The First Electronic Immunization Registry System in Iran, Iranian Immunization Registry (IIR)

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Abstract

Introduction: A national immunization electronic registry system could improve Immunization levels. This system of immunization coverage facilitates shared experiences, information and specialized consultation. The aim of this study is to establish an immunization registry system in the Health- Therapeutic center in Shiraz city.

Method: The study type is to set up a method or academic-implementation system. The immunization software design and implementation was done in 2016 at one of the health centers in Shiraz city. The study population is the area covered by the health-Therapeutic center. The research tool, flow chart design and development of a data collection form were developed prior to making the immunization software.

Results: The main and important result of this research is construction and Setting up of electronic immunization registry software in accordance with country guidelines in 2016 (the latest guidelines). The software has three phases and stages including initial and daily actions by the vaccinator (cold chain control) before starting the process of immunization, immunization registration of children under 18 years of age and immunization registration of adults (over 18 years), pregnant women and women of childbearing age.

Conclusion: The results showed that this web-based system includes the following attributes - timely immunization registration ability, report of vaccine adverse events, report of delayed cases, stocks of vaccine, requests and appropriate distribution of vaccine, ease of use of immunization and reducing parents' failure to follow the immunization and by the adoption of a coordinated and comprehensive system in the province and the country, the possibility to compare immunization coverage, report of shortcomings, problems and risks of immunization program are prepared.

Key words: Immunization, Electronic registry of immunization, Complications of immunization, Immunization coverage, Registry

Introduction

The expanded immunization program of WHO (World Health Organization) was considered to eradicate small-pox in 1974 (Katz, 1993). At that time, in accordance with the immunization program and time schedule of EPI (Expanded Program of Immunization) less than 5% of the world's children were vaccinated against diseases like tuberculosis, polio, diphtheria, tetanus, whooping cough and measles. By 1984, this figure rose to 25 percent (Hueston et al, 1994 and Kelley, 2006).

Vaccines are the greatest successes and achievements of biomedical sciences and public health, and represent one of the most effective means for the prevention of diseases (John, 2010). Continuous efforts to improve the effectiveness and safety of vaccines and vaccine coverage among all age groups will provide overall benefit of public health (Roush et al, 2007 and Zhou et al, 2001).

There are major and significant gaps in scientific research for a complete description of how the registers facilitate the most accurate effectiveness of the vaccine studies based on population. In addition, immunization information systems preparation of IIS (Immunization Information System) is a new field and it is under development and major restrictions such as the disappearance or loss of data, inaccurate data or the potential inability of unrealistic data have not been studied and explored fully (Adams et al, 2000 and Danovaro-Holliday et al, 2014).

However, without detailed information about immunization coverage, we lack the data for placing and initiating necessary systemic and programmatic changes to achieve national Immunization objectives (Morris et al, 2015, Lieu et al, 2015, Bates et al, 2003).

A computer and computer-based system is reliable for maintaining immunization records and a register presenting immunization dates and its reports are printable for parents and schools and they provide guidance for the time being and implementation of immunization program (Young et al, 2015). It provides clinically useful reports for children, teens and adults like report of vaccination coverage and next forecast immunization program of people is possible (Garrido et al, 2016, MacDonald et al, 2014).
All vaccines are registered and collected in the form of a system. Immunization records, and providing safe, accurate and updated immunizations are for children who have been referred to the service supply (Badgett and Mulrow, 2005). It provides a reminder list and tags to people who are delayed in keeping to the schedule. For children and patients who are overdue in their immunization, a reminder is sent and registration and reminders, keeps their immunization schedule up to date.

According to the above criteria we tried to implement the outlook for childhood immunization supply at public and private health centers in the form of electronic data registration based on immunization implementation authenticity with the benefit of new and updated information and communication technologies with high accuracy at the individual level and the monitoring of data accuracy, facilitate immunization coverage and by developing of an immunization electronic system and shared experiences and information and expert advice, expand dramatically the immunization program and develop an important step in data management and implementation of health interventions at the local and national level and also an opportunity for education and research in this field. Therefore, the aim of this study is to establish an immunization registry system in selective health-therapeutic centers of Shiraz city.

Method

In this research, study type is to set up a method or academic-implementation system. The immunization software design and implementation was done in 2016 at one of the health centers in Shiraz city that is a subsidiary of the city health center (Engelab). It has the ability to expand to other health-therapeutic centers, health homes, public and private hospitals and link with headquarters of health center of the city and other provinces and cities of the country.

The method in the project consists of two phases. To start the process, first the flowcharts and guidelines were provided that were based on a program and immunization guide approved by the National Committee in 2016. The first stage started with the vaccinator, health workers or social workers who have responsibility for inoculation and injection of vaccine, and by controlling the cold chain, temperature of vaccine refrigerator and charting temperature, decide whether vaccine is to be kept at refrigerator temperature or not? Subsequent decisions would be taken (based on VVM and cold chain monitoring indicators) and entered into the beginning of immunization stages.

To initiate and carry out immunization, refrigerator vaccine inventory should control with full specifications of vaccines, including vaccine types, the number of vials, serial numbers, expiration date, factory or company of manufacture. Registration and layout of vaccine was conducted according to the National Committee and accordance with the type of person (children or adults), (new or duplicate), date of birth, gender, disease history, effect of the vaccine, an appropriate form is designed, selected and immunization process starts.

In this regard if the visitors have complications or adverse reactions to the vaccine, it can design and select an appropriate form in accordance with the drawn flowchart and based on the immunization process, which will continue. If the child is a delayed visitor, delayed forms would be designed according to child's age and national Committee guidelines, and the selection and immunization program continues. Also for patients older than 18 years (male or female), the form will be designed according to the immunization guidelines of the National Committee and having qualification, standard of selection and immunization will be done (hepatitis, Diphtheria-tetanus, MMR).

Thus, according to a steps summary of the outlined flowcharts, the data collection form was designed and developed. This form that was designed by the researcher, included variables such as vaccinator profile, vaccines important features, visitor specifications, information relating to child immunization, immunization of people over 18 years of age, pregnant women and women of childbearing age. This form was designed for age groups under 18 and over 18 years under the National Immunization Program Committee.

Our target registry population, is the area covered by the health center and people with the age group mentioned, Iranian and non-Iranian nationality and all the people who have moved to this area who have no immunization prohibition and are referred to health center with satisfaction (including children, adults of both genders, pregnant women and women of childbearing age). Explanations were given before completing the form for collecting data in compliance with health research ethics and informed consent of the visitor or parents to register their full details.

It should be noted that for design of the software, it is used first by searching for articles and resources of various databases from the countries which have electronic immunization registry program, because Iran has not have an electronic immunization registry program. The data collection form, collection samples form were separated and from target population until the initiation and progression stages of software development, at least 50 samples were collected for software testing (images as sample of the data collection form).

Table 1: Properties of vaccine
Table 2: Daily actions of vaccinator (Vaccine stock)
Table 3: Visited people Profile
Table 4: Type of visit
Figure 1: Visit due date and on time

The second step (build software) was based on the technical specifications of the registry immunization system. Registry System of the software is Web-based and it is designed and developed based on PHP server technology Version 5.6, MySQL database and HTML 5 world standard and Ajax technology. In this software, minimum hardware requirements are processor: 2x2GHZ, Memory: 4GB, storage space: 20GB for the OS + 500 KB for each data item.

Results

A major result of this research project was construction and setting up of electronic immunizations registry software according to the National Committee in 2016. The immunization data from 50 individuals were collected and developed in accordance with the data collection form, and entered into the software as a pilot and test. Entering data into the software was according to different criteria like the cold chain control, daily actions of vaccinator of refrigerator temperature controlled vaccine, full registration of vaccines information, and the immunization data of children under 18 years of age, their gender, the type of vaccine and also registration information of adults (over 18 years of age), pregnant women and women of childbearing age in terms of the type of vaccine used and information gathering. The software has three phases and stages: initial and daily actions of vaccinator, immunization registration of children under 18 years of age, immunization registration of adults (over 18 years), pregnant women and women of childbearing age.

Images of application performance: Figure 2, Figure 3, Figure 4.

Discussion

The collected data was entered into the software. During data entry we have concluded that, as data entry to the software is needed to complete information, this is contrary to the manuscript notes and paper, which can be changed at any time and line correction and the noted information, is not complete (Kolasa MS et al, 2006). On the other hand, with the lack of a coherent system, each person's immunization program had an immunization registration record in various health units in each immunization time and through improvement of design of the form of data collection, items were very complete that is background of data entry to the software and the software also confirmed its authenticity.

A system of simulated immunization registry of immunization status of children was conducted in county of Olmsted in 1995 for children up to the age of 24 months (Rousseau et al, 2014). Immunization records taken from a population-based sample in this county are secure by summarizing Immunization data, collected from provincial health care centers and they were analyzed by the software system (Rousseau et al, 2014). The results show that 9.1 percent of all children were updated until to the age of 20 months and this increased to 74.2 percent until 24 months of life (Rousseau et al, 2014). The 24-month-old child immunization rates registered in the health care system were changed from 24.3 to 79.5 percent. Added data from health care centers to simulated registry immunization system has increased rate of immunization in each location.
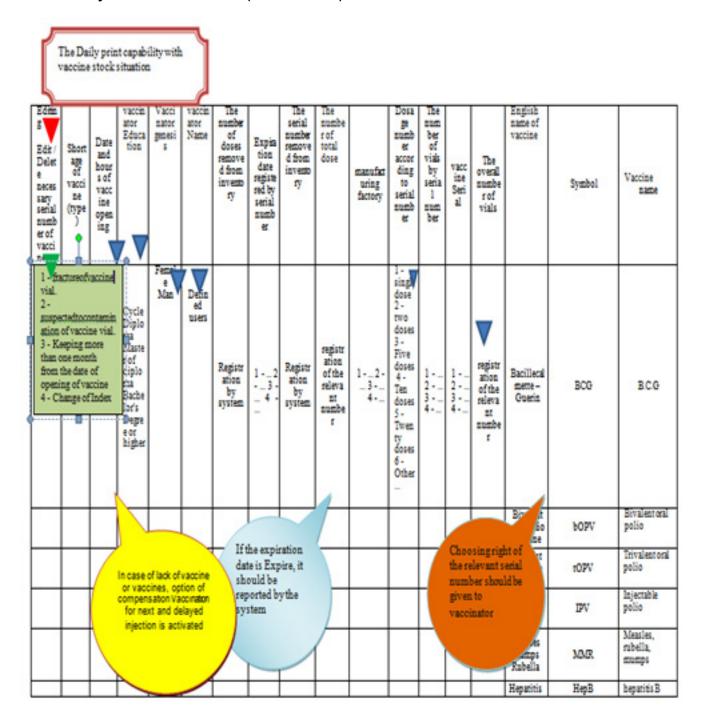
An increase of 27.7 percent while they had the lowest rates of registered immunization had an increase of 6.9% when the immunization rate was the highest. (Rousseau et al, 2014). Setting up of a software system in medical centers and health care facilities can report only immunization within the scope of the health unit and this is only one step of the immunization improvement process (Rousseau et al, 2014, Des Roches et al, 2010).

The availability of a population-based registry system is a solution to the health service provider's data uncertainty and a guide to strengthen the immunization program to Immunization Information Systems (IIS) (Rousseau et al, 2014, Des Roches et al, 2010). Immunization data should be collected ultimately in a central electronic database that
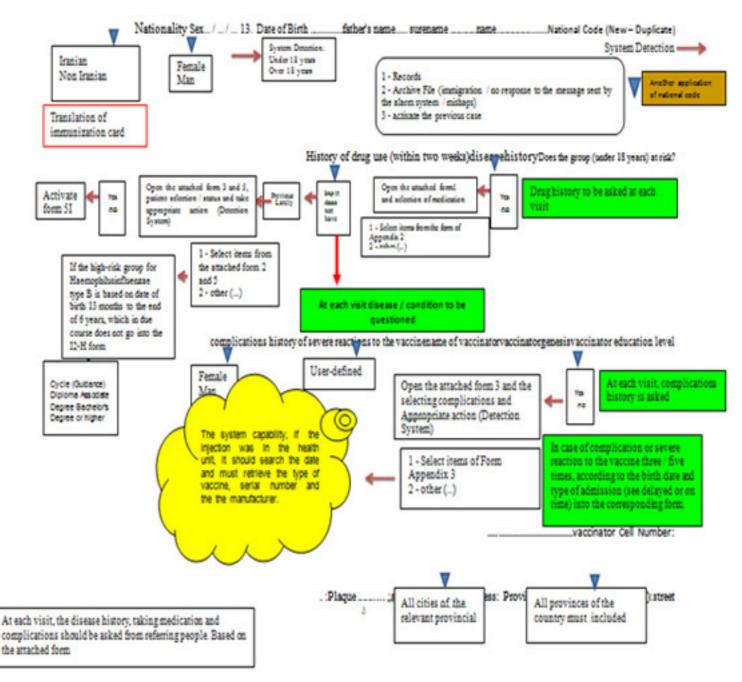
Table 1: Properties of vaccine

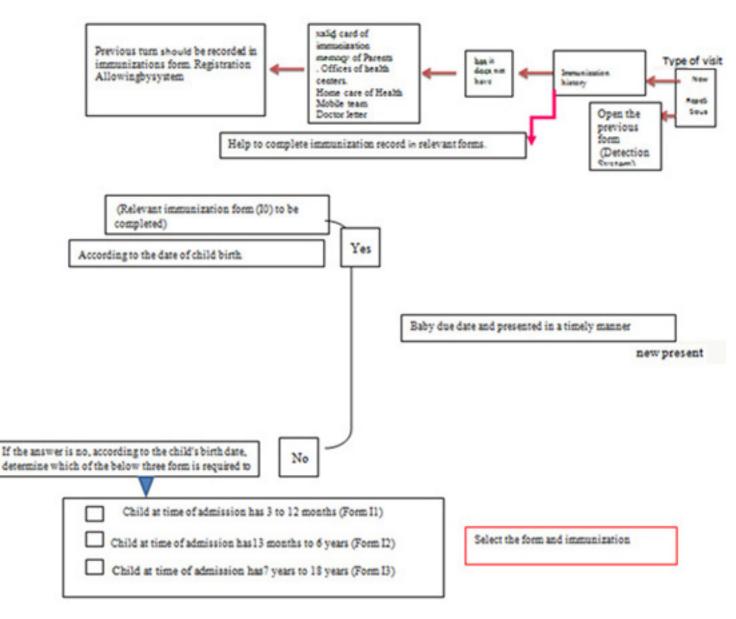| Needles Number	Prescription rate	Prescription method	Injection site	The minimum age of receiving	Maintenance time after opening the vial by mobile teams of vaccination	Storage time after opening the vial: in service centers	Place of registration and doing immunization	The location of the placing refrigerator	Nature of vaccine	Vaccine name
26 or 27	0.05 ml.	Intradermal	Left side	at Birth time	By the end of working day	4 hours	Defined health unit	The upper floor of Refrigerator	Attenuated live basil	B.C.G
	2 drops	oral		at Birth time	By the end of working day	By the end of the expiration time, it should not be crossed by observance of cold chain conditions and more than a month since the opening of the vial	It is registered according to the most basic form completed by the system.	upper floor	Attenuated live virus	Opv
23	0.5 ml.	Subcutaneous or intramuscular (preferably (muscle	Right side	6 weeks of age	By the end of working day	By the end of the expiration time, it should not be crossed by observance of cold chain conditions and more than a month since the opening of the vial		upper floor	Inactivated virus	IPV
26 or 27	10 years and under, 5.0 ml and above 10 years, 1 ml (in adult hemodialysis and adult patients with immune deficiency and thalassemia double dose injected)	intramuscular	Left side	at Birth time	By the end of working day	By the end of the expiration time, it should not be crossed by observance of cold chain conditions and more than a month since the opening of the vial		upper or middle floor	Virus surface antigen	Hepatitis B
23	0.5 ml.	Subcutaneous	Right side	12 months of age	By the end of working day	6 hours		upper floor	attenuated live virus	Measles, rubella, mumps, MMR
23	0.5 ml.	intramuscular	Left side	6 weeks of age	By the end of working day	By the end of the expiration time, it should		lower or middle floor	Tetanus toxoid,	Conjugate

Table 2: Daily actions of vaccinator (Vaccine stock)

Table 3: Visited people profile

Figure 1: Type of visit

Figure 2. Demographic information

Figure 3: Record vaccine information

Figure 4: Referral at due time

has capabilities of storage, retrieval and analysis, because parents are not good sources for a centralized database and they are often unable to report even basic information, such as number and timing of immunizations and their information and report accuracy is not more than 50 to 60 percent (Rousseau et al, 2014).

However, short-term and long-term potential benefits of an immunization registry system should be weighed against the costs, because it requires the purchase and installation of hardware and software and networking capabilities and requires planning and development of a series of standardized data and privacy rights of individuals should be considered (Rousseau et al, 2014, Des Roches et al, 2010, Janet et al, 2015). Creating a system of immunization registry does not change the immunization rate in a community, but it allows authorities to collect gradually immunization report cards and prevent the extreme and excessive effects of missed opportunities to (Rousseau et al, 2014).

Conclusion

The advantages of this web-based system are on-time registration, reports of adverse events, stock of vaccine, requests and appropriate distribution of vaccines, ease of immunization and reducing the failure of parents. In the case of employing a coordinated and comprehensive system at province and country level it is possible to compare immunization coverage, report shortcomings, problems and risks of the immunization program which can be helpful in policy-making and getting the final decision for the process of immunization. It is proposed to improve the immunization program; this web-based system expanded first in Fars province and then other provinces, so that ultimate data collection could be made available to the Ministry of Health and be considered by policy-makers, managers and practitioners.

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