

A Review of Web-Based Immunization Information System of Ernakulam District “Unite for Healthy Ernakulam Kerala (U4HE)”: Perceived End-User Barriers

Irfan Shakeer¹, Prakash Narayanan^{2*}, Anju Baby³

^{1,2}Prasanna School of Public Health, MAHE, Karnataka, India

³National Health Mission, Ernakulam, India

DOI: 10.55489/njcm.141020233150

ABSTRACT

Background: Reported coverage estimates for vaccine have the inherent problem of missing private entity data, to circumvent this, the National Health Mission, Ernakulam, designed and implemented an Immunization Information System (IIS) to collect routine vaccination reports from the private sector. This study attempted to identify the barriers to reporting by the private sector.

Methodology: The study was conducted in Kerala's Ernakulam district. The design of the study was cross-sectional. The end-users, who are from the private sector, were the participants of 28 in-depth interviews in the study.

Results: The new reporting system has increased private sector involvement in information exchange, all 78 private hospitals (100%) were reporting to NHM Ernakulam. But the completeness of reporting was not uniform. Major barriers identified were the lack of IIS interoperability with the hospital information system (HIS) being used by the private hospitals, variance because of lack of training of staff entering the data, and the unavailability of dedicated staff for reporting data.

Conclusion: Addressing these barriers could improve the reporting of routine vaccination data from the private sector.

Keywords: Vaccination reporting, Private sector engagement, Health information system, Vaccine coverage, Immunization information system

ARTICLE INFO

Financial Support: None declared

Conflict of Interest: None declared

Received: 21-06-2023, **Accepted:** 23-08-2023, **Published:** 01-10-2023

***Correspondence:** Dr. Prakash Narayanan (Email: prakash.nvp@manipal.edu)

How to cite this article: Shakeer I, Narayanan P, Baby A. A Review of Web-Based Immunization Information System of Ernakulam District “Unite for Healthy Ernakulam Kerala (U4HE)”: Perceived End-User Barriers. *Natl J Community Med* 2023;14(10):682-686. DOI: 10.55489/njcm.141020233150

Copy Right: The Authors retain the copyrights of this article, with first publication rights granted to Medsci Publications.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Share Alike (CC BY-SA) 4.0 License, which allows others to remix, adapt, and build upon the work commercially, as long as appropriate credit is given, and the new creations are licensed under the identical terms.

www.njcmindia.com | pISSN09763325 | eISSN22296816 | Published by Medsci Publications

INTRODUCTION

Immunization Information System (IIS) is a part of Health Information System (HIS) used to capture data about vaccinations. They are considered as information systems that can capture all immunization doses administered by the participating provider while maintaining the confidentiality and security of the data.¹ According to World Health Organization (WHO), data from the private sector is not well integrated with the routine immunization reporting system in many countries, especially those with fragile health systems¹. Lack of data regarding the vaccine dose administration eventually leads to difficulty in estimating vaccination coverage to the population. Vaccine coverage is one of the most critical indicators for spotting service provision deficiencies within the healthcare system. Having sufficient data on hand could aid researchers and policymakers in monitoring and evaluating health equity at the community level.^{2,3}

Globally, over 5 million deaths were prevented annually (between 2010 and 2015) because of vaccination programs.⁴ Hence, vaccines are a vital intervention that can help countries reach the Sustainable Development Goals (SDGs), considering 14 of the 17 SDG goals are associated with vaccines.⁵ India has one of the world's largest vaccination programmes, with an annual estimated target population of 26.7 million new-borns and 29 million pregnant women.⁶ The private sector in India has been considered an essential stakeholder in providing immunization services to the community. Their involvement has been recognised by the Ministry of Health and Family Welfare (MoHFW), yet their coverage estimates at the national and district level are not known. At present, the Health Management Information System (HMIS) and Reproductive and Child (RCH) portal are used for routine reporting of vaccination data.^{7,8} When it comes to HMIS, the information system was structured to capture aggregated data required for routine health system management.⁹ Hence, the information system fails to provide a line list and demographics of vaccinated beneficiaries. The RCH portal, for example, is a platform that captures immunization data at the community level. Monitoring of Universal Immunization Programme (UIP) highlighted that the quality of data captured by the system could be compromised based on staff competency and availability.⁸ Lack of human resources at the community level could reduce mobilization efficiency and lead to dropouts and missed outs. As a result, depending solely on the RCH portal data can be inefficient, necessitating triangulation. On the other hand, the lack of private-sector data makes the information exchange minimal and inadequate.

To improve information exchange from the private sector, the National Health Mission (NHM), Ernakulam, has developed and introduced an Immunization Information System that collects routine vaccination data from the private sector. The information system

has got its name from 'Unite for healthy Ernakulam (U4HE)' initiative. Moreover, this initiative is often associated with private sector engagement and the Tuberculosis programme. The Ministry of health and family welfare have recognized its impact and potential⁹. The new reporting system uses a web-based portal to collect information on a real-time basis from various private sector providers within the system. The portal collects vaccination status and demographic details of the beneficiaries vaccinated from private service providers. Provisions have also been made to report Vaccine-preventable diseases (VPD) from these private institutions. The present study aims to review the present implementation status of U4HE and to report the barriers faced by the end-users.

METHODOLOGY

The present study was carried out in the Ernakulam district of the state of Kerala. Ernakulam is a densely populated district having a population of 32,82,388. It has 84 panchayaths, 13 municipalities, and one Corporation. Along with the public health sector, the private sector is also a significant stakeholder in providing healthcare services with more than 70 private hospitals within the district. The study was conducted from Jan to May 2020.

U4HE portal was implemented across 78 private hospitals that offered vaccination services to the community in Ernakulam district. It was made operational during May 2019. The NHM team supported end-users with hands-on training. The portal was developed using the Angular Web application framework for the front end. It saves data on the cloud using Amazon Web Services. On the cloud, the data has been encrypted to maintain confidentiality and privacy of the data. Data reported through the portal for one year was used to review the current implementation status of the U4HE initiative. NHM, Ernakulam, has provided access to the portal data. Private hospitals that did not report routine vaccination data via U4HE portal were identified and selected to study the perceived barriers. The participants of the study were end-users from private hospitals who were employees of the hospital. Since the scale and scope of private hospitals varied, it was challenging to provide a definitive inclusion criterion for the designation of end-users in the study. In total, 28 in-depth interviews were conducted, and the average time to complete the interview was 25 minutes. Questions were asked based on a structured interview guide with necessary probes to collect relevant answers. Before the interview, informed written consent was obtained from all the participants included in the study. The interview was carried out in the local language Malayalam. It was then transcribed verbatim and translated into English. The transcription of the collected data was done using Microsoft Word. Later, the transcribed data were inductively coded using the 'MAXQDA standard' ver-

sion. During the initial coding, both In Vivo and descriptive codes were used. Further, line-by-line coding was done to capture more details within the data. The codes were grouped and categorised. Patterns among the codes were used to identify the emerging themes iteratively.

The study protocol was approved by the Institutional Research Committee and Ethics Committee (KMC-KH 841/2019). It was also registered and approved by CTRI. The approvals were taken during the year 2019.

RESULTS

The U4HE portal was implemented on all the 78 private hospitals within the district (100%). However, despite implementing the portal in all the identified private hospitals, only half of them reported at least once. Table 1 highlights the participation of hospitals in reporting routine vaccination data via the portal. The number of private hospitals reported at least once through the portal was 46 (58.9%).

At the end of data collection, end-users from 28 hospitals were interviewed. It was noticed that the designation of the end-users responsible for reporting in U4HE varied. The distribution of their designation is shown in Table 3. The reporting to U4HE web-portal in private hospitals were the responsibility of the infection control department (17.86%), hospital administrator (14.29%) or the public relations officer (14.29%). Figure 1 displays the codes, categories, and themes that emerged from the qualitative data analysis.

Perceived barriers faced by the end-users:

Category 1: Portal related:

It was understood that the participants who were not reporting in the U4HE portal had problems with the username and password to register the hospitals in the portal. The required information in the portal seemed to be bothering the participants because it took much time, particularly when there were many entries to be made in the portal. The portal was not equipped to fetch patient data from the respective hospital information systems, which resulted in multiple data entries during reporting. It was noticed that one of the private hospitals had to spend money to integrate and fetch patient data from their system to the U4HE portal. Even though the portal was updated regularly, some of the portal's essential data entry fields were malfunctioning.

".... I am not able to use the portal since there is a problem with the account which was created for the hospital's login." (Response 1)

".... filling address details takes a huge amount of time, especially to a person who is not comfortable typing a lot. And being in such a position in the hospital, spending this much of time of reporting seems less practical to me." (Response 2)

Table 1: Participation of Private hospitals in routine reporting via U4HE portal

Month (2019-2020)	Cumulative Count of hospitals	Percent (n = 78)
June 2019	9	11.5
July 2019	11	14.1
August 2019	22	28.2
September 2019	29	37.1
October 2019	30	38.4
November 2019	40	51.2
December 2019	36	46.1
January 2020*	NA	NA
February 2020	39	50.0
March 2020	41	52.5
April 2020	39	50.0
May 2020	31	39.7

*The data for January 2020 was corrupted. Hence, Not available.

Table 2: Month-wise total no. of vaccine shots reported by the hospitals through U4HE portal

Month (2019-2020)	Count of doses
June 2019	2422
July 2019	4173
August 2019	5685
September 2019	7631
October 2019	7872
November 2019	7451
December 2019	6879
January 2020*	NA
February 2020	7338
March 2020	7972
April 2020	7921
May 2020	5865
Total	71,209

* The data for January 2020 was corrupted. Hence, Not available

Table 3: Distribution of study participants by designation

Designation	Count (%)
Administrator	4 (14.29)
Assistant Administrator	1 (3.57)
Human Resource Manager	2 (7.14)
Infection Control	1 (3.57)
Infection Controller	5 (17.86)
Lab Technician	2 (7.14)
Medical Records Manager	3 (10.71)
Nursing Superintendent	1 (3.57)
Physician Assistant	1 (3.57)
Public Relations Officer	4 (14.29)
U4HE coordinator	1 (3.57)
Vaccination Room Nurse	3 (10.71)
Total	28 (100)

".... on average it would be around 1000 vaccinations per month. Because of this our management had paid extra money to create an in-house software which has the ability of collect information from the hospital system. Now we are just waiting so that the U4HE team solves the issue." (Response 3)

Theme 1: Transition towards change:

The theme focuses on the transition from the acceptance of the change to the execution of the new system. The transition could be seen in the management of private hospitals as well as among the end-

users. As a result, the theme includes both institutional management and human characteristics since they are interconnected. The new system's long-term viability and performance are ultimately determined by decisions made during the implementation's transition process.

Category 2: Individual characteristics:

Newly employed end-users in hospitals were found to be unaware of and untrained in the reporting platform. This could be due to the high turnover of employees in private hospitals. In addition, some of the participants believed that their daily duties and responsibilities made manual data entry into the portal unworkable. Further, the analysis highlights the impact of peer influence among the end-users on the reporting system.

“... as I am new here, I am not sure about that. I have just joined here since a month. I am still getting used to the tasks here. Maybe the manager knows about it.” (Response 4)

“... I do not use the portal to report vaccination since it’s not possible for me to spend time on that since I have a department to take care of. This hospital is a place where there is a high number of vaccinations given per day. And if you look at my schedule, it is not practical to do this since it takes a lot of time do it.” (Response 5)

“... I also know few of my friends in other hospitals, where they don’t report vaccination data [in U4HE] because of their busy schedule.” (Response 6)

Category 3: Institution and management:

As the hospital's services increased, the number of beneficiaries grew, and as a result, the participants indicated that maintaining such a reporting system was difficult. Assigning the task to the appropriate staff while keeping in mind the routine duties and responsibilities could solve the problem. At the same time, few participants have agreed that there is a delay in this decision among the management. It was also noticed that the lack of an efficient HIS has made it difficult for the end-users to find necessary and adequate patient data for the reporting system.

“... it is also difficult to gather patient information for the portal because the hospital does not collect these during registration” (Response 7)

“... since the daily average of vaccination is more, we feel that reporting via portal takes more time.” (Response 8)

“... we have not started reporting vaccination details via the portal because of some issues and the management was yet to take a decision. But now we have asked the team to give us training so that we can start reporting.” (Response 9)

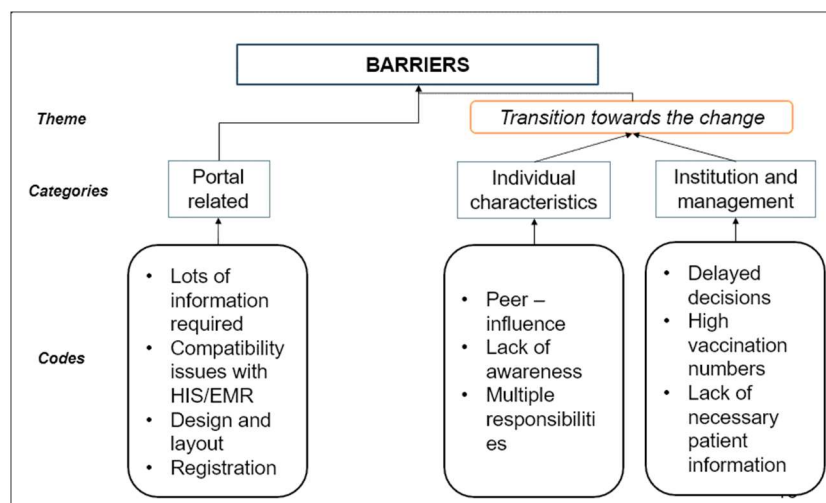


Figure 1: Barriers in complete reporting to Immunization Information Systems from Private sector

DISCUSSION

The present study looked into implementing an Immunization information system and has identified perceived barriers among the end-users. To report the status of implementation, secondary data was collated and analysed, and it was observed that the reporting by the private sector since the launch of U4HE has gradually increased. Even though it was implemented across all the private institutions, only 46 (58.9%) hospitals reported once, and similar pattern was observed in Gujarat, where only 31% of the private sector reported vaccination to the government.¹¹ It is also worth noting that the private sector

has not been expressed any resistance to exchange required information with the government. It should also be noted that this feat of private sector engagement was continuously facilitated by Indian Medical Association (IMA) of the district. This mutual support and trust have bridged the gap between the private and public sector in the district. Similar support and facilitation were provided by the registered medical practitioners to the Government of Nepal to strengthen its National Tuberculosis Programme (NTP).¹²

According to studies, the digital literacy, power instability, sluggish and unreliable internet access, cost of technology, lack of experience, and absence of

hands-on training are the documented challenges of the sustainability of an information system.¹⁰⁻¹³ Fortunately, the end-users of U4HE were not confronted with these barriers. However, private hospitals face significant barriers due to a lack of HIS/EMR interoperability and high human resource turnover. High staff turnover frequently creates a lack of training among newly hired employees. Interoperability between immunization information systems and other information systems would make data exchange easier and fast, would improve the process's efficiency.¹³ The National Vaccine Advisory Committee's (NVAC) report of 2015 and a systematic review by Groom Holly and his colleagues have highly recommended interoperability.^{14,15} Unfortunately, the portal is yet to achieve this goal. Since the initiative is still in the nascent stage, the effectiveness and impact of the new initiative is not included in the study.

The present study signals the future scope of information exchange between the public and private sector in the country. In the Indian context, having such a portal would be an asset to triangulate routine vaccination data within a demographic location. The demographic details captured by the system could complement the tracking of children in areas where the private sector is more active and dominant. The model would also help district administrators keep an accurate record of vaccine logistics that is being delivered in the private sector.

CONCLUSION

The U4HE is an ambitious and progressive initiative that aims to capture vaccination data from the private hospitals. It has boosted private hospitals' participation in routine vaccination reporting throughout the district. Implementing district-level IIS is challenging and complex, and overcoming barriers is crucial to the initiative's long-term success and sustenance. The barriers identified in the study show room for improvement in the new reporting system. Identification and inclusion of the private sector in routine surveillance is an important commitment for policymakers and requires careful planning of resources and time. While a country strives to meet all Sustainable Development Goals, it is equally important to have an efficient system that collects and compiles data at all levels of the system. Intersectoral partnerships and data sharing could also aid in the country's routine monitoring and evaluation of vaccination programs where there are socio-demographic disparities in utilising services. The adoption of such user-friendly portals can enhance evidence-based planning, implementation, and monitoring of health programmes.

ACKNOWLEDGEMENT

We would like to thank Dr. Shaikh Shah Hossain, Dr. Veena, Dr. Mathews Numpeli, and Mr. Nikhil for their

valuable comments and suggestions throughout the study period.

REFERENCES

1. World Health Organization. Engagement of private/ nongovernmental health providers in immunization service delivery: considerations for national immunization programmes. World Health Organization; 2017.
2. Pramanik S, Muthusamy N, Gera R, Laxminarayan R. Vaccination coverage in India: a small area estimation approach. *Vaccine*. 2015 Mar 30;33(14):1731-8.
3. Harrison K, Rahimi N, Danovaro-Holliday MC. Factors limiting data quality in the expanded programme on immunization in low and middle-income countries: A scoping review. *Vaccine*. 2020 Jun 19;38(30):4652-63.
4. Vaccines and immunization - World Health Organization (WHO). Available at: <https://www.who.int/westernpacific/health-topics/vaccines-and-immunization>. Accessed on: July 23 2021.
5. Gavi: The Vaccine Alliance, Sustainable Development Goals. Available at: <https://www.gavi.org/our-alliance/global-health-development/sustainable-development-goals>. Accessed on: August 01 2021.
6. Immunization - National Health Mission. Available at: <https://nhm.gov.in/index1.php?lang=1&level=2&sublinkid=824&lid=220>. Accessed on: June 17 2021.
7. Immunization Handbook for Health Workers - National Health Mission. Available at: https://nhm.gov.in/New_Updates_2018/NHM_Components/Immunization/Guidelines_for_immunization/Immunization_Handbook_for_Health_Workers-English.pdf. Accessed on: June 11 2021.
8. Immunization Handbook for Medical Officers - National Health Mission. Available at: https://nhm.gov.in/New_Updates_2018/NHM_Components/Immunization/Guidelines_for_immunization/Immunization_Handbook_for_MedicalOfficers%202017.pdf. Accessed on: June 06 2021.
9. HMIS-Health Management Information System - National Health Mission. Available at: <https://hmis.nhp.gov.in/#/>. Accessed on: June 17 2021.
10. Ernakulam District Website - National Informatics Centre. Available at: <https://ernakulam.nic.in/>. Accessed on: June 21 2021.
11. Hagan JE, Gaonkar N, Doshi V, Patni A, Vyas S, Mazumdar V, Kosambiya JK, Gupta S, Watkins M. Knowledge, attitudes, and practices of private sector immunization service providers in Gujarat, India. *Vaccine*. 2018 Jan 2;36(1):36-42.
12. Newell JN, Pande SB, Baral SC, Bam DS, Malla P. Leadership, management and technical lessons learnt from a successful public-private partnership for TB control in Nepal. *The International Journal of Tuberculosis and Lung Disease*. 2005 Sep 1;9(9):1013-7.
13. About Immunization Information System (IIS) - Centers for Disease Control and Prevention. Available from: <https://www.cdc.gov/vaccines/programs/iis/about.html>. Accessed on: June 05 2021.
14. Hinman AR, Urquhart GA, Strikas RA, National Vaccine Advisory Committee. Immunization information systems: national vaccine advisory committee progress report, 2007. *Journal of Public Health Management and Practice*. 2007 Nov 1;13(6):553-8.
15. Community Preventive Services Task Force. Recommendation for use of immunization information systems to increase vaccination rates. *Journal of Public Health Management and Practice*. 2015 May 1;21(3):249-52.