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Provider time and costs to vaccinate adult patients: Impact of time counseling without vaccination

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Abstract

Amid provider reports of financial barriers as an impediment to adult immunization, this study explores the time and costs of vaccination in adult provider practices. Both a Vaccination Time-Motion Study and Vaccine Practice Management Survey were conducted (March – October 2017) in a convenience sample of 19 family medicine (FM), internal medicine (IM), and obstetrician-gynecology (OBGYN) practices, in nine states. Practices were directly observed during a one week period; estimates were collected of time spent on activities that could not be directly observed. Cost estimates were calculated by converting staff time for performed activities. In the time-motion study, FM and IM practices spent similar time conducting vaccination activities (median = 5 min per vaccination), while OBGYN practices spent more time (median = 29 min per vaccination). Combining results from the time-motion study and the practice management survey, the median costs of vaccination remained similar for FM practices and IM practices at $7 and $8 per vaccination, respectively, but was substantially higher for OBGYN practices at $43 per vaccination. Factors that contributed to higher costs among OBGYN practices were the increased time to counsel patients, administer vaccines, and to plan and manage vaccine supplies. In addition, 68% of OBGYN patients who were offered and counseled to receive vaccines declined to receive them. Counseling patients who ultimately do not go on to receive a vaccine may be an important cost factor. Lower costs of vaccination services may be achieved by increasing efficiencies in workflow or the volume of vaccinations.

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Keywords

Adult vaccination; Time-motion; Vaccination; Vaccine counseling

1. Introduction

Vaccination coverage among adults remains low in the United States [1]. Provider recommendations are a key factor for increasing adult vaccination coverage [2]. Concerted efforts to increase provider implementation of the National Vaccine Advisory Committee (NVAC) Standards for Adult Immunization [3] places even greater emphasis on understanding the time and cost drivers related to vaccinating practices. Although providers support the benefits of adult vaccination, they also report several barriers including the costs of providing vaccination services, competing demands to deliver acute medical care as well as other preventive services, the complexity of the recommended adult immunization schedule, and challenges with electronic health records and state immunization information systems [4,5].

There are a few studies that have documented the costs of providing child vaccinations [6–8], but little is known about the financial impact of adult immunizations on practices outside of influenza vaccination [9]. Adult providers are concerned about purchasing vaccines and potential financial losses related to public or private health insurance coverage, which can impact their ability to provide vaccination services [9–10]. Additionally, providers in large medical group practices or health systems may experience lower costs of vaccination services due to efficiencies gained through the health system such as the centralization of administrative or billing services, or other efficiencies [11]. Patient perceptions also affect time providers spend on counseling, which may not lead to patient receipt of vaccine. Finally, the current procedural codes for immunization administration do not capture time physicians spend on addressing questions and concerns of patient who ultimately choose not to vaccinate. In two reports [10,12], the NVAC recommended other billing codes may be appropriate to use for time spent on vaccine counseling when a vaccine is not ultimately given. This study aims to better understand the time and costs for vaccination activities in adult provider practices and to potentially improve efficiencies in provider practices or support a rationale for non-vaccinating providers to begin offering vaccination services.

2. Methods

2.1. Data collection

Initial recruitment began in four cities from four states. Selection of these cities was based on the distribution of wages for medical professionals with two cities from the top tertile and two from the bottom tertile [13]. The focus on wages for medical professional is reasonable given that a major objective of this study was to calculate the value of time spent during interactions between patients and medical professionals. A web-based search, using Google Maps, of each city was used to identify potential FM, IM, and OBGYN practices to recruit. Across the four cities, more than 250 practices were first contacted via a postal letter and then with a phone call. Practices were considered eligible for inclusion if the practice

provided 5 or more vaccinations per week in order to allow for the inclusion of smaller practices that may administer few vaccinations. Low response rates were experienced following the initial recruitment activities, particularly among OBGYN practices. This led to the use of the American College of Obstetricians and Gynecologists (ACOG) professional directory to identify additional OBGYN practices to recruit. Continued low response rates from practices identified with the OBGYNs professional directory eventually led to the use of a recruitment sample from a separate, unrelated study being conducted by RTI International, which resulted in the addition of 5 OBGYN practices to our study. The cumulative recruitment efforts resulted in a convenience sample of 19 practices from nine states. This study was conducted from March to October 2017, and included a one-week long timemotion study and a one-time practice management survey. In the Time-Motion Study, data collectors observed and recorded the times of vaccination activities in a practice. Practice staff that participated in the Time-Motion Study were given $50 gift cards in appreciation of their participation. The RTI International Institutional Review Board (IRB) determined this study was not human subjects research because data was only collected on the time spent on activities and no information was collected about individuals.

2.2. Vaccination time-motion study protocol

Trained data collectors were stationed at each practice for one week to directly observe practice staff conduct six vaccination- related activities on a per adult patient basis. Time spent on activities were recorded in minutes and seconds. These activities were:

1. Additional review of patient record for vaccination status including discussion with the patient. The initial assessment of immunization status based on chart review was determined in advance of patient appointment and captured in the Management Survey.
2. Provider counseling
3. Preparation of vaccine
4. Preparation of patient, vaccine administration, and disposal of waste
5. Documentation in the patient record
6. Post-vaccination direct patient observation for adverse reaction (if indicated by standard of practice). This only included time staff spent checking on the patient.

Practice staff identified patients eligible for vaccination based on chart review before the visit and were instructed to inform the data collector when vaccination-related activities were to begin. After receiving patient consent, practice staff invited the data collector to observe the vaccination-related portions of the visit regardless of visit type (e.g., sick visit, annual wellness visit). Data collectors were only present for the vaccination portion of the visit, so if the provider restarted vaccination counseling at a later point in the visit, the data collector would not have captured that time. We did not have an indication that this occurred during data collection. If multiple patients undergoing vaccination-related activities at the same time, the data collector could only follow one patient and followed the first patient available. Data collectors recorded the type of professional staff (i.e., nurse, nurse practitioner, physician assistant, physician) performing each activity. Each activity was

recorded as performed by only one staff member. In general, activities observed in the time-motion study were not assessed using the practice management survey. One exception was the assessment of the immunization status of patients, which occasionally occurred at two different points in the vaccination service workflow. Most patient immunization statuses were initially assessed in weekly or daily activities of the practice, while the patient was not present, but in some cases, there was additional review of patient need for vaccination at patient intake through discussion with the patient.

2.3. Vaccine practice management survey

The practice management survey was an electronic survey sent to practice managers, managing physicians, or administrative managers in practices to self-report time spent by staff type (e.g., practice manager, nurse, physician's assistant, physician) on six activities:

1. Review of patient record to assess immunization
2. Forecasting demand and ordering vaccines
3. Managing inventory, including taking stock of inventory and monitoring refrigerators and freezers
4. Staff training and education
5. Billing for vaccine and vaccination services
6. Entry into state immunization information systems.

For all activities, respondents were instructed to report average weekly hours. Practices also reported the number of patients vaccinated during the week of the survey and the time-motion study. In some cases, particularly in larger practices, data collectors were frequently unable to observe all vaccinations that occurred in the practice during the week.

2.4. Data entry and quality control

In the time-motion study, data was collected using a tablet computer application designed for this study. The data collector started and stopped the timer in the application when an activity began and finished. The application stored the times for each activity for each patient. The study included five data collectors. Because of concerns over potential differences in data collector interpretation of activities, a detailed training was conducted prior to the start of the data collection period. Additionally, after data collection, the data was reviewed for overall quality. In cases where there was overlap in activities performed by practice staff, the data collector recorded all time as one activity. For example, if a nurse provided counseling on vaccination while preparing the patient, the two activities would be recorded together, because the data collection application could only record one activity at a time. In addition, in some cases vaccine preparation may occur for patients who may be indicated for vaccination but go on to decline vaccination during the visit.

2.5. Analysis

Vaccination Time-Motion Study—Time and cost estimates were reported as median, minimum, and maximum minutes observed per patient and stratified by practice type. Due

to the small sample size in our study, one or two outlier values can have a substantial influence on the estimated mean. In this study, the median values are considered a better representation of the time and cost values that would be experienced at a typical provider's office.

When analyzing the time-motion study data, we combined the time and costs related to the following activities: Provider Counseling, Preparation of Vaccine, Preparation of Patient, Vaccine Administration, and Disposal of Waste, and Post-Vaccination Direct Patient Observation. These activities were performed simultaneously or in such quick succession that the data collector could not reliably record them as separate activities.

Vaccine Practice Management Survey—The median, minimum, and maximum values of weekly self-reported times by survey respondents were reported. In the practice management survey, to estimate time per vaccine we divided the weekly time by the weekly number of patients receiving a vaccination. In the survey, practice managers only reported the number of patients receiving a vaccination during the week. Since very few (<5%) patients received more than one vaccine in the time-motion study, we assume that the number of patients receiving vaccines is equal to the number of vaccines administered. Two practices did not disclose the number of vaccinated patients in a week in their practice management survey, for these two practices we used the number of vaccinations observed during the time-motion study.

Costs—Cost estimates were calculated by converting all staff time reported (i.e., OBGYN, general physicians, nurses, nurse practitioners, physician assistants, medical secretaries, managers, and pharmacists) for each activity using mean wage data by city [13] and adjusting for average fringe benefits [14]. For non-labor storage costs in the practice management survey, weekly costs were computed by dividing the cost of purchasing storage equipment by the number of weeks practices reported using this equipment before replacement. Costs of related vaccination supplies (i.e., syringes) were not requested, but based on a published source [9] All costs were adjusted for inflation to 2017 dollars [15].

3. Results

The time-motion study was completed by 19 practices and two community-based pharmacies, but patient vaccinations were only able to be observed in 16 practices. The practice management survey was completed by 17 of 19 practices and 16 practices completed both components. Table 1 presents characteristics of the practices in the sample including their state, practice type, size, whether they are part of a health system, and what vaccines were observed as part of the time motion study. The majority of practices were classified as large (13 practices) and were part of a health system (13 practices).

We observed 451 patients in the time-motion study. While all 451 were indicated for a vaccination, 248 (55%) did not receive a vaccination, 190 (42%) received one vaccination, and 13 (3%) received two vaccinations. Similar amounts of time were recorded for FM and IM practices, but OBGYN practices spent more time on all vaccination-related activities (Table 2). Across all practice types, the majority of time was spent on the combined

activities of: Provider Counseling, Preparation of Vaccine, Preparation of Patient and Administration, Disposal, and Post-Vaccination Direct Patient Observation. FM and IM practices spent comparable median time on these activities (3:09 and 1:57 min, respectively), and OBGYN practices spent more (8:22 min). The FM and IM practices spent less median time on additional review of patient record (0:02 and 0:00 min, respectively) than OBGYN practices (1:10 min). In total time on directly-observed vaccination-related activities, FM practices spent 4:51 min (costing $4.39), IM practices spent 2:48 min ($2.33), and OBGYN practices spent 10:34 min ($12.06) (Table 2). Medical doctors performed counseling at only four of the practices in the sample. At those fours practices they performed 33% of counseling. At all other practices counseling was performed by nurses.

Table 3 presents results from the time-motion study stratified by patients who either did or did not receive a vaccination. IM practices did not spend as much time on vaccination-related activities with patients that did not receive a vaccination in the end (0:19 min), relative to FM (3:20 min) and OBGYN (8:35 min). Among patients indicated for vaccination during the visit, the percent of patients that declined vaccination was 32% in FM practices, 49% in IM practices, and 69% in OBGYN practices. After including the time costs of patients that did not receive a vaccination, the median costs in FM and IM practices increased a small amount (from $4.39 to $4.54 and from $2.33 to $4.06, respectively), but costs in OBGYN practices increased more substantially (from $12.06 to $25.89).

Results from the practice management survey show FM practices had a lower median time per vaccine on each activity and OBGYN practice spent the most time on each activity except for review of patient records (Table 4). The median total time per vaccine on management activities was small for FM and IM practices (33:21 and 6:23 min, respectively) and higher for OBGYN practices (41.30 min) (Table 4).

Table 5 presents estimates of the total time and associated costs of all vaccination related activities on a per vaccine basis, combining estimated costs from the time-motion study and the practice management survey. Reported time and costs are stratified into two groups, one group includes costs of vaccinated patients only and the other includes costs of both vaccinated and unvaccinated patients. Looking at vaccinated patients only, the median costs were comparable between FM and IM practices ($6.94 and $7.23, respectively), but higher for OBGYN practices ($36.04). Including time spent with both vaccinated and unvaccinated patients increases the median time for FM practices ($0.15 increase), for IM practices ($0.81 increase), and for OBGYN practices ($6.61 increase). When reviewing the reported costs of “vaccinated patients only” versus the costs of “vaccinated and unvaccinated patients” among OBGYN, the difference is modest in this table relative to the difference reported in Table 3. This disparity between Table 5 and Table 3 is because our primary analytic statistic is the median.

4. Discussion

This study observed a broad range in the estimated time and cost burden of health care providers, who provide immunization services to adult patients. All the patients included in the timemotion study were indicated to receive a vaccination. However, a substantial portion

of these patients chose not to receive a vaccination after time spent counseling, with the highest rate of non-vaccination after counseling among OBGYN practices (69%). Little data is available documenting the prevalence of vaccine refusal by adults, but this estimate is substantially higher than one previous study of influenza and pneumococcal vaccine refusal by older adults (aged ≥ 65) [16]. This higher estimate may be because our study examined non-influenza vaccines, which adults may be more likely to refuse, included adults under age 65 who may be more likely to refuse vaccination, and included OBGYN practices where patients may not feel inclined to receive a vaccination. Counseling patients who do not go on to receive vaccines can bring substantial costs to the practice that may not be reimbursable depending on OBGYN billing practices. This may warrant further exploration and education on how to bill for this counseling utilizing evaluation and management codes and, if appropriate, for the type of visit. Additionally, it would be beneficial to explore methods for providers to overcome patient vaccine refusal. Practices spent less time with patients that did not go on to receive a vaccination, which may indicate that patients did not receive the most effective counseling. This is most notable in IM practices where staff spent a median time of just 19 s with patients that did not receive a vaccination. One might expect that staff would need to spend more time with a patient that initially refused vaccination in order to convince them of the benefits of vaccination. Therefore, low times spent with patients that did not receive a vaccination may indicate that more time and more effective messaging should be used for these patients. Data were not collected on the type of visit and other services that may have been provided during the patient visit. The quality of counseling was not assessed in this study and may be an area of future research. The proportion of patients who receive counseling and do not go on to receive vaccines may also be widely varied. While this study included a small sample of provider practices, this data may serve as a preliminary basis for the exploration of a counseling code without a service that has been utilized for other preventive services such as tobacco cessation counseling for adults and adolescents code [17].

We generally observed that FM and IM practices spend approximately the same time vaccinating adults, but that OBGYN practices spent substantially more time on vaccination. This may be because FM and IM practices have more automated processes in place due to their traditional role as vaccination providers while OBGYN practices may not yet have these processes, because in many cases vaccination has not traditionally been part of the services they offered. Additionally, implementation of standing orders may lead to reduced time on vaccination.

We observed that FM providers spend much less time in activities leading up to the actual vaccination on a per vaccination basis. FM providers may benefit from some economies of scale (i.e., administering more vaccinations leads to a lower average cost per vaccination) because the overall volume of vaccinations provided in FM settings can include a large number of pediatric vaccines. Economies of scale occur because certain fixed costs, such as ordering vaccines and storage of vaccines, do not vary as much with the number of vaccines, administering more vaccines can lead to lower average time and costs per vaccine administered. This highlights the importance of effectively identifying patients in need of vaccination in order to increase the number of recommended vaccinations in the practice's patient population. Moreover, for practices operating within a health system, some of the

fixed costs associated with vaccination may be absorbed by other departments within the health system, leading to cost efficiencies for those practices. Within the study sample, 81% of providers reported they were a part of a larger health system and the majority reported zero costs to the practice of administrative activities such as billing and interfacing with the IIS. Better understanding of the time providers spend conducting each vaccination activity provides information that can be used by providers to better manage and improve their vaccination services workflow.

This study had a number of limitations. First, the practices included in the sample are not generalizable to the broader population of practices providing adult vaccination. Recognizing provider practices and types vary widely, we emphasize that this study included a limited sample of providers. Additionally, most of the data were collected outside of influenza season, a period of time when the volume of vaccinations in practices dramatically increases. Both FM and OBGYN practices observed during the influenza season included a higher number of vaccinations as compared to practices outside of influenza vaccination season. Vaccination during influenza season may dramatically change the estimates collected in this study by increasing volume and possible decreasing spent on each activity due to a more streamlined approach to influenza vaccination. Further, the study may underestimate the time and costs required for management activities as well as those that may be incurred at the group level that would otherwise be incurred by the practice. Finally, in the time-motion study, certain activities during a patient's appointment may or may not have been explicitly initiated or completed. As a result, data collectors used their best judgement to decide when an activity was initiated or completed. This may have resulted in mis-characterization of a small portion of time and activities. This kind of potential mis-characterization would not be likely to have a substantial qualitative impact on our broader findings about the total costs of providing vaccination or the importance of patients who decline to receive vaccines. Additionally, the data collector could not observe the counseling activity if physicians recommended vaccination and provided counseling while conducting another activity in the visit where the data collector is not present (e.g. physical exam), which would lead to an underestimate of counseling time. It is important to note that the total time and costs in the direct observation time-motion study for IM practices are underestimated as provider counseling for IM was aggregated into other activities (Table 2) that were not ascribed the higher (e.g., physician or nurse practitioner) wage rates.

5. Conclusion

Adult vaccine providers should consider the volume of vaccinations and fixed costs as an important factor affecting total cost per vaccination. Practices can take advantage of the economies of scale associated with fixed administrative costs by increasing the number of recommended vaccinations they administer to their patients.

Another important factor for practices to consider is resources spent on patients who are considered for vaccination, but do not receive a vaccination. If providers cannot bill for this time, then time spent counseling without vaccination can drive up costs. It is therefore important for practices to utilize effective counseling methods and increase the uptake of

vaccinations for counseled patients. Considering these approaches can help practices to increase the financial stability of vaccination at their practice.

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Table 1

Practice characteristics.

Practice	Census region	Practice type	Size[a]	Health system	Vaccines observed during the time motion study
A	West	FM	Large	Yes	Zoster, Tdap, Td, PPSV23, PCV13, HPV
B	West	FM	Large	Yes	Zoster, Tdap, PPSV23, PCV13, HPV
C	South	FM	Large	No	Zoster, Tdap, PCV13, HepAB
D	South	FM	Large	Yes	Zoster, Tdap, PCV13, MCV, HepAB
E	West	FM	Large	Yes	Zoster, Tdap, PPSV23, PCV13
F	West	IM	Large	Yes	Zoster, Tdap, PPSV23, PCV13
G	West	IM	Large	Yes	Zoster, Tdap, PCV13, other
H	South	IM	Small	Yes	Zoster, PPSV23, PCV13
I	South	IM	Small	Yes	PPSV23, PCV13
J	South	OBGYN	Large	Yes	Tdap
K	South	OBGYN	Large	Yes	Tdap, HepAB
L	West	OBGYN	Large	Yes	Tdap, Td
M	South	OBGYN	Large	No	Tdap, HPV, other
N	Midwest	OBGYN	Large	Yes	Tdap, MCV
O	Midwest	OBGYN	Large	Yes	Tdap, HPV
P	West	OBGYN	Small	No	Tdap

Notes:

[a]. Small = 1–2 providers; larger = 3 + providers

Table 2

Time and associated cost of vaccinating patients in the observed vaccine workflow, per vaccine, by practice type from the vaccination time-motion study.

Activity	PRACTICE TYPE					
	FM (Practice n = 5; Patient n = 89)		IM (Practice n = 4; Patient n = 38)		OBGYN (Practice n = 7; Patient n = 76)	
	Median Time (minutes:seconds)/ Vaccine administered	Median Cost ($)/ Vaccine administered	Median Time (minutes:seconds)/ Vaccine administered	Median Cost ($)/ Vaccine administered	Median Time (minutes:seconds)/ Vaccine administered	Median Cost ($)/ Vaccine administered
(1) Additional Review of Patient Record[1]	0:02 (0:00–2:46)	**$0.04 ($0–$1.43)**	0:00 (0:00–0:44)	**$0.00 ($0–$0.56)**	1:10 (0:42–2:46)	**$1.02 ($0.58–$2.02)**
(2) Provider Counseling; (3) Preparation of Vaccine; (4) Preparation of Patient, Administration, Disposal; and (6) Post-Vaccination Observation	3:09 (1:03–7:12)	**$3.51 ($0.86–$6.43)**	1:57 (1:20–3:47)	**$1.55 ($1.21–$3.33)**	8:22 (5:26–16:27)	**$10.52 ($5.38–$16.96)**
(5) Documentation in patient record (chart, Electronic Health Record)[2]	0:47 (0:00–3:09)	**$0.68 ($0–$2.41)**	0:28 (0:00–1:16)	**$0.41 ($0–$1.09)**	1:38 (1:03–3:22)	**$1.36 ($0.89–$2.19)**
Median of Total Time or Cost	4:51 (1:03–12:13)	**$4.39 ($0.86–$10.26)**	2:48 (1:36–4:44)	**$2.33 ($1.29–$4.15)**	10:34 (8:42–20:50)	**$12.06 ($7.87–$19.73)**

Source Notes: Minimum and maximum values are noted in parentheses. Results in this table only includes patients that received a vaccination.

[1]The workflow at some practices did not include additional review of patient record upon intake and triage. In these practices, no time was recorded for this activity. This occurred in 74% of patient observations. Assessment of immunization status was determined in advance of patient appointment and captured in the Management Survey.

[2]No time was recorded for the documentation in patient record activity as some data collectors recorded this activity in other activity areas. This occurred in 9% of patient observations.

Table 3

Median time and cost spent with patients assessed and indicated for vaccination, by vaccination status and provider type from the vaccination time-motion study.

	Unvaccinated Patients			Vaccinated Patients				*Time/Vaccine Administered (including time of all patients)*	*Cost Per Vaccine Administered/ Patient (including time of all patients)*
Practice Type	**N**	**Median Time per Patient (Minutes:seconds)**	**Median Cost per vaccine**	**N**	**Median Time per Vaccine (Minutes:seconds)**	**Median Cost per patient**	**% of Patients who Declined Vaccinations**	***Median Time per vaccine (minutes:seconds)***	***Median Cost per vaccine***
FM	**41**	3:20 (0:22–10:33)	**$4.29 ($0.28–$9.92)**	**89**	4:51 (1:03–12:13)	**$4.39 ($0.86–$10.26)**	**32%**	*5:01 (3:13–17:45)*	***$4.54 ($2.53–$14.55)***
IM	**36**	0:19 (0:14–0:23)	**$0.19 ($0.03–$0.30)**	**38**	2:48 (1:36–4:44)	**$2.33 ($1.29–$4.15)**	**49%**	*4:55 (2:35–5:32)*	***$4.06 ($2.30–$4.31)***
OBGYN	**171**	8:35 (3:14–10:33)	**$8.28 ($2.62–$11.82)**	**76**	10:34 (8:42–20:50)	**$12.06 ($7.87–$19.73)**	**69%**	*28:43 (20:17–57:30)*	***$25.89 ($17.40–$199.01)***

Source Notes: Minimum and maximum values are noted in parentheses. For these *italicized columns*, the costs associated with counseling a patient who does not go on to receive a vaccine are added to the costs associated with patients who received vaccines; this total cost is divided by the original number of vaccines given. Therefore, additional time and costs are spread over the same number of vaccines, so the time and costs in these columns are greater than the values in the columns associated vaccinated patients only. Minimum and maximum values are noted in parentheses.

Table 4

Median time and cost of vaccination workflow activities, per vaccine, by practice type from vaccine practice management survey.

Activity	PRACTICE TYPE					
	FM (n = 6)		IM (n = 5)		OBGYN (n = 6)	
	Time (minutes:seconds)/ Vaccine administered	Cost($)/Vaccine administered	Time (minutes:seconds)/ Vaccine administered	Cost($)/Vaccine administered	Time (minutes:seconds)/ Vaccine administered	Cost ($)/Vaccine administered
(1) Review patient record and assess immunization	0:26 (0:00–3:32)	**$0.17 ($0–$2.00)**	0:54 (0:00–20:00[1])	**$0.39 ($0–$15.32)**	0:38 (0:00–33:44)	**$0.40 ($0–$12.96)**
(2) Forecast demand and order vaccines	0:57 (0:41–2:38)	**$0.93 ($0.54–$ 1.76)**	1:30 (0:16–40:00[1])	**$1.34 ($0.40–$30.64)**	7:44 (2:06–22:30)	**$9.02 ($2.08–$17.76)**
(3) Manage vaccine inventory and associated supplies	1:26 (0:40–2:38)	**$0.83 ($0.47–$3.56)**	1:09 (0:45–30:00[1])	**$2.24 ($0.54–$36.60)**	6:37 (2:51–23:28)	**$4.89 ($2.03–$11.26)**
(4) Staff vaccination training and continuing education	0:02 (0:00–1:19)	**$0.01 ($0–$0.73)**	0:46 (0:00–30:00[1])	**$0.28 ($0–$34.97)**	2:09 (0:00–23:10)	**$2.90 ($0–$14.15)**
(5) Billing for vaccine and vaccination services	0:00 (0:00–3:32)	**$0.00 ($0–$5.27)**	0:00 (0:00–4:00)	**$0.00 ($0–$1.50)**	9:43 (0:00–93:50)	**$3.53 ($0–$40.09)**
(6) Entry into state immunization information systems	0:00 (0:00–3:57)	**$0.00 ($0–$2.14)**	0:00 (0:00–0:00)	**$0.00 ($0–$0)**	0:00 (0:00–0:00)	**$0.00 ($0–$0)**
Median of total time or cost	3:21 (1:26–12:40)	**$2.27 ($1.30–$12.11)**	6:23 (3:09–120:00[1])	**$4.16 ($3.11–$117.53)**	41:30 (8:05–149:13)	**$25.05 ($6.62–$81.27)**

Source Notes: Minimum and maximum values are noted in parentheses. Values in this row are the medians of total time or costs found in the vaccination management survey. These values are not equal to the sum of the four rows above.

[1] All of the max values from the IM practices column come from a smaller practice that only administered 3 vaccines in the week of the study.

Table 5

Median total costs from the vaccination time-motion and vaccine practice management survey.

Practice Type	Median Total Cost, including only vaccinated patients $vaccine administered	Median Total Cost, including vaccinated and unvaccinated patients $/vaccine administered
FM (n = 5)	$6.94 ($2.22 – $19.64)	$7.09 ($3.88 – $24.14)
IM (n = 4)	$7.23 ($5.41 – $118.81)	$8.04 ($5.41 – $121.84)
OBGYN (n = 6)	$36.04 ($17.56 – $91.08)	$42.65 ($25.79 – $280.28)

Source Notes: Minimum and maximum values are noted in parentheses.