Improving vaccine supply chains using mobile technology

Experiences from India

May 2015

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Agenda

• Context, Challenges, Solution
  – By Arun Ramanujapuram

• Impact in Uttar Pradesh, India
  – Dr. Bhrigu Kapuria

• Q&A
Uttar Pradesh
India: Very large immunization program

~26M newborns each year

>300M doses per year

~27,000 facilities (95% sub-district)
5-6 level supply chain

- National Store
- State Store
- Regional Store
- District Store
- Taluk Store
- PHC/CHC

Low resource environment
- Low human resource capacity
- Limited infrastructure

• Annual estimations
• Monthly targets
• Delivery and Pickup
Critical issues

• No stock visibility from last-mile
  – Little or no reporting from last mile
• Sub-optimal stocking
  – Ad hoc management practices, hoarding and last-minute requisitions
• Ad hoc supply
  – No clear basis for supplying, ad hoc transfers
• Inconsistent recording
  – Not all transactions recorded always (e.g. discards, open vials)
• Inability to audit
  – Non-standard record keeping practices
Logistimo: Connecting the chain

Mobile-cloud technology gives **visibility** into **stock consumption**
Enables **optimal decisions** across the chain to ensure **stock availability**
Key functionality

- Inventory management
- Order management
- Batch management
- Inventory optimization
- Workforce management
- Community management
- Notification / alerts
- Geo-tracking services
- Transport routing & scheduling
- Financial management
- Telemetry (e.g. temperature monitoring)
Managing logistics in 4 states

Karnataka
300 cold-chain points
3M people
Monitoring temperature in pilot mode

Uttar Pradesh
42 cold-chain points
8M people

Arunachal Pradesh, Meghalaya
22 cold-chain points
0.2M people
## Key Challenges

### PHC Low human capacity
- No culture of data recording
- Lack management capacity
- Understaffed & overburdened
- Significantly lack IT skills
- 52% passed 12th grade (UP)
- 67% > 46 years (UP)
- X-ray technicians, ward boys
- Nurse handling everything
- Responsible for multiple PHCs (KA)

### District Low supervisory capacity
- Multitasking
- Poor decisions
- Capacity to act on data is low
- Lack computer skills
- Elderly store managers – technology averse (UP)
- Data entry operators not always available
- Churn of personnel
- Unfamiliar with web apps.

### PHC Limited infrastructure
- Intermittent GPRS
- No GSM signal
- Erratic power
- Connections time out frequently
- No signal at PHC
- > 50Km to nearest signal point (AP)
- < 4 hours power
Karnataka
Arunachal Pradesh
Solution strategy

**Simplicity**

**Technology**
- Easy
- Robust
- Personalized

**Process**
- Physical
- Digital

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**Redundancy**

**Devices**
- Phone
- Tablet
- Computer

**Human resources**
- >1 trained

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**Empowerment**

**PHC-level**
- Tracking
- Auditing
- Capacity

**District & above**
- Monitoring
- Better decisions
Empowering cold-chain handlers

Health worker enters:
- issues
- receipts
- stock counts
- discards
- transfers
- orders

Health worker gets:
- real-time stock views
- alerts on low stock/expiry
- delivery status
- optimal stocking recommendations
- consumption patterns
- drugs usage information

Multi-modal interaction over Internet, SMS and Voice
## Empowering Supervisors

- **Review stock in real-time**
- **Take decisions based on inventory trends**
- **Monitor users' data entry patterns**
- **Monitor events in real-time**

### Digital Bulletin Board

- Monitor temperatures alongside stock quantity

### Stock Inventory Table

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<th>Sl.No.</th>
<th>Material</th>
<th>Current stock</th>
<th>Min.</th>
<th>Max.</th>
<th>Last updated</th>
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<td>BCG (dose)</td>
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<tr>
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<td>8</td>
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<td>180</td>
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<tr>
<td>9</td>
<td>Vaccine ILR</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>13/5/15 5:24 PM</td>
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</table>

### Temperatures of Vaccine ILR of Yemalur

- **358776032695713**
- **Normal**
  - **2°C - 8°C**
- **5.5°C**
  - **13/5/2015 11:27:37**
Hybrid approach to human capacity building

• Supervisory monitoring and evaluation
  – Empower supervisors with appropriate tools to monitor cold-chain handler capacity
  – Improve behavior on data entry and stock management

• Community development
  – Digital Bulletin Board to post incidents (e.g. stock outs) and receive solutions from anyone in the chain
  – Stronger networking for problem solving
Robust technology for low-resource environments

Service Management Middleware

- Logistics
- Human resources
- Analytics

- Transactions
- Events
- Locations
- Devices

Device heterogeneity

- GPRS
- SMS
- Voice
Behavior changes after intervention

• Data recording behavior improved
  – Cold-chain worker entered data in a timely and consistent manner
  – Supervisors could spot weak users and intervene quickly to build capacity

• Cold-chain handler’s inventory management discipline improved
  – Awareness of low stock situations improved
  – Response time to replenish stock improved
  – Orders were placed more optimally

• Supervisor’s efficiency improved
  – Supervisors could focus more on low-performing users
  – System recommendations and reports enable better decisions
What we enabled

Coordinated logistics & Integrated channels

Catalyzed positive behavioral changes amongst cold-chain handlers

Enabled optimized & opportunistic decision support

Improved vaccine availability
Uttar Pradesh

Management and Impact
2 Districts – Bareilly and Shahjahanpur

42 cold-chain points

2-level supply chain

At the end of each session day, CCH enters total vaccine consumed in mobile application
DISTRICTS PROFILE

Bareilly & Shahjahanpur

- **Total Population**: 7.4 million
- **Estimated children Below 1 year age**: 0.2 million
- **Estimated Pregnant Mothers in 1 year**: 0.24 million
- **Total number of children & Pregnant mothers targeted for Immunization in 1 year**: 1.1 million
Data for Management
## Stock view

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<tr>
<th></th>
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Inventory trends

'BCG (dose)' Inventory trends
From: 1/5/2010 To: 31/5/2015 Entity: Civil Lines

Download as CSV
## Monthly consumption

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Activity

1662 Transactions
41 Active Users
43 Active Entities

Bar chart showing activity from December 2014 to May 2015.

- December 2014: 9.21K transactions
- January 2015: 7.71K transactions
- February 2015: 7.87K transactions
- March 2015: 7.79K transactions
- April 2015: 10.3K transactions
- May 2015: 1.66K transactions
# Issue Activity

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# Detailed Activity Report

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<td>old city - bawalla</td>
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<td>kala</td>
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</tbody>
</table>

- Error in value
- Entered receipt of R1 Vaccines
- Stock count entry
- Discarded entry
- Dripped/dropper value not talling
Impacts
EXPECTED OUTCOMES

**IMPROVED STOCK AVAILABILITY**
through better visibility and standardized procedures

**REAL TIME DATA VISIBILITY**
at all cold chain points along with real time temperature monitoring

**TOOLS AND REPORTS**
reports to facilitate decision making in vaccine logistics management

**STRENGTHENED HEALTH SYSTEM**
through Human Resource, Capacity Building and Leveraging technology

**REPLICABLE MODEL**
for state/Nation-wide scale up
The reporting rates for both the districts – Bareilly and Shahjahanpur are seen consistently between 80% - 90%.
Is the data reported on time?

Shahjahanpur Reporting Timeliness

89.5%
Within 24 Hrs

TIMELINESS RATE
TIMELINESS

RATE

Is the data reported on time?

Shahjanpur Reporting Timeliness

- 89.5% within 24 Hrs
- 100% within 24-48 Hrs

Session Dates
Both the districts have consistently reported **above 80%** of complete data in reporting the utilisation/net consumption of all the vaccines, diluents and droppers.
BAREILLY: 70-80% of cold chain points reported stock out in initial months which has now dropped significantly.
The average number of days reporting stock outs per month has steadily reduced from 4 days to 1 day since the launch of eVIN.
Data Quality Indicators

- Average Access Rate, per session day: 90%
- Average Completeness Rate, per session day: 87%
- Average Timeliness Rate, per session day: 87%
- Data Accuracy: 82%
Feedback from End Users

• ‘‘When I send the message on stock, I become tension free (I feel relieved) because my data is updated. (I get to know) I have this much (available stock). I feel good that my stock is well maintained’’ [CCH].

• “After the implementation of eVIN, if we are in need of any data, such as how many vaccines is there with us, then we open the application and immediately we come to know about it. Earlier we used to search that on register” [CCH].

• “Good thing (about the mobile based application) is that my reporting is easy because of it. I have exact information about the vaccine stock and how much requirement I’ll have” [CCH].

• “…. (with the mobile based application) the work was made very easier. Actually first (in the pre-eVIN phase) I had to take the reports from here and get it for the DIO. (With eVIN application) I just (need to) click it from the phone and the report is delivered” [CCH].
Stock Outs – first 6 months of eVIN

SKU stock out instances on session days, District 1

SKU stock out instances on session days, District 2
Summary

• Low resource environments pose significant challenges to achieve data quality from the last mile
  – Simple, but robust, technology and processes are essential
• Data on both human activity and material movement are essential
  – Both human capacity and inventory have to be optimized
• People are well-intentioned and will evolve towards better performance
  – Empowerment and appropriate capacity building are important in combination
• Supervisory capacity needs to be enhanced in the initial stages
  – Bandwidth and capacity to act on data need to be upgraded, with full support from District/State
• The model can scale with robust technology
  – Scale poses additional challenges, and it needs good technology address it
Thank you

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