

## Comparison of Pharmacists and Primary Care Providers as Immunizers

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## **ABSTRACT**

### **Context:**

Primary care is reeling under present service demand and cost-containment initiatives, to the point that the American College of Physicians has issued a warning that “primary care, the backbone of the nation's health care system, is at grave risk of collapse.”

Advisory Committee on Immunization Practices recommendations to vaccinate all children to 18 years of age adds 83 million children, at a minimum of 2,900,000 additional man-hours each flu season.

### **Objective:**

This study examines the potential role of “alternative community immunizers,” specifically pharmacists, in providing immunization services.

### **Design:**

This study uses system engineering principles and methods to analyze the costs, efficiency, and other operational issues associated with the provision of immunizations in ambulatory care and pharmacy settings.

### **Setting:**

Routine scheduled primary care visits, mass influenza immunization clinics, and pharmacies in 15 ambulatory care settings and 11 pharmacies in San Diego, California.

### **Patients or Other Participants:**

A convenience sampling of almost 700 adults eligible for vaccinations during the 2006–2007 and the 2007–2008 influenza seasons.

**Main Outcomes Measure(s):**

Primary outcomes of interest included adherence to immunization safety guidelines, customer characteristics, units costs, efficiency, and productivity of primary care providers and pharmacists.

**Results:**

Patient characteristics and beliefs were similar between primary care and pharmacies, but pharmacies proved more consistent in following safety protocols; had lower unit costs; and were more efficient, with greater productivity.

**Conclusions:**

Providers and pharmacists already "partner" in providing care to the nation's health care consumers, and pharmacists are well-positioned to help meet the growing demand associated with the likely increase in demand for immunization services. Pharmacies combine the best immunization practices of routine scheduled primary care visits and mass influenza vaccination clinics, but gaps still exist in pharmacies' ability to effectively transmit immunization records and address concerns about such issues as client privacy and provider willingness to embrace these "alternative immunizers."

**KEY WORDS**

Immunization, operational science, pharmacy, public health policy, service industry

## INTRODUCTION

A major success of modern public health has been the near-eradication of vaccine-preventable diseases. Currently, vaccines are licensed for 27 diseases<sup>1</sup>, with a number of new vaccines at or near licensure and new populations being added.<sup>2</sup>

Contained within this public health success are significant operational challenges to an already overtaxed primary health care infrastructure. By way of example, the Advisory Committee on Immunization Practices (ACIP) recently recommended that all children aged 6 months to 18 years of age—as well as their household contacts and out-of-home caregivers—be immunized for influenza.<sup>3</sup>

According to the U.S. Census Bureau, there are an estimated 83 million children in this age cohort.<sup>4</sup> Given the fact that there were 880.5 million health care visits in 2005, the more than 100 million visits required to immunize all these children represents nearly a 9% increase in service provision during a few months of each year<sup>5</sup> and would require, at a minimum, 2,900,000 additional man-hours each flu season.<sup>6</sup> This does not include the costs and man-hours required for indirect support and administrative services, which our research shows far exceeds the direct service costs.<sup>7,8</sup>

Primary care is already reeling under present service demand and cost-containment initiatives, to the point that the American College of Physicians has issued a warning that “primary care, the backbone of the nation's health care system, is at grave risk of collapse.”<sup>9</sup> Given that immunizations recommendations will further expand over the

coming years, identifying community immunizers who can supplement the role of primary care providers becomes paramount.

Pharmacists are in an excellent position to meet this growing need. Close to 200,000 pharmacists (or 71.2 per 100,000 Americans)<sup>10</sup> work in a variety of pharmacy settings across the country. Pharmacists are explicitly authorized to immunize in 48 states;<sup>11</sup> have effectively boosted influenza immunization rates during past flu seasons;<sup>12,13</sup> and are accepted by patients<sup>14–17</sup> and primary care physicians.<sup>18</sup> There exist practical guidelines for establishing immunization practices for pharmacists<sup>19,20</sup> as well as national certification programs approved by the Centers for Disease Control and Prevention (CDC) and the APhA.<sup>21</sup>

Pharmacists clearly play an important role in the evolving business of vaccine administration. What is not known is how the operational conditions, workflow dynamics, or consistency with which pharmacists adhere to CDC, ACIP, and Joint Commission immunization guidelines will affect the future of this industry.

This paper compares the operational strengths and weakness associated with vaccine administration by primary care providers during the 2006–2007 influenza season and by pharmacists during the 2007–2008 flu season.

## **METHODS**

### ***Design and Study Population***

The data set was part of a larger study examining operational issues surrounding expanded recommendations for influenza immunizations. A convenience sample of 15 ambulatory care settings and 11 pharmacies in San Diego was used to collect workflow observations of immunization services and patient/client satisfaction and reasons for seeking immunizations. Ambulatory care observations were conducted during the 2006–2007 influenza season, followed by pharmacy data collection the following flu season. Observations were encoded using the Observational Checklist of Patient/Client Encounters (OCPE), a standardized workflow data acquisition tool described in earlier publications.<sup>22</sup>

Our study population was a convenience sample of patients/clients eligible for influenza or other immunizations who declared they had not yet been immunized during the current flu season and who gave verbal consent to be observed. For purposes of this study, we compared the administration of influenza vaccines at routine scheduled visits to primary care (operationally defined as a visit at which any new or current patient arrives at the clinic for a scheduled appointment); mass influenza vaccination clinics (operationally defined as a visit at which any new or current patient arrives at the clinic without a scheduled appointment *with the purpose of receiving an influenza immunization only*); and at pharmacies.

### ***Data Collection***

Data collection and control processes were designed so that all decisions and assumptions were documented and data were double-reviewed. Observers recorded the presence or absence of specific activities (e.g., whether a patient's/client's health history was discussed; patient/client was asked about potential allergies to eggs; and a vaccine was administered and the immunization subsequently recorded).

Observations included detailed distinctions, such as whether a provider/pharmacist simply asked a patient/client about immunization status or actually discussed the purpose of immunizing against influenza. The time required to complete activities was recorded, as were operational conditions (e.g., staffing ratios at the time of each observation). As a consequence, the data permit comparison of items, such as the maximum number of patients/clients that can be seen for a given unit of time and labor, the likelihood that a patient/client will leave immunized, and the likelihood that the encounter will include activities recommended by the CDC and required by the Joint Commission.

### ***Data Analysis***

Five types of comparative analyses were performed for the three immunization services studied: characteristics of the populations, including health beliefs and reasons for receiving influenza vaccinations; facility adherence to vaccination standards; unit costs to vaccinate; productivity; and efficiency. Data from the workflow observations were used as the basis for each calculation.

Analysis began with entering the individual workflow observations into an Excel worksheet and examining these data for anomalous findings (e.g., a data entry error where a recorded observation time indicates that a patient/client completed the pre-exam process before he or she had arrived at the clinic). Each anomalous finding was evaluated to determine if it could be corrected with certainty; if this was not possible, the observation was discarded.

Where a specific data field was incomplete within a specific observation (e.g., whether the receptionist updated patient/client contact information), that specific field from that observation was eliminated from analysis (thus the changing numerator/denominator for specific observed activities). However, if several observation points were missing from a particular patient/client observation, the observation was discarded. A total of 255 primary care routine, 341 primary care mass vaccination, and 100 pharmacy observations were used for this analysis.

Data from the observations for each delivery strategy were used to establish both time sequences (e.g., registration duration, patient–provider/client–pharmacist interaction duration) and frequency tables for specific events (e.g., asking the patient/client if he or she had been vaccinated that year or had specific allergies, noting if the vaccine was administered and then documented).

## **RESULTS**

### ***Adherence to Immunization Standards***

Reviewing a patient's/client's health history, asking about egg allergies, or simply asking whether a patient/client has received an influenza immunization that flu season are part of the CDC's recommended immunizations practices and/or part of the standards of practice. Equally important are the collection and verification of contact and billing information and the documentation of administered vaccines. Table 1 lists the frequency with which each service provider was observed completing key activities.

### ***(Table 1: Comparison of Operational Data for Service Type)***

### ***Reasons for Immunizations***

A variety of personal, financial, and convenience reasons exist for why a patient/client might choose to be immunized against influenza. Although the age and gender characteristics of our study population proved quite similar, we discovered a number of differences in patients'/clients' reasons for seeking influenza immunizations at specific sites. Specifically, employers greatly influenced decision on immunization sites, with those clients receiving immunizations at pharmacies being nearly three times more likely than primary care patients to report that their employer had recommended the immunization. Pharmacy clients were also much more likely to report that they had received a flu shot the previous year. Table 2 lists the frequency with which patients'/clients reported reasons why they elected to be immunized at each service provider.

***(Table 2: Comparison of Patient/Client Characteristics)***

***Direct Unit Costs***

Direct unit costs were established adding labor, material, and overhead costs associated with immunizing a single patient/client. Included in labor costs were all personnel who had direct contact with a patient/client. As routine scheduled exams include, by definition, a wide array of health issues, only time directly related to immunization activity was used in the direct unit costs analysis; this compares to mass vaccination and pharmacist visits, in which the sole purpose is to immunize and, therefore, all the costs are accrued to immunizations.

Time factors were derived either by direct observation (e.g., time required to administer a vaccine) or by calculating the additional time spent in a particular activity by comparing those activities in which an immunization occurred to those in which they didn't occur (e.g., pre-exam duration when immunizations occurred or patient-provider/client-pharmacist interaction duration when vaccinations were discussed). Table 3 lists the relevant times used for calculating costs.

***(Table 3: Time Devoted to Immunization Activities)***

The average hourly pay for each type of health care personnel listed by the U.S. Bureau of Labor Statistics for 2007 was used to determine labor costs.<sup>23</sup> Similarly, capital or “overhead” costs were established using the Medical Group Management Association’s

(MGMA) published data for 2005.<sup>24</sup> Material costs included the average cost of vaccine, syringe, and supplies listed in the CDC “pink book.”<sup>25</sup> The activity times from Table 3 and labor, overhead, and material costs were combined to calculate the direct unit costs shown in Table 4.

**(Table 4: Direct Unit Costs)**

***Productivity***

Productivity is operationally defined as the ratio of services rendered to resources used—in our case, the number of eligible patients/clients immunized per unit of labor, overhead, and materials.

Time spent with the provider (either a physician in a routine scheduled appointment or an allied health professional operating under standing orders in a mass vaccination clinic) or pharmacist was used to define how many patients/clients could be immunized in a given span (also referred to as work labor units), as patient/client throughput can occur more slowly—but certainly no faster—than the provider encounter.

Productivity was calculated using the following formula:

$$\text{Productivity} = \frac{L + C + M}{N}$$

Where:

L = labor costs

C = capital costs

M = material costs

N = individuals who could be immunized per hour

The results of the above calculation are shown in Table 5 below.

***(Table 5: Productivity of Immunization Strategies)***

***Efficiency***

Encounters involve more than simply immunizing patients/clients as quickly and cheaply as possible. Educating patients/clients, assessing for valid contraindications, determining true eligibility, and documenting the encounter are all activities recommended by the CDC/National Immunization Program and by Joint Commission standards for documenting clinical encounters in ambulatory care settings.<sup>28</sup>

In general, these activities can be considered quality indicators. For purposes of this study, quality indicators were operationally defined as review and documentation of health history (to assess for eligibility, contraindications, and egg allergies); assessment of basic biometrics (e.g., height, weight); observation of the patient/client for allergic reaction; and documentation of either vaccine administered or immunization delay/refusal when recommended.

When productivity includes quality indicators, the resulting analysis is said to quantify the relative efficiency of the service. Efficiency is essentially how much of a service can be provided correctly for a given set of costs.

Efficiency was calculated using the following formula:

$$\frac{N * PV * PHHR * PD}{L + C + M}$$

Where:

N = individuals who could be immunized per hour

PV = probability of being immunized

PHHR = probability of health history reviewed

PD = probability of immunization documented

L = labor costs

C = capital costs

M = material costs

The results of these calculations are shown in Table 6.

***(Table 6: Efficiency Ratio of Immunization Strategies)***

## **DISCUSSION**

In general, expanding the number of individuals eligible for immunizations will require new strategies and partnerships. Based on this limited study, pharmacies appear to be quite capable of reaching a large number of individuals while still meeting ACIP and CDC standards for immunizations. Indeed, pharmacies seem to combine the strengths of both mass vaccination clinics and scheduled appointments at primary care sites.

Immunizations at pharmacies and mass vaccination clinics have a substantial advantage in productivity over routine scheduled appointments at primary care sites. More patients/clients can be immunized in a comparable period of time for a given standard work unit relative to routine scheduled appointments (Table 6). It was also surprising to see how consistently pharmacists carried out ACIP and CDC recommendations such as inquiring about egg allergies and having clients sit for a brief period of time post-immunization. Much like mass vaccination clinics, the biggest shortcoming at pharmacies was the lack of privacy—not the safety of the practices.

Conversely, providers seeing patients at scheduled primary care visits and pharmacists involved in immunization services were very good at collecting data critical for reminder/recall and audit/feedback functions, such as verifying contact information and documenting the vaccines administered. Compared to mass immunization clinics, immunizations were more likely to be documented and patient/client health history—even if only in a limited sense—was far more likely to be noted and reviewed at scheduled primary care visits and pharmacies.

## **CONCLUSION**

Our study suggests that within the context of a changing national health care system, pharmacies are well-positioned to provide key preventive, non-dispensing services such as immunizations. We have already seen a transition from public health departments to the medical homes in providing the majority of immunizations. Given the already heavily burdened world of primary care and the likely continued increase in demand for immunization services, it may be time to look at the partnership between primary care and pharmacists. Pharmacists participating in this study proved every bit as diligent in following recommended ACIP and CDC adult vaccination safety guidelines, and had a lower cost-structure than did primary care providers. Clients have demonstrated that they are willing to seek out pharmacists for "travel shots" and for influenza and multi-stage (e.g., human papillomavirus) immunizations, and have found the services provided by pharmacies convenient.

Prescribing physicians and pharmacists already "partner" in providing health care, and acceptance of pharmacists as "alternative immunizers" would likely increase further if there was a more effective means of transmitting immunization records, potentially in the form of a community-based registry.

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**Table 1: Comparison of Operational Data for Service Type**

Observations	Visit Type		
	Primary Care— Routine Schedule Visit (n=255)	Primary Care— Mass Vaccination Clinic (n=343)	Pharmacy (n=100)
<b>Registration</b>			
Contact information verified at check-in	166/255 (65%)	231/343 (67%)	86/90 (96%)
Insurance information verified at check-in	214/255 (84%)	89/343 (26%)	85/90 (94%)
<b>Pre-exam</b>			
Health history taken	139/231 (59%)	0/343 (0%)	83/91 (91%)
Patient/client asked about allergies	139/231 (59%)	0/343 (0%)	83/91 (91%)
Staff member asked patient/client if he/she had received an immunization that flu season	54/229 (23%)	0/343 (0%)	32/89 (36%)
Patient/client leaves before completing encounter (i.e., does not receive immunization)	2/84 (2%)	0/343 (0%)	0/90 (0%)
<b>Treatment</b>			
Eligible patient/client is administered vaccine	151/255 (59%)	341/344 (99%)	91/99 (92%)
Patient/client is provided a copy of his/her immunization record	105/151 (70%)	154/341 (45%)	64/91 (70%)

**Table 2: Comparison of Patient/Client Characteristics**

Observations	Visit Type		
	Primary Care— Routine Schedule Visit (n=151*)	Primary Care— Mass Vaccination Clinic (n=343)	Pharmacy (n=100)
<b>Characteristics</b>			
Age	66	73	67
Gender (M:F)	38%:62%	42%:58%	34%:66%
<b>Utilization history</b>			
Sees a provider regularly	117/147 (80%)	292/340 (86%)	76/88 (86%)
Has a primary care provider	100/147 (68%)	170/340 (50%)	81/88 (92%)
<b>Practices and beliefs</b>			
Got a flu shot last year	58/147 (39%)	222/338 (66%)	72/82 (88%)
Flu can be severe	37/147 (25%)	297/320 (93%)	86/86 (100%)
<b>Reasons for getting an influenza vaccine</b>			
Recommended by physician	105/147 (71%)	262/320 (82%)	28/86 (33%)
Recommended by employer	28/147 (19%)	76/320 (24%)	51/86 (59%)

\* 151 patients out of a total 255 observed at routine scheduled appointments underwent an in-depth post-exam interview.

**Table 3: Time Devoted to Immunization Activities**

Activity	Visit Type		
	Primary Care— Routine Schedule Visit (n=255)	Primary Care— Mass Vaccination Clinic (n=343)	Pharmacy (n=100)
Check-in	1.5 min	4.0 min	N/A
Health history review	0.1 min	N/A	5.0 min <sup>a</sup>
Time to administer vaccine	1.0 min	1.0	1.0 min
Time spent with provider/pharmacist	30 min	2.0	2.0 min
Total time in facility	34 min	16.0	28.0 min <sup>b</sup>

<sup>a</sup> Provider was operationally defined as a licensed medical person able to order and administer vaccines under his or her own license.

<sup>b</sup> Client time in pharmacy frequently extended several minutes post-immunization due to clients' tendency to shop in the pharmacy/store after being administered a vaccine.

**Table 4: Direct Unit Costs**

Personnel	Visit Type		
	Primary Care— Routine Schedule Visit (n=255)	Primary Care— Mass Vaccination Clinic (n=343)	Pharmacy (n=100)
Physician (\$61.43/hour) <sup>a</sup> ; pharmacists (\$44.95/hour)	\$3.07	N/A	\$3.74
Nurse (\$21.93/hour)	\$0.40	\$1.10	N/A
Receptionist (\$10.14/hour)	\$0.25	\$0.68	N/A
Overhead <sup>b,c</sup>	\$5.04	\$6.30	\$0.23
Pre-filled vaccine/syringe cost <sup>d</sup>	\$13.25	\$13.25	\$13.25
<b>Total</b>	<b>\$22.01</b>	<b>\$21.33</b>	<b>\$17.22</b>

<sup>a</sup> Physicians did not administer vaccines. Only time spent discussing immunizations is included.

<sup>b</sup> The Medical Group Management Association cost survey of 2005 data shows an average non-labor annual overhead cost of \$0.90/minute.<sup>24</sup>

<sup>c</sup> The United States Government Accountability Office and the Medicare Payment Advisory Committee reports on overhead and handling costs placed per pharmacists costs at \$1.75/hour.<sup>26,27</sup>

<sup>d</sup> Taken from "Appendix B: Vaccine Price List."<sup>25</sup>

**Table 5: Productivity of Immunization Strategies**

	Visit Type		
	Primary Care— Routine Schedule Visit (n=255)	Primary Care—Mass Vaccination Clinic (n=343)	Pharmacy (n=100)
Mean labor cost <sup>a</sup>	\$3.72	\$2.45	\$3.74
Mean overhead cost <sup>b</sup>	\$5.04	\$9.90	\$0.23
Mean materials cost	\$13.25	\$13.25	\$13.25
Mean number of patients seen per hour	2.87	8.9	8.5
Calculation	$\frac{2.87}{\$3.87 + \$5.04 + \$13.25}$	$\frac{8.9}{\$2.45 + \$9.90 + \$13.25}$	$\frac{8.5}{\$3.74 + \$0.70 + \$13.25}$
<b>Production value</b>	<b>\$7.67<sup>c</sup></b>	<b>\$2.88<sup>c</sup></b>	<b>\$2.03<sup>c</sup></b>

<sup>a</sup> For maximum patient throughput, mass vaccination clinics used two receptionists for each allied health professional immunizing under standing orders.

<sup>b</sup> Overhead costs are increased using the two receptionists for each allied health professional in mass vaccination clinics.

<sup>c</sup> The lower the score, the greater the productivity.

**Table 6: Efficiency Ratio of Immunization Strategies**

	Visit Type		
	Primary Care— Routine Schedule Visit (n=151)	Primary Care— Mass Vaccination Clinic (n=341)	Pharmacy (n=100)
Number of patients/clients who could be immunized per hour	2.87	8.9	8.7
Probability of patient/client being administered vaccine	59%	99%	99%
Probability of health history being reviewed	59%	0% <sup>a</sup>	91%
Probability patient/client is provided a copy of his/her immunization record	70%	45%	70%
Calculation	$\frac{2.87 * .59 * .59 * .70}{\$3.72 + \$5.04 + \$13.25}$	$\frac{8.9 * .99 * .01 * .45}{\$2.45 + \$9.90 + \$13.25}$	$\frac{8.7 * .99 * .91 * .70}{\$3.74 + \$0.70 + \$13.25}$
<b>Production value</b>	<b>0.032<sup>b</sup></b>	<b>0.002<sup>b</sup></b>	<b>0.319<sup>b</sup></b>

<sup>a</sup> We arbitrarily set a minimum value of .01.

<sup>b</sup> The higher the score, the greater the efficiency.

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In addition, co-author Jason Shafrin had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.