Certificate Course in

Healthcare Technology (CCHT)

Module 3 :Technology-led Health Care Part-2

Case Study: Example of a Smart Technology Enabled Hospital

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Case Study: Example of a Smart Technology Enabled Hospital

Learning Objectives:

- Case Study – Smart Hospital. Narayana Superspecialty Hospital, Mysore

Overview of Session:

Making hospitals "Smart" doesn't always involve installing always-on internet-connected devices and fancy software that makes your daily life more complicated. India is a poor country and technology penetration is very low. If we are to realize the goal of universal healthcare, we need to implement technology that reduces cost by improving quality, enhancing throughput, and reduces variance

Case Study is Narayana Super specialty Hospital in Mysore. This is a low-cost cancer hospital, meant mostly for patients under Government Welfare Schemes. We implemented a digitization exercise in response to the COVID pandemic with the idea of reducing crowding in the OPD waiting areas and minimizing spread of infection. The end goal is to create a model for smart hospitals in Tier 2 cities using simple tools that require low levels of digital literacy and utilize existing technology infrastructure.

Introduction

Outpatient Department (OPD) services in Indian tertiary hospitals constitute approximately 90% of total patient volume but only 10% of patient revenue. This is due to the unorganised, fragmented system of referrals in the country. Unlike developed country healthcare systems, any Indian with a headache can walk into a superspecialty hospital for a consultation with a neurologist for as little as ₹300. The doctor won't be able to spend more than 10 minutes per patient because there may be 40 patients waiting outside the door. The doctor will ask a few questions and generally recommend a medicine or send the patient home. With such huge patient footfalls, doctors might miss serious cases that may require major intervention. The OPD to IPD conversion ratio by volume in Indian tertiary hospitals ranges between 5% to 15%, depending on the size and speciality mix.

The following table calculates the number of patients in a 300-bed hospital per doctor.
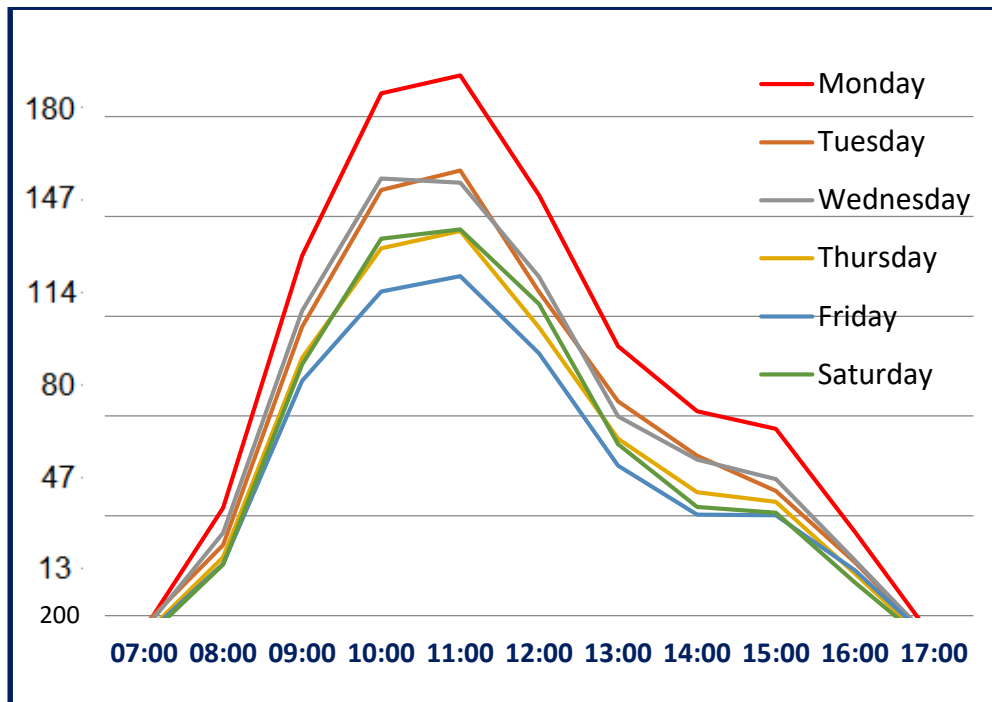
Beds	300
80% occupancy	240
Total admission per day considering average length of stay (ALOS)	96
Total admission per month	2400
Monthly OPD volume - Considering 10% OPD:IPD conversion	24000
OPD volume per day	960
Patient per doctor - Considering 25 speciality doctors in the OPD	38
Average consultation time (minutes) a doctor can spend in OPD	**420**
Average minutes doctor use for consultation	10
Time required to consult all the patient (in Minutes)	**384**

The doctor will take approximately 6.5 to 7 hours of time in OPD to consult all 38 patients. If the doctor can see all the patient in his 7 hours of OPD schedule, we need to understand the reasons for patient delay and dissatisfaction?

Typical Hospital Scenario

We have observed that 80% of OPD patients come to the Mysore hospital without an appointment. This data varies across geographies depending on the literacy level and economic background, for e.g. technology hubs like DLF Cybercity or Whitefield have higher appointment bookings.

NH Mysore is a 250 bed, tertiary care centre which caters to the population of Mysore and adjoining districts. The population is predominantly low-income blue workers and agriculturists which explains unfamiliarity with appointment booking systems. The OPD handles around 600-700 patients on a regular day between 20 specialist doctors. The peak footfall of patients is between 10am to 12pm every day, causing long waiting time & stress on the patients and staff. The average waiting time for a patient who arrives unplanned at 11AM can go up to 2 hours. Even though the doctor can handle 35 patients across an 8-hour workday, there is a mismatch of supply and demand due to the uneven distribution of patient load.

Chart legend: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday

Y-axis values: 180, 147, 114, 80, 47, 13, 200

X-axis values: 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00

Levers for improvement

Smart hospitals are defined by the smart decisions they take, not by the smart devices that they purchase. NH Mysore dug further into understanding the key drivers of the outpatient department and identified these levers for improvement.

1. Number of doctors available in the OPD during peak hours
2. Maximum Number of patients that can be seen by the doctor during consulting hours
3. Times when patients are arriving for the appointment
4. Average time taken by doctors to conduct a patient consultation

Possible solutions

The traditional response to long waiting times is to add more doctors to the hospital. Due to the pandemic, NH was constrained in adding more resources (doctors) to the rolls. NH briefly considered reducing the consultation time with the patient but that was quickly rejected by the doctors. The traditional response to crowded OPD's is to make the waiting areas bigger and add more people to registration and billing counters. Demand (patient) is concentrated within a short span of time which causes crowding and long waiting time. Adding resources to deal with peak demand will only lead to

suboptimal utilization during non-peak hours. Hence the only possible solution was to change the process to flatten the demand curve by spreading it out across the day.

Smart Solution: Technology-driven Process Change

For any process change to be successful, it needs the buy in of key stake holders (ie doctors and nurses). This is because change management is a process that alters well-established behaviour patterns of patients, staff and doctors, and we all know that change is uncomfortable.

However, COVID-19 completely disrupted normal functioning of the health care system. NH superspecialty hospitals were designed for non-communicable elective surgeries. Our healthcare workers were not used to risking a chance of contracting infection during the care giving process. Patient acquired a new phobia of acquiring an infection just by visiting a hospital, despite the precautions that hospitals have taken to eliminate cross-infection. This spurred NH to consider solutions that implemented safe distance protocols and isolated areas.

Digital appointment system:

NH had spent many years promoting the appointment system for the benefit of patients. In order for our digital OPD project to be successful, we made appointments compulsory for all the patients to enter the hospital. Appointments can be made through either

1. Web site
2. Centralised call centre
3. OPD entrance gate on arrival

The patients were initially guided to use the appointment platform, preferably through the website. In case of difficulties, they were given the choice of using the central call centre. Those who couldn't access any of the options, were guided by the OPD staff to book appointment manually.

Upon booking the appointment, patient receives an SMS with the details of the appointment along with the payment link. The payment confirmation leads to appointment confirmation and we collect history & present complaints. The 'History & Present Complaint Input' is filled by the patient as he

understands his disease. The data is validated by a staff before the consultation and color of the code changes from red to yellow on completion of the validation. Doctors and front office staff receive the confirmed list of patients for the following day with validated patient complaints which helps in better planning of resources and time. If the payment is not done within 2 hours, the appointment is cancelled, and patient receives a message of cancelled appointment. This minimises no-shows and helps manage the OPD with high predictability.

Patient Arrival Procedure:

When patient arrives in the hospital, they confirm arrival through a QR code scanning or Kiosk at the entrance, then walk into the vitals measurement area. The vital area staff enter patient details in EMR portal and validate the patient history & present complaints details. In some clinical specialities, patient will be asked to complete some mandatory tests before the consultation as per the clinical protocol. In this scenario, the patient would be asked to arrive in the hospital according to the availability of diagnostics slots.

The bay management system tracks the time of arrival and monitors the waiting time of the patient, escalating to the operations manager if they exceed the control limits. Patient walks into the consultation room as per the guidance of the bay management system. Doctor views history, present complaints, reports and validates the data prior to seeing the patient. The EMR changes the colour of the template to green to confirm the consultant's validation of the clinical data.

This pre-filling & validation of clinical data helps the consultant minimise data input during the consultation and maximises the patient interaction which in turn enhances patient satisfaction.

The patient may be asked to undergo further diagnostics or arrange a follow up visit at a later stage. Some patients might require admission if the definitive diagnostics indicate that hospitalisation is required.

Diagnostics Management:

The doctor may require patient to undergo some tests prior to diagnosis. They will be given a link which helps him to choose the tests for that day or to do them later. The payment can be made electronically in advance or upon completion of the tests. On confirmation of the diagnostic tests, the bay management system gets activated and patient is sent a message with the details of time, counter, and approximate time to complete the test.

On completion of the tests, patient gets a message with the TAT (Turn Around Time) for the report. Patient then gets a suggestion for fixing appointment with the consultant same day or next available day as per the availability of slots for the consultant. They can then confirm the time for the revisit and complete the consultation.

Once the report is authenticated by the concerned doctor, it will be sent to the patient through email and will be available in NH Patient Portal for any time access. The reports can be viewed once the payment is cleared by the billing system.

Table below shows the time saved by the patient in the hospital due to the digitisation of the process chain.

Narayana Health

Process – before

➢ Majority of patients walk in with out appointment
➢ Patient fill in registration form manually at the counter
➢ Patient wait in billing counter and make registration & consultation charge
➢ Patient get the token number & time of consultation
➢ Patient proceeds for Vital check

Digitalisation Initiative

➢ Patient friendly digital appointment system
➢ Patient fill in the form through appointment portal
➢ Patient pay the charges online at portal
➢ Patient get the confirmation of consultation & time to arrive the Hospital
➢ Patient walk in 10 minutes before the consultion & confirm the arrival through QR scanning/Kiosk entry/front office staff and proceed for Vital check

Narayana Health

Process – before

➢ Patient wait for his token time & Patient complete the consultation
➢ Patient instructed for diagnostics
➢ Patient revisits the billing queue and make the payment & proceeds for diagnostics
➢ Patient get the waiting time & completes the test
➢ Patient wait for the report and collect the report from the despatch counter
➢ Patient revisits the counter for further appointment

Digitalisation Initiative

➢ Patient complete the consultation as per the appointment time.
➢ Patient instructed for diagnostics
➢ Patient accept the link for diagnostics & proceeds for diagnostics
➢ Patient get the token number and complete the tests
➢ Patient get the update & upload of the report on completion of payment
➢ Patient get the revisit appointment time as per the queue
➢ Patient portal App

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NH Narayana Health

Process – before	Digitalisation Initiative
➢ Post consultation medical prescription is written in case sheet for purchase	➢ Patient receives the medication list in his phone/app
➢ Patient wait in pharmacy counter & make the payment	➢ Patient can confirm the medicines, and number of days & make the payment
➢ Patient takes bill to delivery counter, wait for medicine pickup	➢ Patient can chose to pick up the medicine from pharmacy or to deliver at residence.
➢ Patient pick up medicine and leave hospital	

Key Benefits:

1. Patient can book the appointment through the digital platform at their convenience
2. Patient can skip the queue at the Registration desk & Billing
3. Doctor gets quality time to interact with patient
4. Patient avoids multiple visits to billing counter
5. Patient avoids the waiting at the report despatch counter.
6. Patients get predictable waiting times which reduce anxiety
7. Patient gets digital reports for easy storage and recall
8. Patient can confirm the medicines online and same can be kept ready for pick up or can be delivered to residence.
9. Better experience, lesser staff requirement, improved customer experience

Patients used to be involved in several time-wasting activities in the old system. Most of these activities can be re-designed or re-engineered digitally to be minimised or avoided entirely. Prior scheduling of appointment, filling the registration details, payment of registration & consultation fees minimises the waiting time in the hospital. A well scheduled consultation list is easy and predictable to manage for both patient and staff. OPD digitization minimises physical contact, reduces staff interaction, and de crowds OPD spaces. Of course, it serves its original purpose of making the OPD

safer for patients during the Covid pandemic. We estimate that digitization will save minimum of 7.5-man hour days every day which can be utilised for higher value-added work (considering average savings of 18 minutes per patient for 600 patients a day).

Time Motion Study in the hospital	Time Saved compared to Manual Process		
	Minutes	Hours	Days
Registration form filling	3		
Registration & Consultant payment	5		
Pre-consultation entry (History & complaints)	5		
Billing queue for Diagnostic payment	5		
Total	18		
Avg. Number of patients in a day	600		
Total time saved in Manual process	10800	180	7.5

Billing counter on a normal day before digitalisation:
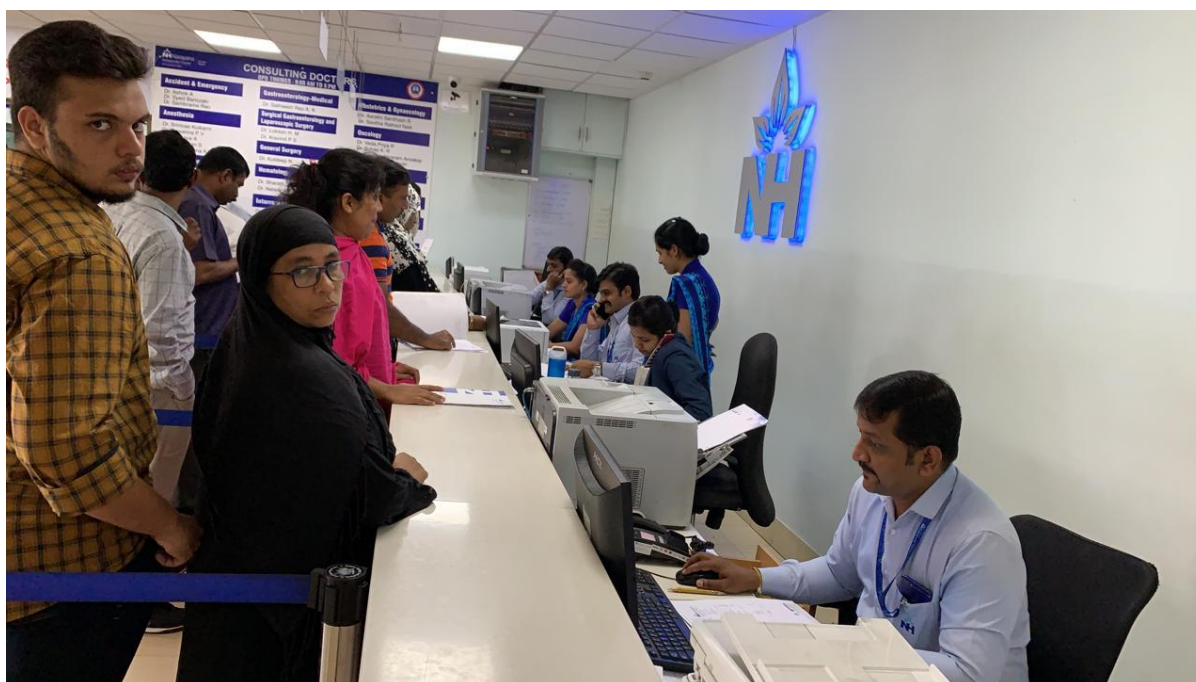
Billing counter on a normal day after digitalisation

Conclusion

Technology adoption and Process re-engineering tools have been practiced since the industrial revolution. Systems like TQM and Kaizen have improved throughput in manufacturing & services sector. Healthcare has evolved over a long period in relative isolation to improvements taking place in other industries. NH has always believed that we must take inputs from various industries to improve.

While hospitals have been the last to adopt digital technology, the software penetration into healthcare services has gained faster momentum in recent years. Most modern hospitals can boast software like Hospital information Systems, Patient access platform and Clinical Decision Support Systems. Hospitals will truly unlock the value of their software once they carry out seamless integration of all these platforms.

Suggested readings:

The Digitization of Healthcare - https://www.healthcatalyst.com/insights/digitization-healthcare-5-keys-progress

Raising your Digital Quotient - https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/raising-your-digital-quotient

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5433641/

8 ways to reduce Patient Wait Times - https://blog.evisit.com/virtual-care-blog/reduce-patient-wait-times

Hospital of the Future - https://www2.deloitte.com/content/dam/Deloitte/global/Documents/Life-Sciences-Health-Care/us-lshc-hospital-of-the-future.pdf

AIIMS Goes Digital - https://pibindia.wordpress.com/2016/10/19/aiims-goes-digital/

Presentations
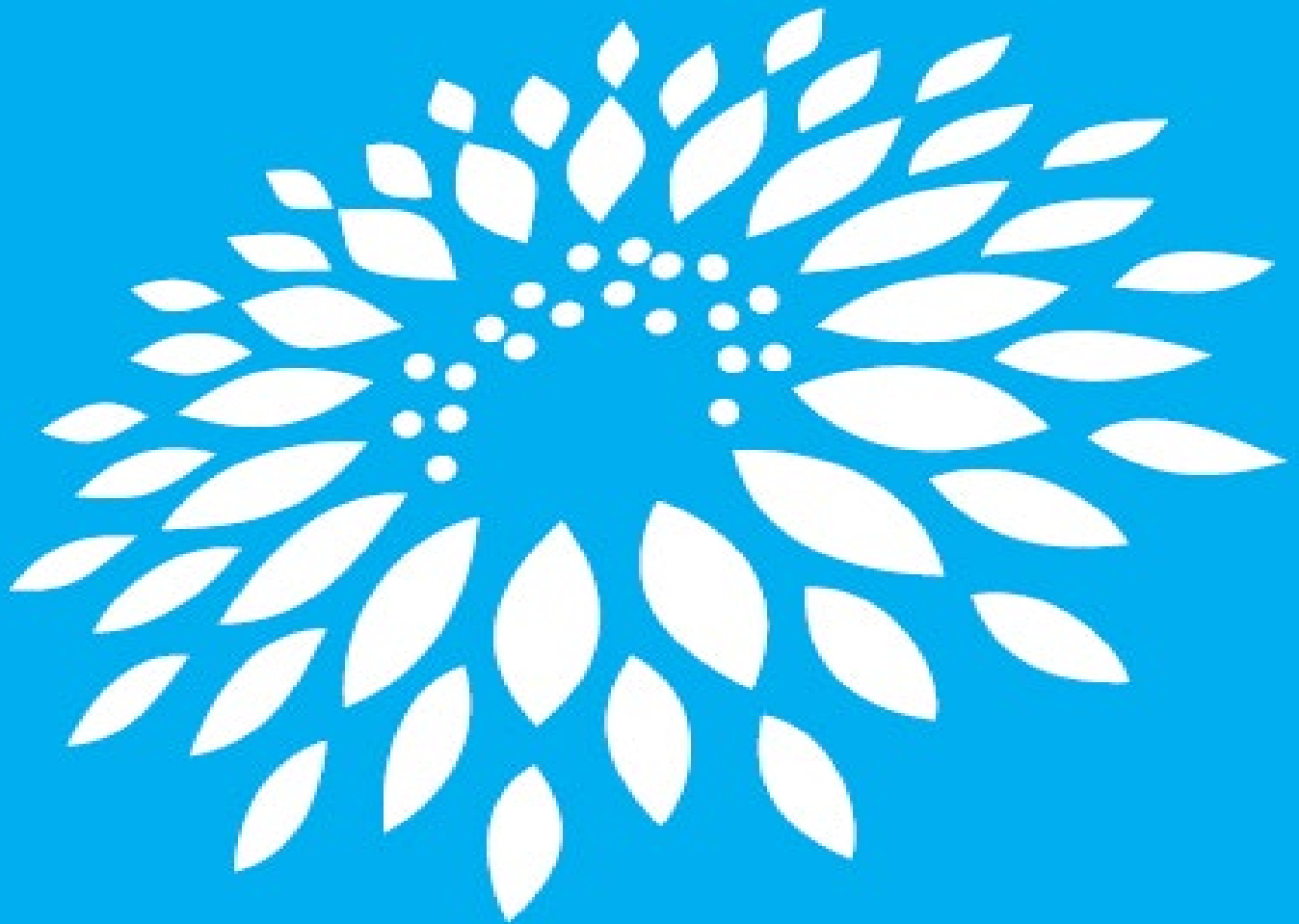
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Module 3 : Technology led Health Care

Topic : Smart Hospitals Case study : Example of a smart technology enabled hospital

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HEALTHCARE TECHNOLOGY

Mr. Viren Shetty

Executive Director and Group COO, Narayana health

Viren Shetty is an Executive Director and the Chief Operating Officer of Narayana Health, a world-renowned healthcare group dedicated to bringing high quality healthcare to the masses. His past experience includes hospital design & construction, project planning, supply chain management, business development, hospital operations, investor relations, strategy, and healthcare policy. He is currently driving the business transformation of NH, which will completely redesign the way hospitals function by building software, reengineering processes and using robotic automation to improve quality, reduce cost and provide a better experience for patients.

Viren has an MBA from the Stanford Graduate School of Business and an undergraduate degree in Civil Engineering. He lives in Bangalore with his wife and two daughters.

Overview of Session

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Objectives

Establish NH Mysore as India's first "Digital OPD"
Use digitization to reduce crowding, introduce people to online appointments, reduce patient touch points, remove waiting areas
Make the entire process of seeing a doctor in the hospital seamless

Picture of General Ward at Narayana Superspecialty Hospital

Observations from OPD Patient Flow Studies

- Patient Flow is highest on Monday
- Peaks between 10am to 12pm which account for 60% of total consultations
- Pattern is uniform across departments
- Nearly 60% are First Time Visitors
- Revisits are planned by the doctors and predictable

Conclusion

- Peak hours can be reserved for First Time Visitors

Patient Arrival: Consultation type wise
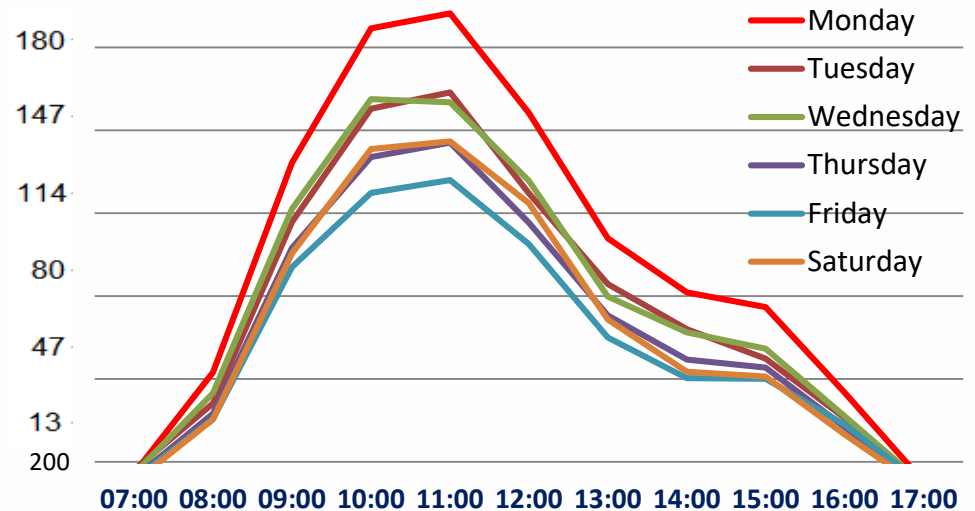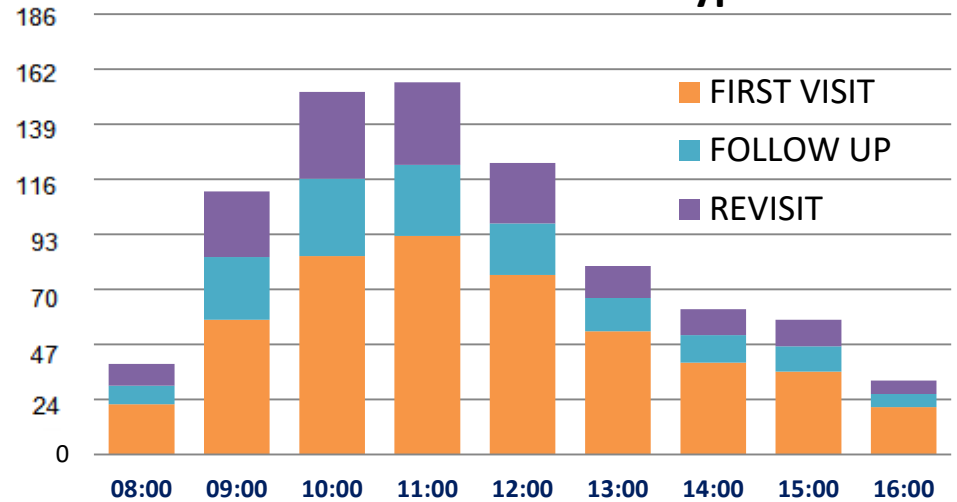
Observations from OPD Patient Flow Studies

- Most patients opt to walk-in over making an appointment
- Data entry at multiple touchpoints leading to bottlenecks
- Cash transactions at multiple points leading to dissatisfaction and sense of overcharging
- Difficulty in resource planning

Conclusion

- Need to streamline the patient journey
- Replace some touchpoints with mobile phones or kiosks

Patient Enters the Hospital → Registration Counter → OPD Waiting Area → Doctor Office → Lab Waiting Area → Lab Tests → Lab Waiting Area → Lab Reports → Billing → OPD Waiting Area → Doctor Office → OPD Waiting Area → Pharmacy → Billing → Patient Leaves the Hospital
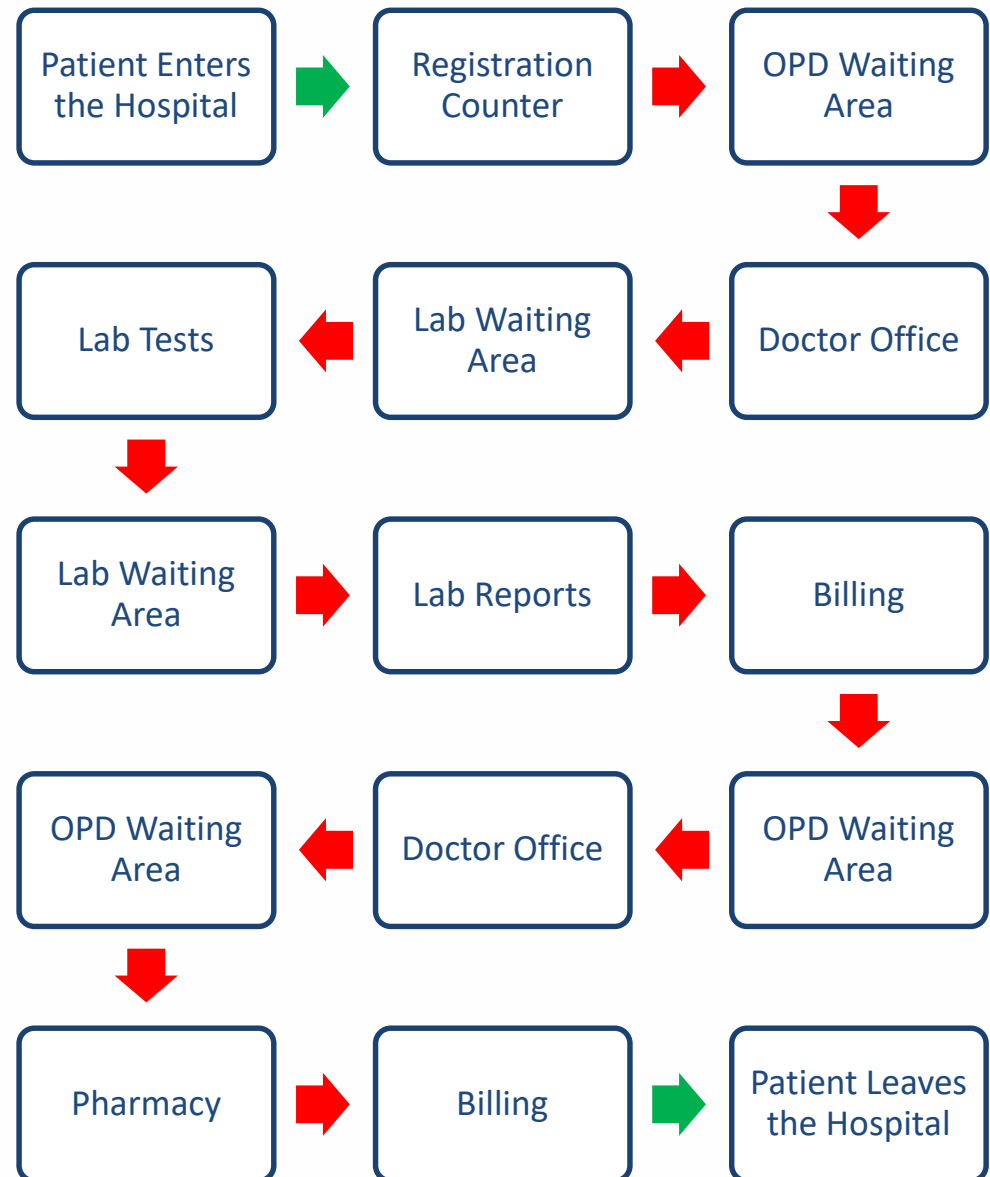
Immediate Objectives from OPD Digitization

- Eliminate large waiting areas in the hospital,
  - Prevents cross-infection
  - Saves space
  - Can increase OPD rooms
- Reduce waiting time for individual patients
  - Improves patient satisfaction
  - Increases patient throughput
- Planned appointments for consultations
  - Better utilization of consultant time
  - Better resource deployment to manage peak hours
  - Reduces stress on workforce

Appointment Options

Website

- Visit Website
- Click on 'Book an Appointment'
- Search by Hospital name, Specialty or Doctor
- Select Date and Time of Appointment
- Enter Patient Details
- Enter Appointment details
- Confirmation message will be delivered
- Link for Online Payment will be sent

Call Centre

- Dial 186-0208-2028
- Give Patient details
- Appointment booked by Executive
- Confirmation Message Delivered
- Link for Online Payment will be sent

Walk-in Patient

- Patient approaches Registration Desk
- Patient details entered and MRN generated
- Consultation raised in ATHMA
- Appointment slots based on availability
- Patient waits till appointment time

App (coming soon)

Online Appointment Screenshots

Patient Searches by Hospital, Speciality or Consultant

Online Appointment Screenshots

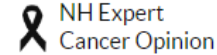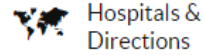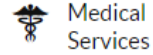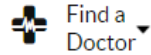Patient Selects Date and Time of Appointment as per availability

Online Appointment Screenshots

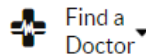Patient Enters Demographic Details. If they have an MRN, this is filled automatically

Online Appointment Screenshots

Receipt is Generated after Appointment is booked. Confirmation Message is sent to Registered Mobile Number

Online Appointment Screenshots

Receipt is Generated after Appointment is booked. Confirmation Message is sent to Registered Mobile Number

SMS Confirmation Screenshot
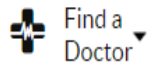
OTP generated from Online Appointment

Appointment confirmation message

Link for Online Payment sent to Registered Mobile Number

Link redirects to Payment Page

Dear Customer, your OTP for appointment is 3306. Use this password to validate your details.

Hello SAIMA (-/E100220009168), your appointment with Dr. Rajendra N.S is scheduled on 08/09/2020 at 12:15 PM at Narayana Multispeciality Hospital, Mysore. If you are unable to make it to the appointment, please call 18602080208

Dear SAIMA, we have blocked the slot for your consultation with Dr. Rajendra N.S for 08/09/2020 at 12:15. To confirm your booking please complete the payment of INR.300.0 using this https://rzp.io/i/1GftCBA within 2 hours of the booking time or before the appointment time, whichever is earlier. For any further assistance, please call 186 0208 0208

Payment Gateway and Confirmation Screenshots

Confirmation Message after Payment Success. Invoice is generated 2 hours before appointment time

If payment fails, appointment is automatically cancelled

Digital OPD Workflow

Will be automated

Appointment through Website, App or Call Center

Automated message with link sent to phone

Patient can pay through UPI, net banking, internet banking, etc

Payment successful within 2hrs

No → Appointment cancelled

yes

Confirmation message sent to patient registered mobile number

Patient reports To Appointment Counter and invoice is cross checked against confirmation message

Patient Vitals and History are taken at nursing desk

Payment collected from patient in billing counter & report handed over

Reports are handed over to secretary, then guided towards payment

Patient is guided to Lab Or Radiology according to investigation

Secretary Desk will raise the invoice

Investigation advised — Yes / No

Doctor Consultation

Sent for Inpatient Admission

Yes

Patient Consents — No

Patient take to Counselling Room to get consent

Yes

Admission Advised — No → Pharmacy

Secretary checks payment and hands over Prescription

Walks Out

Step 1: Patient Arrival

```
┌──────────────┐                                      ┌──────────────┐
│   Arrive to  │                                      │    Invoice   │
│   hospital   │                                      │   printout   │
└──────────────┘                                      └──────────────┘
        │                   ┌──────────────┐                  ▲
        │                   │ Appointment  │                  │
        └──────────────────▶│    desk      │──────────────────┘
                            └──────────────┘
```

- Greet the Patient
- Ask for Appointment Confirmation
- Guide the Patient for Thermal Screening
- After Thermal Screening, Patient guided to appointment counter
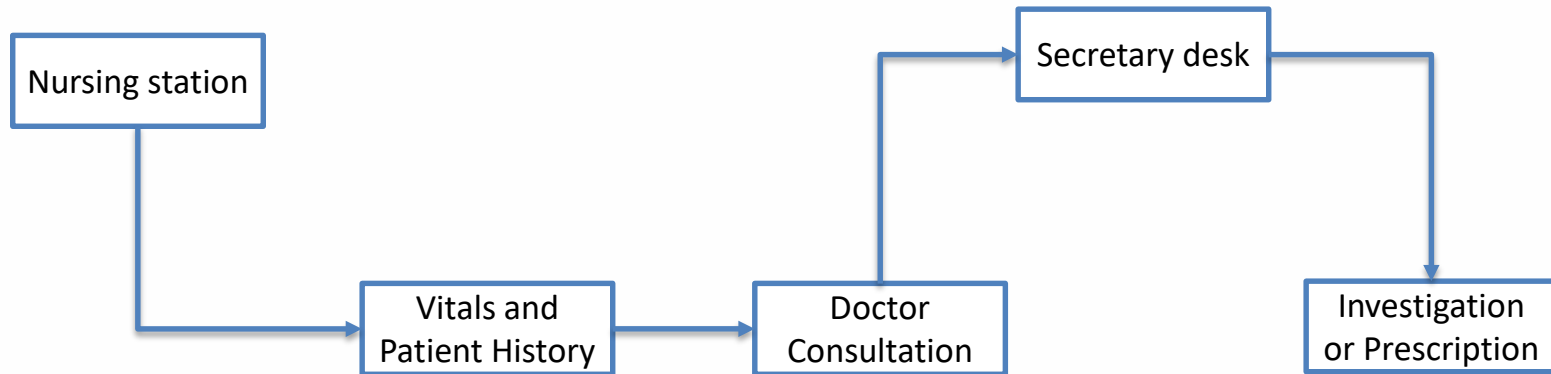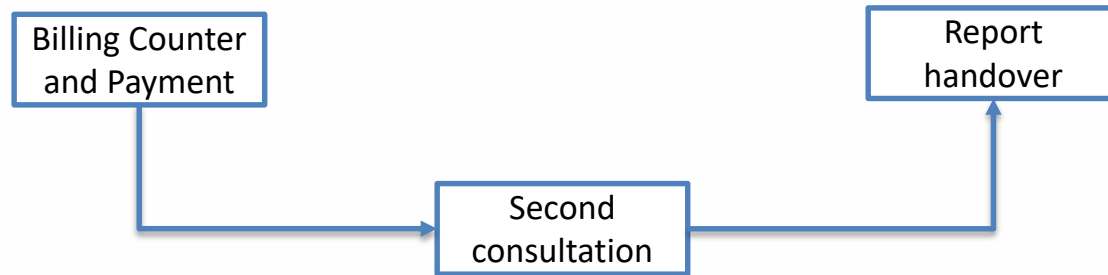- Executive will give Invoice Printout.

Step 2: Consultation and Investigation

```
┌──────────────────┐
│ Nursing station  │
└──────────────────┘
                                                    ┌──────────────────┐
                                                    │  Secretary desk  │
                                                    └──────────────────┘
┌──────────────────┐      ┌──────────────────┐      ┌──────────────────┐
│   Vitals and     │ ───▶ │     Doctor       │      │  Investigation   │
│ Patient History  │      │  Consultation    │      │ or Prescription  │
└──────────────────┘      └──────────────────┘      └──────────────────┘
```

- Nursing staff to check Vitals and take patient history in ATHMA
- Patient Care Coordinators to guide the Patient to the Respective OPD
- Informs the patient about the Doctor's availability and guides the patient to the consultation room as per their appointment
- After the consultation, secretary will check the prescription, if any investigation is required - secretary will generate the bill
- Patient to be guided to appropriate diagnostic area (i.e., Lab or Radiology) as per requirement

Step 3: Payment and Report collection

```
┌─────────────────┐                              ┌─────────────────┐
│ Billing Counter │                              │     Report      │
│  and Payment    │                              │    handover     │
└─────────────────┘                              └─────────────────┘
         │                                                 ▲
         │         ┌─────────────────┐                     │
         └────────▶│     Second      │─────────────────────┘
                   │  consultation   │
                   └─────────────────┘
```
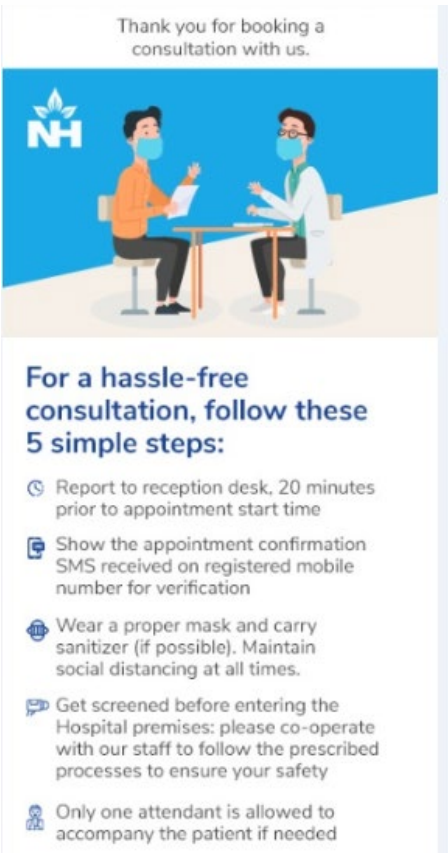
- Patient will be directed to the Billing counter to settle the amount.
- Secretary will handover the reports to the Patient after settling bill
- In case patient requires Cross-Consultation, secretary will generate the Bill.
- Patient is referred to the concerned specialist
- In case the patient requires admission, they are guided towards Counseling Room, and then towards admission counter

Challenges Faced During Implementation

- Patient does not have smart phone or internet connection

- Patients aren't educated or unable to navigate mobile web pages

- Patients are not comfortable to pay online

- Online payment vendor doesn't always synchronize on time with ATHMA, so invoice and receipt would not be raised. Patient waits till issue is rectified

- If the Patient doesn't visit the hospital or doctor isn't available, the appointment can't be rescheduled once the 2-hour window closes

- If the appointment gets cancelled, amount gets be refunded after 7 to 10 days. So patients aren't comfortable to pay online during next visit

- In some cases of miscommunication, patients have paid twice for the appointment

- New MRN will be generated for existing patient by the call center due to patient communication error

Improvements Planned for Digital OPD

1. New app will be made available for easy pay, access patient reports
2. QR code will be implemented to pay for investigation seamlessly
3. Automatization of report dispatch after payment to patient e-mail ID
4. Patient instruction to be sent to registered mobile number

•

Long Term Benefits from OPD Digitization

- Better doctor-patient communication
  - Entire patient experience in the hospital hinges on the doctor-patient interaction
  - Less time spent in waiting areas, more time can be spent with the doctor answering valuable questions
- Quicker turnaround time for hospital services – lab, radiology, pharmacy, billing, medical reports, etc
  - Increased utilization of NH services
  - Otherwise patients seek these services elsewhere
- High levels of patient compliance leading to improved clinical quality outcomes
  - Follow ups can be handled online
  - Medicine compliance can be tracked automatically
  - Electronic patient records
- Predictable patient behaviour will help reduce prices
  - Using analytics, NH can bundle complementary services to reduce overall cash outgo
  - With better planning, diagnostics can be offered at a discount during non-peak hours

For more Information please contact

Program Secretariat – CCHT
Public Health Foundation of India
Plot No. 47, Sector 44, Institutional Area, Gurgaon -122002, India
Tel: 0124-4781400 (Extn. 4511,4596,4512) Fax: 0124- 4722971
Mobile No.: +91- 9582215659, 9958158787
Web: www.phfi.org, ccht@phfi.org

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