

## **National Medical Oxygen Grid (NMOG)**

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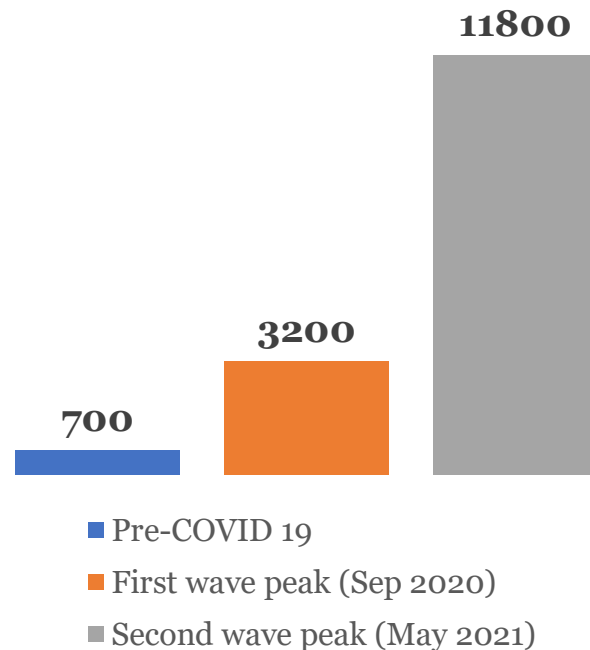
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# Need for National Medical Oxygen Grid (NMOG)

Medical oxygen demand in India  
(MT/day)



## Limitations

- At the height of India's COVID-19 medical oxygen shortage, **multiple IT platforms were developed** by various stakeholders with the goals of aggregating, monitoring, and allocating India's medical oxygen supply.
- Oxygen Digital Tracking System (ODTS), the Oxygen Demand Aggregation System (ODAS), and the OxyCare Management Information System (OC-MIS).
- **Proved to be invaluable assets** that allowed the authorities at district, state and national level to make meaningful decisions based on the aggregated data to optimize faster delivery of oxygen.

- Not integrated with each other
- Not capturing all assets
- No dashboards, no decision analytics
- Mostly web portals and no offline mode
- Not user friendly

# National Medical Oxygen Grid's (NMOG's) working & operations

**One time activity:**

- Facility registration with HFR ID under ABDM
- Facility to declare their oxygen assets

**Daily data entry:**

- Bed occupancy
- Disease specific patient load
- Oxygen stock, supply raised & received, consumed

**Data entry personnel:** Oxygen asset operator/staff nurse/pharmacist

**Data entry:** Under the supervision of oxygen nodal person such as a specialist, anesthetist, etc.

**One time activity:**

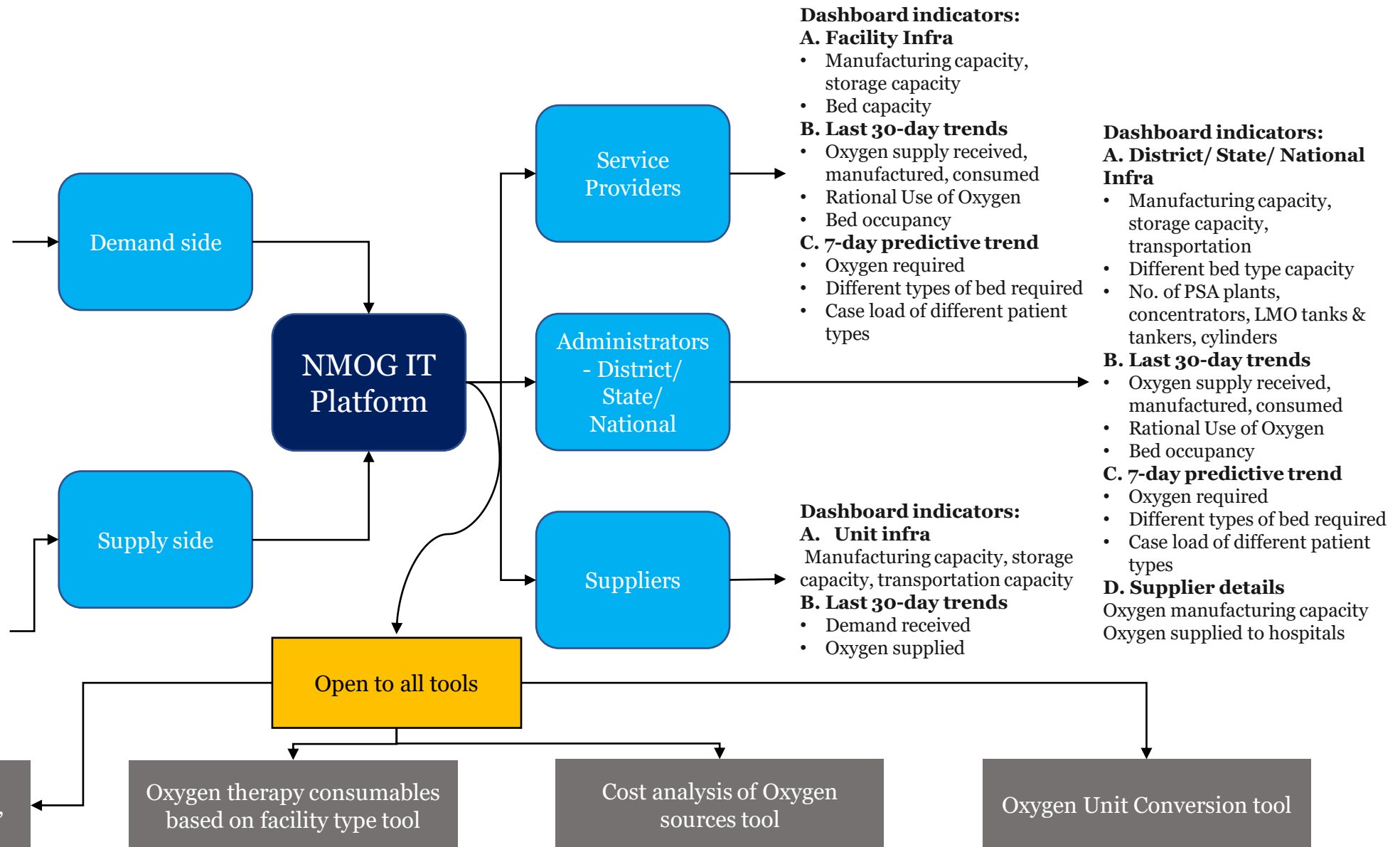
- Registration
- Declare their oxygen assets

**Daily data entry:**

- Orders received, accepted and dispatched
- Oxygen stock

**Data entry personnel:** Oxygen asset operator

**Data entry:** Under the supervision of facility manager



**Dashboard indicators:**

**A. Facility Infra**

- Manufacturing capacity, storage capacity
- Bed capacity

**B. Last 30-day trends**

- Oxygen supply received, manufactured, consumed
- Rational Use of Oxygen
- Bed occupancy

**C. 7-day predictive trend**

- Oxygen required
- Different types of bed required
- Case load of different patient types

**Dashboard indicators:**

**A. District/ State/ National Infra**

- Manufacturing capacity, storage capacity, transportation
- Different bed type capacity
- No. of PSA plants, concentrators, LMO tanks & tankers, cylinders

**B. Last 30-day trends**

- Oxygen supply received, manufactured, consumed
- Rational Use of Oxygen
- Bed occupancy

**C. 7-day predictive trend**

- Oxygen required
- Different types of bed required
- Case load of different patient types

**D. Supplier details**

- Oxygen manufacturing capacity
- Oxygen supplied to hospitals

**Dashboard indicators:**

**A. Unit infra**

Manufacturing capacity, storage capacity, transportation capacity

**B. Last 30-day trends**

- Demand received
- Oxygen supplied

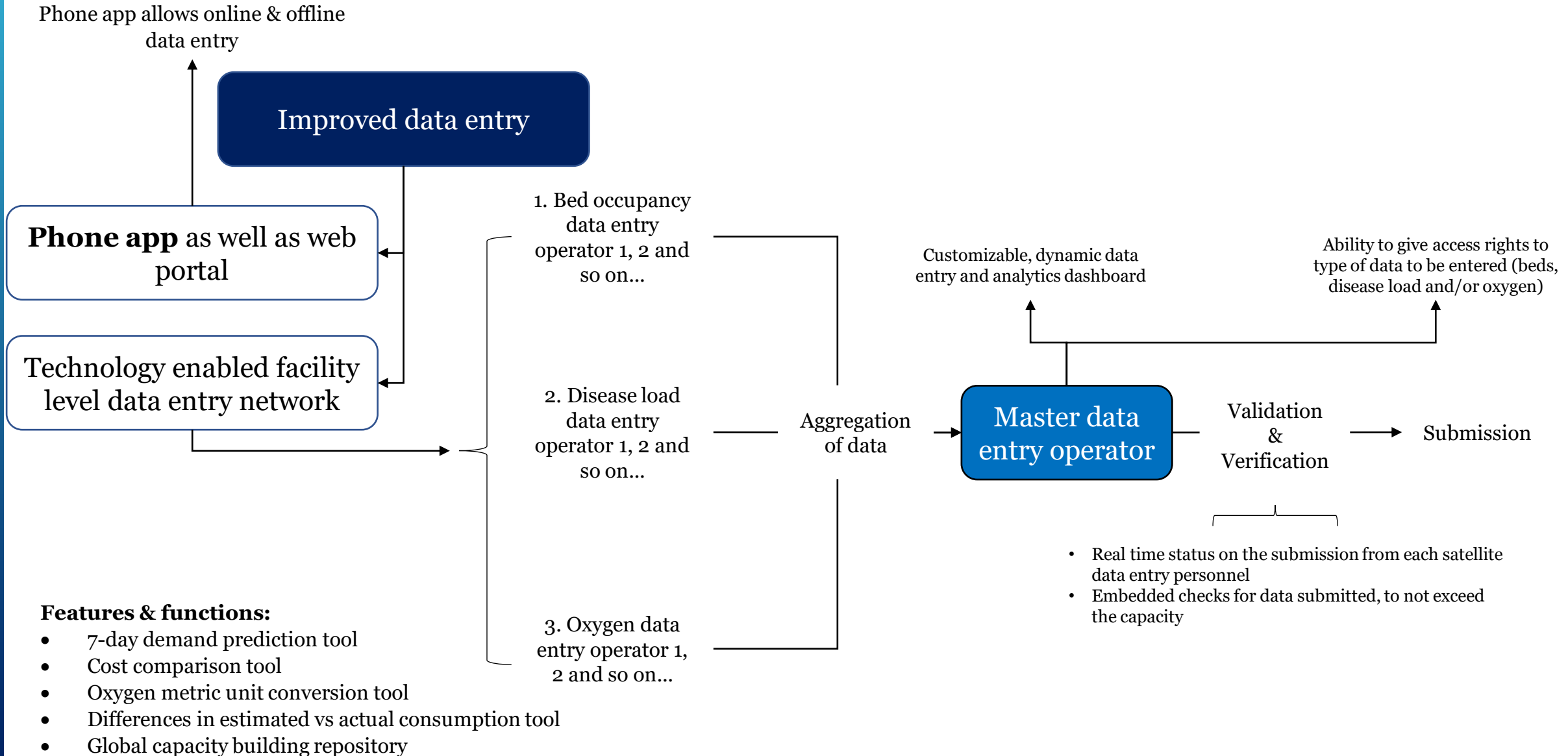
Knowledge products tool- Guidelines, training videos, posters

Oxygen therapy consumables based on facility type tool

Cost analysis of Oxygen sources tool

Oxygen Unit Conversion tool

# Specific efforts to improve data entry



# Web portal (<https://oxygengrid.in/login>)

**National Medical Oxygen Grid**  
Improving Health & Wellbeing

[Demand predictive analysis tool](#)
[Oxygen unit conversion tool](#)
[Operational cost analysis of oxygen sources tool](#)

[Oxygen knowledge products repository](#)
[Oxygen therapy commodities and consumables](#)

## Login

Please enter your username & password to login

I'm not a robot

Remember Me

[Login](#)

- Facility details
- Contact details
- Bed infrastructure**
- Oxygen infrastructure
- High flow delivery devices
- Supplier details

## Bed infrastructure

\*These flow rates are default flow rates and you can change them as per your convenience.

Total beds\* 
 Total oxygen supported beds\* 
 Non-oxygen supported beds\*

Bed type	Total count (330)	Average oxygen consumption (LPM) *
Oxygen supported beds	<input type="text" value="100"/>	<input type="text" value="5"/>
ICU beds	<input type="text" value="50"/>	<input type="text" value="12"/>
HDU beds	<input type="text" value="30"/>	<input type="text" value="12"/>
SNCU/NICU beds	<input type="text" value="30"/>	<input type="text" value="2.5"/>
PICU beds	<input type="text" value="30"/>	<input type="text" value="4"/>
CCB beds	<input type="text" value="50"/>	<input type="text" value="12"/>
Any other oxygen supported beds	<input type="text" value="40"/>	<input type="text" value="5"/>

## Oxygen infrastructure

\*Please reach out to your district or state administrator to add/modify any source of oxygen.

## Disease-wise patient occupancy

As on : 22/06/2023

\* Predictive analysis can only be performed if the data is entered regularly on daily basis.

Disease type	Number of patients admitted	Average oxygen flow rate used (in LPM)	Average hours of therapy in a day (in hours/per day)
Acute myocardial infarction	<input type="text" value="67"/>	<input type="text" value="66"/>	<input type="text" value="24"/>
Anaphylaxis	<input type="text" value="76"/>	<input type="text" value="36"/>	<input type="text" value="24"/>
Birth asphyxia	<input type="text" value="76"/>	<input type="text" value="46"/>	<input type="text" value="15"/>
Congenital heart disorders	<input type="text" value="45"/>	<input type="text" value="75"/>	<input type="text" value="14"/>
COPD	<input type="text" value="76"/>	<input type="text" value="46"/>	<input type="text" value="22"/>
COVID-19	<input type="text" value="24"/>	<input type="text" value="54"/>	<input type="text" value="16"/>
Cystic fibrosis	<input type="text" value="45"/>	<input type="text" value="35"/>	<input type="text" value="14"/>

PSA plant infrastructure	Generation capacity (in LPM)	Cylinder refiller available	Refilling capacity (in LPM)	IoT device available?	PM-CARES funded?	Is registered with EMM5?	PSA manufacturer	Maintenance contract available	Maintenance vendor	Is functional?
PSA plant 1	<input type="text" value="1000"/>	<input checked="" type="checkbox"/>	<input type="text" value="10"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trident Pnel	AMC	Shiv Shakti	<input type="checkbox"/>
PSA plant 2	<input type="text" value="2000"/>	<input checked="" type="checkbox"/>	<input type="text" value="10"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	TATA Advan	CMC	India Oxygen	<input checked="" type="checkbox"/>
PSA plant 3	<input type="text" value="5000"/>	<input checked="" type="checkbox"/>	<input type="text" value="10"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trident Pnel	CMC	India Oxygen	<input checked="" type="checkbox"/>

VSA plant infrastructure	Generation capacity (in LPM)	Cylinder refiller available	Refilling capacity (in LPM)	IoT device available?	PM-CARES funded?	Is registered with EMM5?	VSA manufacturer	Maintenance contract available	Maintenance vendor	Is functional?
VSA plant 1	<input type="text" value="500"/>	<input checked="" type="checkbox"/>	<input type="text" value="20"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Test VSA 1	AMC	RAVI OXYGEI	<input checked="" type="checkbox"/>
VSA plant 2	<input type="text" value="800"/>	<input checked="" type="checkbox"/>	<input type="text" value="50"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Test VSA 2	None	Shree Balaje	<input checked="" type="checkbox"/>

# Phone app



## Login

Please enter your username & password to login

- Demands predictive analysis tool
- Oxygen end conversion tool
- Operational cost analysis oxygen source tool
- Oxygen knowledge products repository

*\* Predictive analysis can only be performed if the data is entered regularly on daily basis.*

3 Number of PSA plants	3 Number of PSA plants with cylinder refiller
3 Number of VSA plants	2 Number of VSA plants with cylinder refiller
2 Number of LMO tanks	2 Number of dura cylinder type
3 Number of gaseous cylinder type	3 Number of concentrator type

### Facility details

Facility name\*  
District Hospital Mathura

Facility id (facility registration as per ABDM)  
FC286

Ownership\*  
State Government

Facility type\*  
District hospital (DH)

Facility region\*  
 Urban  Rural

State/UT\*  
Uttar Pradesh

District\*

### Facility details

Contact details

Bed infrastructure

Oxygen infrastructure

High flow delivery devices

Supplier details

### Oxygen bed occupancy

As on : 23/06/2023

*\* Predictive analysis can only be performed if the data is entered regularly on daily basis.*

23/06/2023

--All users--

Bed Type	Oxygen supported beds
Total Bed Count	100
Occupied Count	50

Bed Type	ICU beds
Total Bed Count	50
Occupied Count	

Bed Type	PICU beds
Total Bed Count	30
Occupied Count	20

Bed Type	CCB beds
Total Bed Count	50
Occupied Count	10

Bed Type	Any other oxygen supported beds
Total Bed Count	40
Occupied Count	19

### Disease-wise patient occupancy

As on : 23/06/2023

*\* Predictive analysis can only be performed if the data is entered regularly on daily basis.*

23/06/2023

--All users--

Disease type: Acute myocardial infarction

Number of patients admitted	20
Average oxygen flow rate used (in LPM)	10.00
Average hours of therapy in a day (in hours/per day)	6

Number of patients admitted	12
Average oxygen flow rate used (in LPM)	10.00
Average hours of therapy in a day (in hours/per day)	6

Disease type: Any other disease type

Number of patients admitted	50
Average oxygen flow rate used (in LPM)	80.00
Average hours of therapy in a day (in hours/per day)	18

### Manage daily stock (delivery, generation & consumption)

As on : 23/06/2023

*\* Predictive analysis can only be performed if the data is entered regularly on daily basis.*

23/06/2023

--All users--

PSA plant infrastructure	PSA plant 1
Generation capacity (in LPM)	1000
Running time with MGS (in hours/ per day)	5.00
Running time with refiller (in hours/ per day)	5.00
Oxygen generated and consumed (in MT)	

Gaseous cylinder type	D Type
Cylinder count	687
Opening stock (in MT)	0.00
Cylinder filled using PSA plant	0
Cylinder received	200
Cylinder used	100
Closing stock (in MT)	0.97222

### Manage users

Search:

Sr. No.	Name	Userrn
1	test nirdesh	nirde
2	kapil	kapil.
3	netra	netra
4	RAAAM	ben_j
5	raam	jamkj
6	Ram	ram_j
7	Ramesh	rame
8	Ravi	ravi_l
9	District Hospital Ballia	distri
10	BMC	bmc_

Showing 1 to 10 of 107 entries

### Mock drill

Mock drill saved successfully.

When was the last mock drill done?

06/08/2023

### Oxygen demand order request

As on : 23/06/2023

Supplier type  
LMO supplier

Select supplier  
Luxfer Uttam India Ltd

LMO demand  Oxygen demand

Liquid medical oxygen

### Manage order request

From: 01/05/2023

To: 03/06/2023

Order status: Confirmed

Search:

Sr No.	Order id	Order date
1	36	23 May, 2023   14

### Manage rights

Dashboard tabs

- Check All
- Medical oxygen equipment infrastructure
- Medical oxygen consumption
- Bed infrastructure
- Disease-specific patient load
- High flow delivery devices
- Medical oxygen suppliers
- Mock drill

Facility profile tabs

- Check All
- Facility details
- Contact details
- Bed infrastructure
- Oxygen infrastructure
- High flow delivery devices
- Supplier details
- Mock Drill

### Contact us

For any question or query please contact on below mobile number or email id:

**Web portal**

8929090958

nirdeshchauhhan878@gmail.com

**Mobile App**

9770866107

satishdhakar64@gmail.com

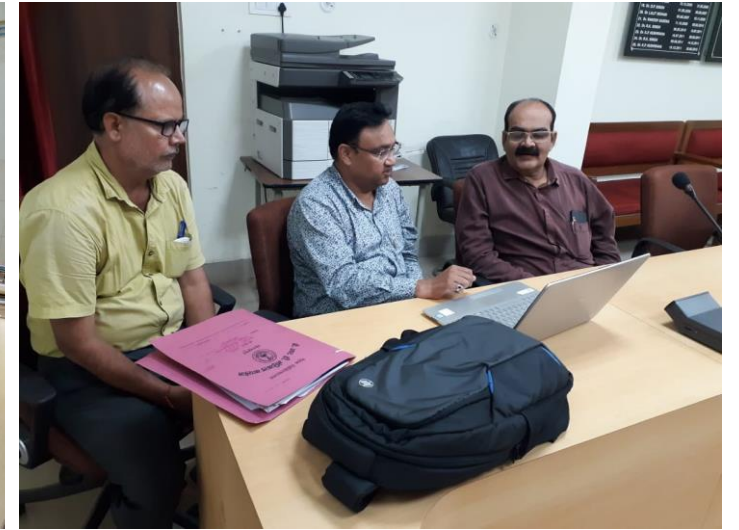


# ODAS vs OCMIS vs NMOG

Metrics	ODAS	OCMIS	NMOG
<b>Technology</b>			
<b>Intuitive user interface</b>			
<b>Master-satellite users</b>			
<b>Personalised GUI</b>			
Web portal	Present	Present	Present
Phone app	Present	Present	Present
<b>Features &amp; Functions</b>			
Facility profile creation	Present	Present	Present
Oxygen infrastructure management	Present	Present	Present
Bed infrastructure management	Present	Present	Present
<b>Disease-wise patient management</b>			
Mock drill management	Present	Present	Present
Supplier management	Present	Present	Present
Order placing & management (demand side)	Present	Present	Present
<b>Order placing &amp; management (supply side)</b>			
<b>Predictive analysis of oxygen demand, bed demand and disease-specific patient caseload</b>			
<b>Decision analytics on asset allocation and patient management</b>			
<b>Oxygen source operational cost analysis tool</b>			
<b>Rational use of oxygen tool</b>			
<b>Oxygen unit conversion tool</b>			
<b>Oxygen knowledge products repository</b>			
<b>Map based data visualisation</b>			
<b>Help &amp; support</b>			
User manual	Present	Present	Present
<b>Video tutorial</b>			
Accessible technical support/ grievance redressal mechanism	Present	Present	Present



# Implementation across UP and Karnataka



# Recommendations from the data analysis & observations made

- **PSA plants with cylinder refilling stations** can improve their utilisation and supply cost-effective oxygen to other facilities in a hub-spoke model, would require PESO approval.
- **Equipment need to be registered on EMMS** and relevant stake holders should be aware of equipment maintenance practices as well as AMC/CMC contracts.
- In future, for enhancing any on-site oxygen manufacturing capacity, **VSA plants could be preferred over PSA plants to tackle issues related to noise, electricity costs, and for improved performance** in conditions with higher altitude and humidity.
- **Dura cylinders can ensure quick enhancement of mobile bulk liquid storage** capacity and do not require PESO approval.
- **Concentrators could be allocated to old age homes or for home care use** through concentrator banks.
- Gaseous **cylinders should be kept full at all times** as they have expiry date of 3 years from the date of filling.
- **Oxygen audit** on rational use of oxygen may be required to ensure no wastage of medical oxygen.

However, more and regular data on bed occupancy and disease specific patient load required to draw insights.

# Testimonials from Uttar Pradesh and Karnataka

## CHCs

“App is useful to document oxygen usage and **data entry made easy.**”

“**Easy to use the app** and data entry is simple.”

“Tool allows us to monitor our consumption and supply especially refilling of cylinders.”

- Nursing Officers
- PSA plant Operator

## SDHs

“**Very easy to use** and carefully designed tool.”

“The NMOG app is valuable as it allows us to monitor our oxygen consumption and manage the distribution of oxygen effectively. It enables us to track our daily oxygen usage and proves to be a beneficial tool for our hospital.”

- Chief Pharmacist
- Data Entry Operator

## DHs

“Incredibly **practical tool** that facilitates the understanding on medical oxygen consumption”

“Tool allows us to access comprehensive information regarding oxygen & bed availability and equipment specifications.”

- Biomedical Engineer
- Data Entry Operator

## GMCs

“**Novel and excellent app**, user-friendly interface **encourages consistent data entry, easy to use**, particularly effective for inventory monitoring.”

“**Highly beneficial** for our daily data entry needs, provides insights into bed occupancy, performs automatic calculations.”

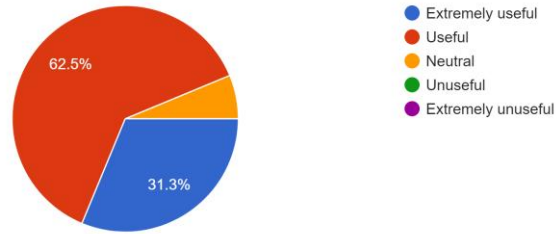
- Chief Pharmacist
- Data Entry Operator



# End user feedback (n=16)

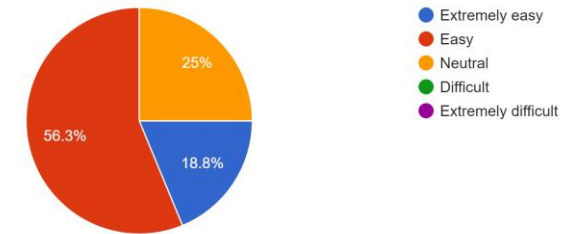
1. Did you find the new portal useful?

16 responses



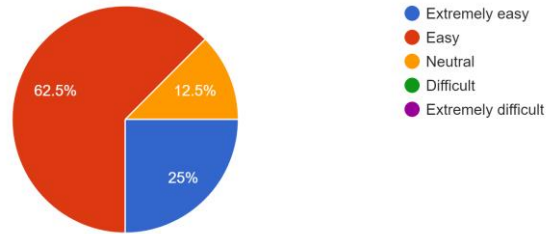
5. How easy was it to use or navigate through the new portal?

16 responses



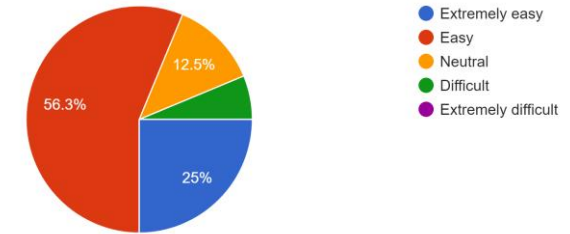
6. How easy was it to understand information on the new portal?

16 responses



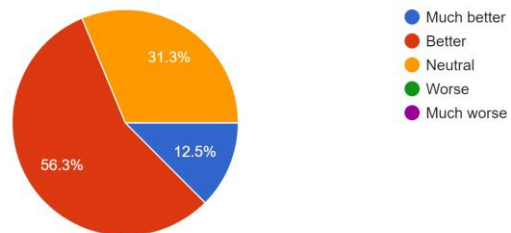
7. How easy was it to enter data on the new portal?

16 responses



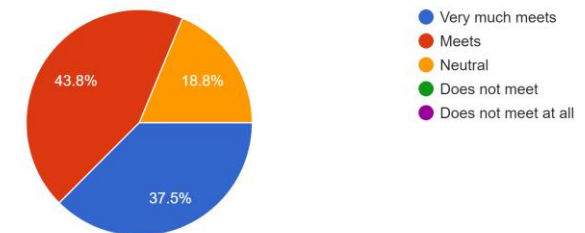
8. How was your experience in comparison to ODAS and OCMIS?

16 responses

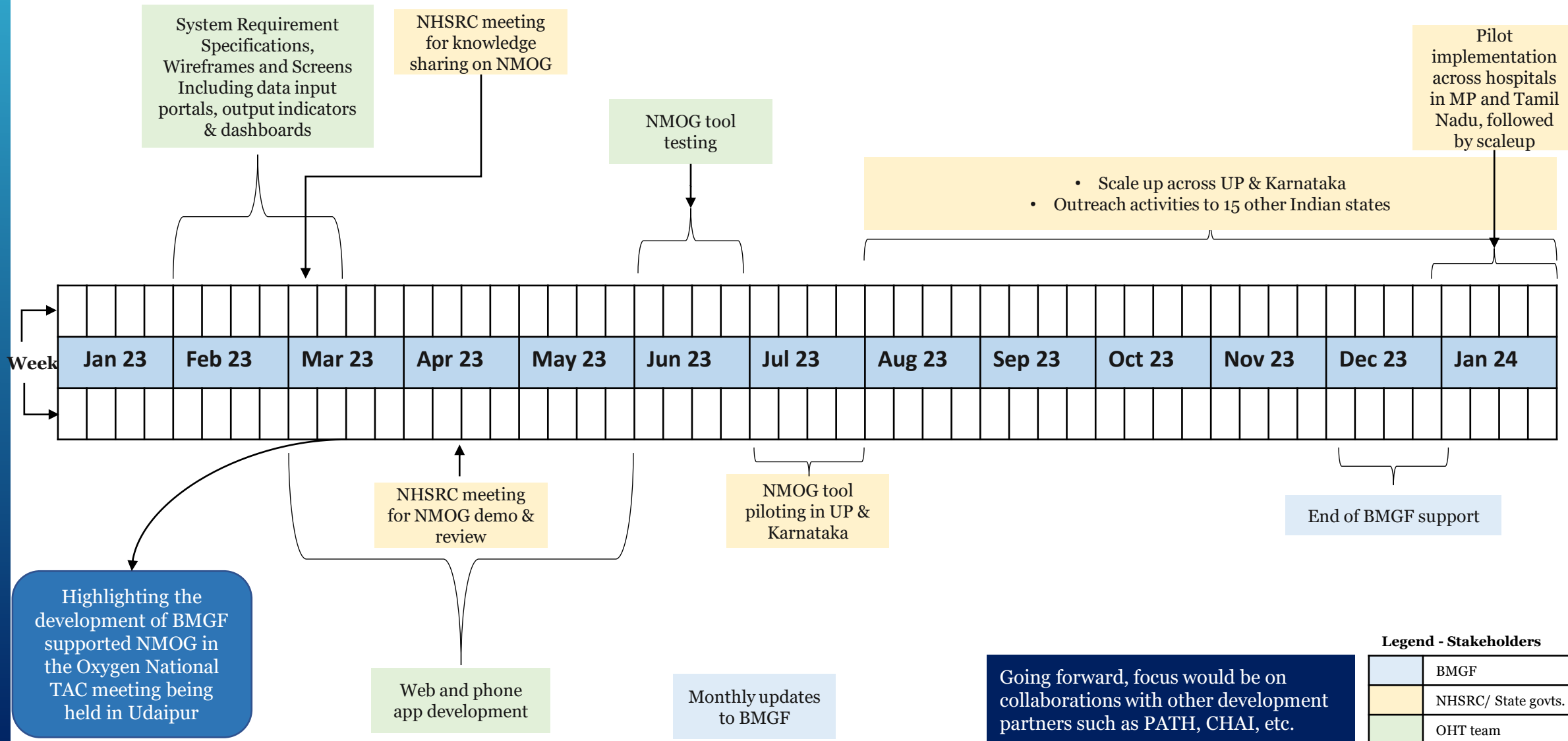


13. Does the new portal meet your expectations?

16 responses



# National Medical Oxygen Grid (NMOG) development timelines



# Current status of NMOG implementation

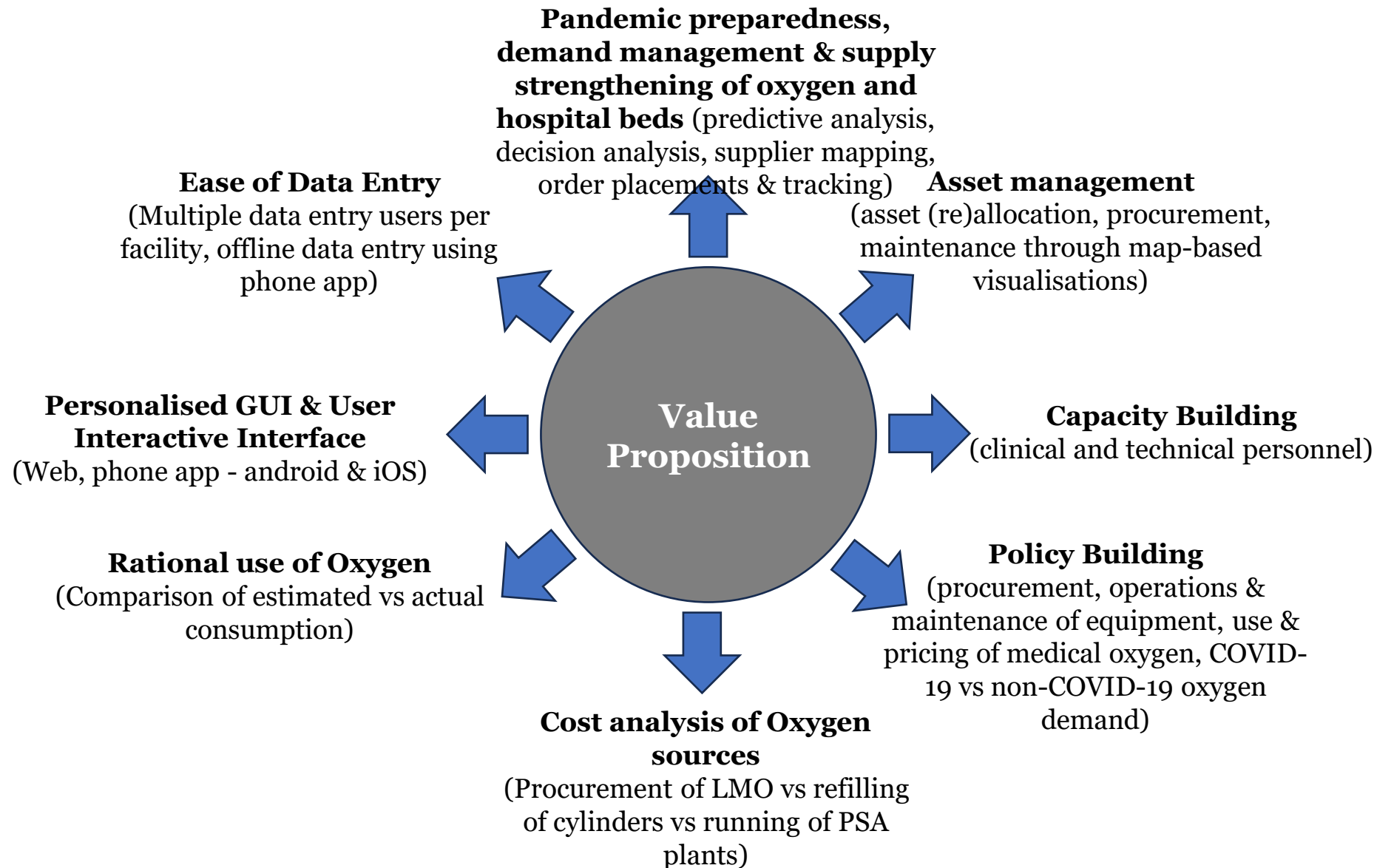
Ongoing			
Type of facility	Uttar Pradesh	Karnataka	Madhya Pradesh
Government Medical Colleges (GMCs)	35	24	13
District Hospitals (DHs)	108	20	51
<b>Total</b>	<b>143</b>	<b>44</b>	<b>64</b>

Expected in Feb 2024	
Type of facility	Tamil Nadu
Government Medical Colleges (GMCs)	37
District Hospitals (DHs)	29
<b>Total</b>	<b>66</b>

## Current reach out activities:

- Reached out to the medical oxygen nodal officers in 15 other Indian states
- Presented NMOG to WHO Geneva, WHO SEARO and WHO Middle-East offices

# NMOG implementation strategy – 1. Value Proposition





# NMOG implementation strategy – 2. Ideal implementation timelines for a state (also applicable to a country)

- OHT team engages with state’s Directorate of Medical and Health Services with a request to implement NMOG.
- Request states that NMOG tool would be provided for zero-costs and based on the funds available OHT would support the implementation and uptake.
- 3-6 different facility types are finalized for a one-month pilot (online & in-person capacity building activities on NMOG).
- b. This creates multiple master trainers who could be utilized for state-wide implementation.
- Expansion and scaling it to all tertiary care hospitals in the state, which is mostly through online, and in-person support wherever required.
- Implementation and uptake report submission



- OHT team engages with state’s oxygen nodal officers to modify NMOG as per local needs.
- Pilot report submitted to the government on implementation & uptake including end-user feedback on NMOG.
- Rebranding as per State’s requirements, followed by handover of the NMOG to the state which is to be hosted on servers owned and managed by state IT cell or data center.
- Support the state in implementation of NMOG in secondary and primary care hospitals.
- Provide technical support whenever required.

Going forward, focus would be on collaborations with other development partners such as WHO, PATH, CHAI, Jhpiego, etc.

# NMOG implementation strategy – 3. Estimated cost implications

No.	Description of Cost	For an Indian state (USD)	For another country (USD)
1.	Procurement cost of NMOG IT platform	Free-of-charge	Free-of-charge
2.	Annual cost for hosting iOS app on the App store	\$99	\$99
3.	One-Time cost for hosting Android app on Google play store	\$25	\$25
4.	Annual estimated cost for a customised web domain name	\$45	\$45
5.	IT costs for translation of NMOG portal into a non-English language such as French, Spanish, Arabic, etc. (not including the translator costs)	Not applicable	Up to \$5,000 per language
6.	Maintenance IT costs (only if required by the state)	Up to \$10,000 per year	Up to \$10,000 per year
7.	Hand holding and implementation support from OHT (remote)	Up to \$2000 per month	Up to \$2000 per month
8.	Hand holding and implementation support from OHT (in person)	Up to \$6000 per month	Up to \$8,000 per month
9.	One-Time security audit charges before the platform is hosted on state-owned data centre as mandated by IT laws and regulations	Up to \$5,000	Charges as applicable by country (usually up to \$5,000)
<b>Total Costs</b>			
	One – Time Costs (including 6-month <b>[in person]</b> handholding by OHT team)	\$41,025	\$58,025
	One – Time Costs (including 6-month <b>[remote]</b> handholding by OHT team)	\$17,025	\$22,025
	Recurring Costs (primarily maintenance costs)	\$10,144 per year	\$10,144 per year

**Thank You!**

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