India was one of the first countries in the world to declare a comprehensive lockdown to respond to Covid-19. A local contagion was detected in India in late January 2020. Early modeling projections showed that India could have as many as 364 million cases and 1.5 million deaths by July 2020 if no action were taken.¹

The government promptly initiated a number of mitigation initiatives (e.g., case surveillance, a contact tracing app, increased testing, protecting the vulnerable, and public and medical advisories). A countrywide lockdown of 1.3 billion people was initiated on March 24, 2020, when there were only 564 cases. The lockdown was lifted in May 2020 and replaced with local restrictions as needed. Figure 1 depicts Covid-19 case rates in India compared with the United States.
Because the private sector is so large, the government enlisted its support in combating the pandemic and caring for those infected. This paper describes the Covid-19 response at India’s largest integrated private health system, Apollo Hospitals.

**Apollo Hospitals and Project Kavach**

Apollo Hospitals operates 71 hospitals (10,261 beds), 237 outpatient clinics, 3,766 retail pharmacies, a telehealth network covering 125 sites, and several medical educational institutions (Figure 2). Patients mostly come from middle- and upper-class segments with a mix of private pay (about half), insurance, government schemes, and international patients.
In March 2020, after a month of intense planning and diligence, Apollo launched “Project Kavach” (meaning “shield” in Hindi), a multipronged program to tackle the Covid-19 pandemic (Figure 3). While the core underlying principles were similar to those employed by U.S. health systems, Kavach was designed to overcome some unique challenges through innovative new health delivery approaches.
In the early days of the pandemic, Apollo had to rapidly standardize protocols across its 71 hospitals, in anticipation of a large volume of Covid-19 patients and to avoid disrupting the care of people with other conditions. Apollo employs approximately 80,000 people, including some 11,500 nurses (of whom 14% worked with Covid-19 patients). Many staff lived in relatively small joint-family homes where they could not easily isolate themselves and so staff welfare was a priority.

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Apollo also had to adapt to the health policies of each of the 16 Indian states in which it operates. There were variations by state in requirements for allocation of Covid-19 beds, how to isolate patients, prices for tests or hospital stays, and who can be cared for at home.

**Project Kavach: Components, Scale, and Metrics**

The Apollo Kavach initiative comprised the following components:
**Information Dissemination**

The available information on Covid-19 changed rapidly (and is still changing). Information on precautionary measures, mode of transmission, clinical presentation, and management of Covid-19 was developed and disseminated to all Apollo’s entities and referring doctors via a “living” evidence review called Red Book (more below). Similar information for patients, including the importance of not neglecting other aspects of health, was disseminated to the public through an e-book as well as multiple print and social media channels totaling some 75 million impressions. After a 60% dip, patient admissions and outpatient visits for serious non-Covid-19 indications are returning to baseline levels.

**Covid-19 Risk Self-Assessment Tool**

Based on guidelines from the World Health Organization and Indian government, a secure, AI-based self-risk assessment tool was launched on the Apollo 24|7 app and website that allowed screening through simple interactive questions. No personal information was collected. The questions identified comorbidities, travel history, and current symptoms to stratify patients’ risk and guide them for appropriate clinical intervention. Over 15.7 million have used this tool and about 5,000 people still use it daily. Apollo is also piloting the integration of an AI based Cough Scanner to identify restrictive or obstructive lung disease for better triaging. This online tool asks people to cough multiple times for up to 10 seconds. Evolving independent research is working to validate such tools.

**24-7 Round-the-Clock Virtual Consultation**

The interactive digital platform mentioned above, Apollo 24|7, was developed to enable users from any part of India to access Apollo services from their mobile phones or Web (Figure 4). The platform offered a range of services from consultation with over 4,000 doctors, to diagnostic testing, to home delivery of medicines. With over 5 million people registered and roughly 100,000 active daily users, the app/platform has enabled about 240,000 consultation appointments booked across 75 cities. More than 470,000 prescriptions (both for Covid-19 and for other health conditions) were filled through the platform. Initial challenges included inability to provide a smooth continuum of care between online and offline services, lack of connectivity in some rural areas, and consultation fee parity. Apollo standardized teleconsultation rates across all specialties with 2 tiers (approximately USD$4 for junior/mid-tier and USD$15 for specialists). Medical charts used for offline consults and digital consults are also being integrated to enable better continuity of care. As more doctors consulted via these services, they realized that the consultations both minimized their own risk and brought great value to patients.
Testing for Covid-19

Most community testing was initially restricted to government labs. Once private labs were approved, Apollo Laboratories rapidly expanded to 16 accredited sites and implemented home collection of samples, as well as drive-through testing. Testing regulations and rates varied by state and district; the team had to be extremely vigilant to be compliant. As the government approved new tests, lab facilities were expanded for testing and included real-time reverse transcription.
polymerase chain reaction (rRT-PCR), Gene Xpert, Nucleic Acid Amplification Technique (NAT), and cartridge-based Nucleic Acid Amplification test (CBNAAT), Antigen testing, and serology testing. Apollo has done over 350,000 tests. Across the public and private sector, India has tested over 190 million samples and is currently doing about 200,000 tests per day for free or at a price of under USD$15 per test. To further scale testing, Apollo has partnered with an Indian company (Tata Medical and Diagnostics) to launch a CRISPR Cas-9–based diagnostic test (developed by the CSIR-Institute of Genomics & Integrative Biology) and also partnered with a leading Indian lab (CSIR-Centre for Cellular & Molecular Biology) to jointly commercialize a dry swab test (DArRT-PCR).

Apollo Fever Clinics

These were segregated facilities to ensure convenient screening and management of patients with symptoms suggestive of Covid-19 while preventing contagion to other patients. Approximately 100 such clinics were set up, either inside hospitals or freestanding, to reduce the burden on emergency departments and implement a standardized protocol for evaluation of suspected cases.

Project Stay @ Home

A monitored “hospital at home” home isolation service was offered for patients who were presymptomatic or had very mild symptoms and were either positive or suspected of Covid-19. The services encompassed clinical, nutritional, mental health, movement, and support services. It has been used, to date, by people from more than 100 locations, both cities and remote villages. Because symptoms can change from mild to moderate quickly, it was imperative to monitor the vital parameters judiciously. Availability of teleconsults, mental health counselling, and caregiver services made this project a success for non-hospitalized and post-hospitalized patients. Hospitalization rate has been low (3%).

Project Stay @ Hotel

This novel “hospital in a hotel” initiative offered subsidized isolation rooms in hotels with medical supervision. Many middle-class Indians live in smaller homes that are not suitable for self-isolation. Apollo Hospitals assembled a team of corporate and hotel chains to jointly develop a master plan for capacity, protocols, functions, and monitoring framework. Because hotels are not designed to deliver health care, we had to address a number of logistic issues such as elevator size, sanitization, accommodating devices (e.g., HEPA filtering, oxygen, and monitoring), and disposal of medical waste. Apollo provided kits for monitoring vital signs and set up nursing kiosks in hotels. The rooms had access to 24-7 telemedicine and a visiting medical team to check on them once a day. Apollo trained hotel housekeeping staff on sanitization and hygiene, personal safety, social distancing, food safety, and waste disposal. Three hundred isolation rooms were rolled out in 6 cities with an eventual target of 5,000 rooms across the country. We initially overestimated the demand and had excess inventory because people were reluctant to choose hotels over hospitals.
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In some hotels we just used floors or wings and in others we used the entire hotel, always with the intent to segregate Covid-19 patients and minimize disruption to any other hotel business. We modified the hotel dietary systems to meet medical needs (e.g., diabetic diet). Also, because elevators could not accommodate a stretcher and most hotels do not have guest rooms on the ground floor, we had to develop protocols for carrying patients down stairs if needed. We also avoided carpeted rooms to better sanitize them. Concerns of hotel staff were addressed as they arose. Overall, the effort was effective in mitigation and there was only one unrelated death of an elderly person due to a heart attack. This partnership helped free up beds in medical facilities for critically ill patients and benefitted hotels by using rooms that otherwise would have been vacant due to the pandemic. If we were to repeat this process, we would have done more education beforehand of both the patients and hotel staff.

Approximately 80,000 hotel nights were utilized. The project currently operates rooms in 23 3-star hotels in 11 cities. While most users paid for the hotel care (approximately USD$28–48 per night inclusive of room, food, and medical oversight, with bulk of payments going to hotels), the initiative provided approximately 20% of hotel rooms at no cost to low-income individuals via the support of corporate partners (State Bank of India, Deutsche Bank, Hindustan Unilever Ltd).

These home and hotel innovations (termed Project Stay-I) provided an alternative to help curb the spread of infection. While Singapore, New York, and several other countries/cities have utilized hotel rooms for housing travellers or patients, few have provided such comprehensive “hospital in a hotel” services and some (such as New York) have since stopped it.

**Treatment for Covid-19**

Across the Apollo system, 2,300 dedicated Covid-19 beds were made available (repurposed from other uses such as a standalone rehabilitation facility, where rehab patients were shifted to the main hospital). Approximately 800 ventilators were deployed (which proved sufficient as many patients were on alternative means of breathing support such as BiPAP and high-flow nasal cannula). Personnel received training on the latest protocols. Medicines, personal protection equipment, hospital supplies, ventilators, and additional medical equipment were procured to meet any increase in demand.

In collaboration with Medvarsity (a medical e-learning platform) and the Indian Society of Critical Care Medicine (ISCCM), Apollo imparted training (analogous to CME) to 163,241 health care professionals (most outside the Apollo system) on ventilator management. This training comprised multiple e-learning or live sessions across 8 weeks as well as simulator training.
With an explosion of scientific papers, the clinical team developed The Apollo Covid-19 Red Book to standardize protocols across its hospitals. Evidence-based guidelines were revised once per week as needed and sometimes more often: for example, when Recovery trial data was published from the UK on the use of steroids. The Red Book has been revised 14 times and one or more clinical protocols revised 31 times to date. The changes were communicated to medical directors via emails, WhatsApp, and virtual meetings who then communicated it to local consultants. An audit committee reviewed compliance weekly. The book addressed off-label therapies (such as hydroxychloroquine, which some staff initially used as a prophylactic until evidence of its ineffectiveness became available) and how to educate patients not to postpone or avoid necessary care.

Apollo also worked closely with the government to ensure medications (e.g., Remdesivir and Favipiravir) were rapidly provided to those who could derive clinical benefit from them. We not only secured enough to help all those who needed them, but also helped smaller facilities get access to Remdesivir.

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Last, but not least, Apollo created a hub-and-spoke model to ensure timely transfer of patients with medical emergencies to the hospital. There was a coordinator in every shift in each hospital who were able to handle the volume adequately. In each city, the support staff was notified to direct all concerns related to Covid-19 to a designated person, who ensured appropriate and safe transfers.

**Seropositivity of Staff**

Apollo has been monitoring employee health and infection symptoms to protect staff and patients. At Apollo Gleneagles hospital in Calcutta, 1,122 staff (approximately 25% of the employees) underwent testing for SARS-CoV-2-IgG antibodies. The overall seroprevalence among workers was 11.94%, which included 19.85% in Covid-19 units, 11.09% in non–Covid-19 units, and 8% in administrative workers. Housekeeping staff, food and beverage staff, lab assistants, and technicians had higher seroprevalence rates than doctors and nurses. The overall seroprevalence rate of health staff at Apollo is in line with findings reported in the U.S., UK, and Europe. However, the higher seroprevalence rates among hospital housekeeping staff have not been noted previously, to our knowledge. This finding is unexpected and suggests that all health systems should pay closer attention to risks of nonmedical staff to reduce their exposure in the future.
Recovery Clinics

In the initial months, Apollo, like others around the world, did not prepare for the post–Covid-19 syndrome with its lingering neuropsychiatric and physical symptoms. As the incidence went up, in October 2020, Apollo launched the ReCOVer clinics in 14 cities to provide dedicated care. About 60–70 patients are being seen per day across the system.

Vaccination

The Indian government developed a national protocol for vaccination that includes self-registration on an app, CoWIN, that is also used to monitor progress in real time and issue completion certificates. Apollo held a mock drill at several sites (covering identity checks, cold chain maintenance for the vaccine, validation of data in the CoWIN app, and management of patient safety). To date, 23 Apollo hospitals received approvals for vaccination by state authorities and are administering vaccines. Apollo clinicians and leadership have also taken part in educational activities around the benefits of vaccination.

Outcomes

Project Kavach was designed to intervene proactively at every stage — detection, testing, isolation, and treatment — and was deemed successful overall. In the Apollo system, 55,199 patients (6,081 in intensive care units) have been treated for Covid-19, and the inpatient mortality rate has decreased from 3.02% (June–August 2020) to 2.38% (September–November 2020). While comparable statistics are not available to us from other Indian hospitals, these rates compare favorably with those in Western nations.

Overall, India’s Covid-19 death rate is much lower than the United States (Figure 1).

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