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Impact of implementing a technology platform in community pharmacies to increase adult immunizations rates

Nizar K. Wehbi [a,*], Rajvi J. Wani [b], Donald G. Klepser [c], Janice Murry [c], Ali S. Khan [d]

[a] Department of Health Services Research and Administration, University of Nebraska Medical Center, Omaha, NE, USA
[b] Nebraska Department of Health and Human Services, Lincoln NE, USA
[c] Department of Pharmacy Practice, University of Nebraska Medical Center, Omaha, NE, USA
[d] Department of Epidemiology, University of Nebraska Medical Center, Omaha, NE, USA

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ABSTRACT

Over the course of this project, we utilized pharmacists at 159 community pharmacies in Nebraska and Iowa to administer vaccinations to adults 19 years of age or older with the objective of improving immunization rates in both states. We implemented a pharmacy-based technology platform and partnered with public health via the state immunization registries of both states to ensure that immunizations provided at the pharmacy were transmitted to the statewide registry, for which reporting is currently voluntary for health care providers. After using the technology platform for one year, an increase of immunization rates for influenza, herpes zoster, and pertussis vaccination rates by 37%, 12%, and 74%, respectively, was recorded in comparison to the prior year numbers. However, there was about 16% decrease in vaccination rates for pneumococcal vaccine. For the first time, the project's participating pharmacies in Nebraska reported immunization counts to their state's immunization registries. This project leveraged community pharmacies as healthcare destinations to achieve further gains in increasing immunization rates, improving the health of adults, and creating a community-wide network for prevention.

1. Introduction

Thousands of vaccine-preventable deaths among adults are reported in the US every year [1,2], reflecting the need to implement more innovative public health programs focused on prevention. Economically, over $10 billion is spent as direct medical costs and indirect societal costs on treating vaccine-preventable diseases among adults, excluding the non-medical costs such as the value of years of life lost and the lost future income [3–5]. Vaccination goals of Healthy People 2000 and 2010 were unmet, and studies have predicted that vaccination rates will plummet and fall short of the Healthy People 2020 target [2,6]. The Advisory Committee on Immunization Practices (ACIP) recommends an adult be immunized against the four major vaccine-preventable diseases of (1) influenza, (2) pneumococcal disease (both invasive disease and pneumonia), (3) herpes zoster (shingles), and (4) pertussis (whooping cough) [5,7]. Of those eligible as per ACIP guidelines, the vaccination rate for the traditional influenza vaccine was only 42% during the influenza vaccination season of 2013–2014 [7]. Similarly, 60% of adults over the age of 65 received either of the two doses of pneumococcal vaccine. Also, only 20% of the immunocompromised adults, below the age of 65 received the pneumococcal vaccine, thereby subjecting the rest to serious outcomes including death [5,8]. Likewise, in 2013, the Centers for Disease Control and Prevention (CDC) reported that the adult vaccination coverage for tetanus, diphtheria and acellular pertussis (Tdap) was only 20% and that for the herpes zoster vaccine among adults aged ≥60 years was 28% [9]. These rates indicate that despite continued public health efforts, a substantial portion of American adults have yet to be vaccinated.

Previous studies by Johnson et al. and Burson et al. have identified barriers such as missed opportunities by providers and dearth

Abbreviations: ACIP, Advisory Committee on Immunization Practices; CDC, Centers for Disease Control and Prevention; HIPAA, Health Insurance Portability and Accountability Act of 1996; IRIS, Iowa Immunization Registry Information System; NESIIS, Nebraska State Immunization Information System; STC, Scientific Technologies Corporation; Tdap, Tetanus, diphtheria and acellular pertussis.

* Corresponding author at: Center for Health Policy, Health Services Research and Administration, College of Public Health, University of Nebraska Medical Center, 984350 Nebraska Medical Center, Omaha, NE 68198-4350, USA.
E-mail address: nizar.wehbi@unmc.edu (N.K. Wehbi).
URL: http://www.unmc.edu/publichealth/nizarWehbi.htm (N.K. Wehbi).

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or no access to a convenient site for care, specifically healthcare settings with extended hours of operation [2,10]. The traditional locations for delivering vaccines have been physicians' offices and hospitals as well as community health clinics and schools that are set up by public health groups [11–13]. However, some studies have shown that pharmacies are the second (following physicians' offices) most trusted healthcare destinations for vaccinations [2], thereby, making them target locations to increase vaccination rates and improve population health [14–16]. Over the years, a substantial proportion (around 25%) of influenza vaccines have been provided at pharmacies [17]. More specifically, around 18.4% of these vaccines were administered at pharmacies located in supermarkets. However, major challenges still exist. Pharmacists have the ability to administer pneumococcal, herpes zoster and Tdap vaccines, but challenges remain aligning public health priorities with health care reimbursement. To yield the potential benefits of community pharmacy as a healthcare destination for immunizations among other preventive services, health plans can take responsibility for facilitating education and reimbursement of vaccines as effective tools against premature death and avoidable healthcare costs. It is estimated that there are 62,000 such community pharmacies in the nation that have the capability to administer immunizations, but are under-utilized and may not receive adequate reimbursement for the services provided [2,18].

Leveraging community or grocery store-based pharmacies that already have a high influx of shoppers to reach potential patients is a non-traditional approach to achieving vaccination and public health goals [19,20]. Because pharmacists are accessible healthcare professionals and involved in educating patients, they are capable of building relationships with patients and building immunized neighborhoods that benefit from improved health of the overall population. However, pharmacists often provide vaccinations requested by patients or by teaming up with health systems or employer plans, but are not always equipped with patients' vaccination history to make recommendations for other vaccinations. Registry reporting and greater data access, therefore, may allow pharmacists to improve vaccination rates. By utilizing a common technology platform in these pharmacies to connect technology used by pharmacists to respective state registries or by partnering with health systems, employers, or plans, pharmacists can make personalized immunization recommendations.

In this study, the Midwestern neighborhood chain of market pharmacies (Hy-Vee Inc.) incorporated a bidirectional platform called ImmsLink (STC, Scottsdale, AZ) that connected the pharmacists' technology platform (Enterprise, McKesson, CA) to both state immunization registries: Iowa Immunization Registry Information System (IRIS) and Nebraska State Immunization Information System (NESIIS). Community pharmacists used this platform as part of the study from October 1, 2016, through September 30, 2017. The outcome was improved immunization rates in Iowa and Nebraska for that adult population most likely in part due to pharmacists now being able to identify those who need immunizations through accessing the immunization registry data. The primary point of care to improve the immunization profile of adult patients has been the 2016 and early 2017 season influenza vaccination. Community pharmacies utilized a single sign-on bidirectional link to increase non-influenza vaccination rates. This platform provides personalized on-screen recommendations with respect to the four targeted vaccines, which facilitates discussion between pharmacists and patients when patients seek the seasonal influenza vaccination. The pharmacies transferred vaccination data from their internal Enterprise records to the respective state registries, allowing for more complete public health records.

To our knowledge, this study is the first to monitor a pharmacist-initiated vaccination program using a bidirectional technology platform. The purpose of this study is to improve immunization (influenza, pneumococcal, pertussis, and herpes zoster) rates for adult patients (age 19 and older) at 159 locations of the pharmacies in Iowa and Nebraska. This was accomplished by leveraging community pharmacists in providing personalized immunization recommendations to incoming patients by utilizing a bidirectional platform connected to the respective state registries.

2. Materials and methods

2.1. Implementation sites

According to the CDC, the 2013 participation rate of adults in an immunization information system was 50% in Iowa and 35% in Nebraska [21]. Pharmacists in Nebraska and Iowa are permitted to administer influenza, pneumococcal, pertussis, and herpes zoster vaccinations to adult patients [22,23]. Nonetheless, reporting to NESIIS in Nebraska is voluntary while reporting to IRIS is mandatory in Iowa.

The selected Midwestern pharmacy is one of the largest grocery store chains in both Iowa and Nebraska with a wide market reach. A total of 159 pharmacies (129 in Iowa and 30 in Nebraska) committed to this study. In 2015, those 159 community pharmacies filled prescriptions for 1,021,170 patients who are our initial target population for influenza vaccination, and all subsequent adult immunizations.

2.2. Intervention using technology platform

As of September 2016, the pharmacists in Iowa were required to enter their organization-related code in addition to their Username and Password in order to access, view and update immunization records in IRIS. This process was performed manually via individual user logins, and the reporting of vaccinations provided to the registry was also completed manually. On the other hand, Nebraska pharmacists are not mandated to report immunizations to NESIIS. They can still access and update patients' records if they so choose but would also require a separate user login to NESIIS.

The bidirectional link for immunization interface established a single sign-on system that allowed for the automated transfer of immunization data from the pharmacy management system to both state immunization registries – NESIIS and IRIS. The bidirectional link accepted a secure data feed from pharmacies' management system that were processed through HIPAA compliant servers and then reported to the appropriate state registry. Implementing this platform enhanced data reporting to the registries and allowed pharmacists easier access to the state immunization registries.

2.3. Target population and data collection

Due to the difference in age of majority in Nebraska (19 years and older) and Iowa (18 years and older), to streamline the operations, we standardized the age limit of the target population to 19 years and above for all four types of vaccinations for this study. All patients who visited the pharmacies and requested an influenza vaccination between October 1, 2016, and September 30, 2017 were included in this study.

Using the bidirectional link, pharmacists were able to access immunization records directly from state immunization registries along with the Advisory Committee on Immunization Practices (ACIP) compliant forecast for that specific patient.

In Nebraska and Iowa, pharmacists are permitted to administer all four types of adult vaccinations included in the study; as compared to some states which restrict pharmacists from administer-

ing certain vaccines (e.g. Tdap and pneumococcal vaccine) [24,25]. Pharmacists use the opportunity during influenza season to interact with patients and educate them about other vaccinations that they might be due for.

To increase education of the public and enhance vaccination rates in the adult population in the Nebraska and Iowa region, the stores used promotional materials such as newspaper advertisements, flyers, regular announcements, yard signs, and personalized mail. Patients receiving vaccinations also received incentives as part of the pharmacies' customer loyalty and reward program.

Patients included in this study were also provided with materials to promote awareness of the public access portals available from both state registries. These materials stated that the portals are a trusted resource for complete personal immunization history as well as an information resource for recommended vaccinations.

2.4. Measures

Pharmacies provided data from the prior year (2015–2016) to allow comparison of the number of immunized patients at Iowa and Nebraska pharmacy stores and demonstrate improvements in the vaccination rates after the implementation of the bidirectional link.

The pneumococcal vaccination numbers represent both the 23 valent polysaccharide vaccine as well as the 13 valent conjugate vaccine since in any given year, a patient would receive only one type of the other of these 2 vaccines.

The University of Nebraska Medical Center's Institute of Review Board determined that this project does not constitute human subject research.

3. Results

Comparing the counts of vaccinations administered before and after the implementation of technology platform (see Table 1), we found that a total of 198,237 Influenza vaccinations were reported. In Nebraska alone, 103, 999 flu vaccinations were administered whereas in Iowa there were 94,328 vaccinations. There was a 37% increase in the vaccinations for influenza after implementation of the project compared to the prior year. Community pharmacies were leveraged as healthcare destinations to achieve gains in improving the health of adults and promoting prevention within communities.

Before implementation of the project, 5146 Herpes Zoster vaccinations were administered at the participating pharmacies. There was a 12% increase in Herpes Zoster vaccinations after implementation of the bidirectional link (total 5769) with 2947 and 2822 counts administered in Nebraska and Iowa, respectively.

The counts for Pertussis increased by 74% after implementing the link from 1733 counts in 2015–2016 to 3015 in 2016–2017. Specifically, 1678 were administered in Nebraska and 1,337 in Iowa. However, there was a 16% decrease in vaccine counts for Pneumococcal vaccination (12,062 before vs 10,173 after link) where 4397 and 5776 pneumococcal vaccines were administered in Nebraska and Iowa, respectively.

4. Discussion

The primary purpose of this demonstration project is to improve population health and increase immunization rates through the implementation of a single user sign-on, bidirectional immunization interface at 159 pharmacies in Iowa and Nebraska. The implementation of this technology connected pharmacy systems to state immunization registries and facilitated personalized immunization recommendations for adult patients who seek vaccinations at the pharmacy. Our results show that implementing the bidirectional link improved access and the immunization status for the targeted populations in Nebraska and Iowa. Increasing the proportion of immunizations delivered at community-based pharmacies has shown that these pharmacies are a convenient and efficient healthcare destination. Additionally, the implementation of the technology platform has eliminated the need for added sign-on and manual entry of immunization records into the state registries and enhanced the reporting process to the registries. Moreover, the consistency of patient look-up in the system across all pharmacy locations has standardized the workflow within the pharmacies across the two states.

Increasing vaccination rates among populations has always had its challenges. As reported in a previous study by Helms et al and the National Vaccine Advisory Committee's report of 2011, even very strong efforts to increase flu vaccinations among hospital workers have proven to be challenging and resulted in a modest increase of up to 10% [26,27]. In a study by Drozd et al, allowing pharmacists to administer influenza vaccines was associated with 2.2–7.6% increase in adult influenza vaccination numbers over 10 years [28]. In the 2017 report by National Center for Health Statistics, between the years of 2014 and 2015, there was an overall 0.5% reduction in influenza vaccinations in the Midwestern states [29]. As a result, we set our goal to increase influenza vaccinations by 6–10% compared to the previous year. However, using the 'seasonal approach' to recruit participants and appropriate promotional strategies, we were able to surpass our goal and deliver 37% more influenza vaccinations compared to the year prior.

Subsequently, there was a 2% overall increase in administration of non-influenza vaccines (pneumococcal, herpes zoster, and pertussis). Specifically, our efforts resulted in a 12% increase in herpes zoster vaccination rates compared with the prior year which is much greater than the CDC-reported 3% increase in national herpes zoster immunization rates for the year 2016 [30]. Similarly, Williams et al reported that on a national-level, vaccination rates for pertussis saw a modest increase of 2.9% in 2013 from 2012 [6]. However, our study shows a tremendous improvement (increase by 74%) in vaccination rates of pertussis which reassures the

Table 1
Adult Immunization rates in Nebraska and Iowa before and after implementation of the bidirectional link.

Vaccine type	Number of vaccinations before implementing link	Number of vaccinations after implementing link			Percent change over prior year
		NE	IA	Total	
Influenza	144,415	103,999	94,238	198,237	+37%
Pneumococcal	12,062	4397	5776	10,173	−16%
Herpes Zoster	5146	2947	2822	5769	+12%
Pertussis	1733	1678	1337	3015	+74%

NE, Nebraska; IA, Iowa.
Note: Pneumococcal vaccination counts are a total of Pneumovax & Prevnar 13 combined.
The duration of study period after implementing the ImmsLink is from October 1, 2016 to September 30, 2017.

impact of vaccination programs, such as ours, that are well-promoted, executed by providing regular reminders and education in convenient healthcare settings. It is unlikely that the observed increase in immunization rates is totally attributed to better reporting by pharmacists and the improved access to immunization registries. Nonetheless, the ease of access to the registries might have helped pharmacists to get more complete and accurate vaccination history and thus encourage customers to complete vaccinations they are due for.

In contrast, vaccination rates for pneumococcal decreased by 16% after the commencement of our study. We suspect that there are several reasons that may have led to this reduction in immunization rate for pneumococcal. First, the participating pharmacies in Nebraska and Iowa experienced a 150% increase in the 2015–2016 season due partially to new pneumonia immunization recommendations released at that time, yet this vaccine is generally administered every 10 years. It is possible that this might be a one-time increase rather than a trend. Second, manufacturers of pneumococcal vaccines played a vital role in promoting the vaccine in 2015. For example, Pfizer Inc. undertook a successful public service announcement campaign for the pneumococcal vaccine called "Who Pneu?" while GlaxoSmithKline plc reduced the cost of the vaccine [31,32]. Both of these factors could have contributed to immunization market saturation in the prior year.

This study effectively captured data on two preventative care measures, influenza immunization and pneumonia vaccination status for older adults, which are widely used in value-based models to demonstrate quality and cost of care. Pharmacists' access, query and reporting was enhanced to both states' immunization registries, IRIS and NESIIS. We anticipate these findings will provide an opportunity for meaningful change and a model for comparison of immunization data from stores located in the other states. Because an overall increase in rates of vaccines for influenza, herpes zoster, and pertussis is seen after the implementation of the link, our study contributed to a statewide (both NE and IA) uptake of adult immunizations. Also, considering that pharmacists in Nebraska have not been reporting to NESIIS prior to this project, documenting patient immunization information in the registries is a unique and constructive start to build a more robust data repository.

Our findings certify this study's aim to strengthen the immunization registries (by having complete patient data in the registries) can be achieved using a bidirectional technology platform. Allowing the registry data to be shared to the state Health Information Exchange would allow providers access to a more robust data base. We anticipate that patients' perceived value of the registry will also increase with more complete records. In the future, it would be beneficial to consider implementing an annual/quarterly patient immunization checks at the pharmacy when forthcoming software integration supports automated immunization and query process.

This study should not be interpreted without its limitations. The vaccination rates are to be read discerning external factors such as saturation of potential patient population that regularly visit those pharmacies. Moreover, all the three non-influenza vaccinations are not meant to be administered annually among adults. The cost benefit analysis of implementing and maintaining the bidirectional link versus the net profit made by pharmacies have not be calculated in this study. Also, the results might not be generalizable to other vaccines or to stand-alone pharmacies or pharmacies with less foot traffic than supermarkets.

5. Conclusion

Utilizing pharmacists to administer the four vital adult vaccinations against diseases such as influenza, pneumococcal, herpes zoster and pertussis in Iowa and Nebraska, has contributed to the two states' population health and corresponding efforts of increasing immunization rates. Recommendations from pharmacists were valued by patients, and the action taken by patients with respect to vaccines have tremendously helped increase immunization rates. Community pharmacy-based immunization is a meaningful part of the rising interest in providing a convenient, accessible and flexible retail health delivery system. For even further engagement of community pharmacies, health plans need to take on responsibility for facilitating education and reimbursement of vaccines in this setting, yielding benefits for population health and communities. The findings from our study reiterates the importance of community pharmacists in providing needed immunization and recommendations to patients, thus contributing to improved immunization rates and better community health. Implementation of a technology platform that links pharmacies' retail software to state registries can help create a nationwide database of patient immunization data, including vaccinations provided at physician offices and community pharmacies.

Conflicts of interests disclosure statement

Declarations of interest: none.

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Attestation

All authors attest they meet the ICMJE criteria for authorship.

Authors' contributions to the work are as follows:

Conception and design of the study, or acquisition of data, or analysis and interpretation of data (NKW, RW, DK, ASK)

Drafting the article or revising it critically for important intellectual content (NKW, RW, DK, JM)

Final approval of the version to be submitted (NKW, DK)

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