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Using a mixed methods approach to examine practice characteristics associated with implementation of an adult immunization intervention using the 4 Pillars™ Practice Transformation Program

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BACKGROUND

The development of vaccines has been credited with the prevention of more than 100 million cases of contagious diseases since 1924 (van Panhuis et al., 2013). In spite of this success, new cases of vaccine-preventable disease occur each year. There were more than 28,000 confirmed cases of pertussis reported in the United States in the year 2014 alone (“2014 Provisional Pertussis Surveillance Report,” 2015), and from September 28, 2014–May 23, 2015, more than 125,000 confirmed cases of seasonal influenza (Appiah et al., 2015). Approximately 28,000 adults are hospitalized for influenza-related critical illness annually (“Estimates of deaths associated with seasonal influenza --- United States, 1976–2007,” 2010). In addition to the human impact, the persistence of vaccine-preventable disease has a significant financial toll. One recent study estimated that for the population of adults age 50 and older in the U.S., the annual economic burden attributed to four vaccine-preventable diseases (influenza, pneumococcal disease, shingles, and pertussis) was \$26.5 billion. These estimates included medical costs per case related to diagnoses and treatment as well as indirect costs, such as work loss and lost productivity (McLaughlin, McGinnis, Tan, Mercatante, & Fortuna, 2015).

In spite of these known impacts, immunization rates remain low. The rate of the combination tetanus, diphtheria, and acellular pertussis vaccine (Tdap) vaccination among adults aged 19 or older is just 17.2% (Williams et al., 2015). Rates for influenza immunization are only marginally better but increase with age: 32.3% for those aged 18–49, 45.3% in those 50–64 years, and 65.0% for adults aged 65 and older (CDC, 2013). Numerous barriers to immunization have been well documented. Consumer barriers include concern about side effects (Johnson, Nichol, & Lipczynski, 2008; McIntyre, Zecevic, & Diachun, 2014), low perceived risk of contracting disease (Johnson et al., 2008; McIntyre et al., 2014; Miller, Kretsinger, Euler, Lu, & Ahmed, 2011), low collective awareness of the availability of the vaccine (Johnson et al., 2008), and limited recommendations by medical providers (Johnson et al., 2008; McIntyre et al., 2014; Miller et al., 2011). Healthcare professionals perceive that patient barriers to immunization include inadequate healthcare coverage, patients’ fear of needles, and patients’ failure to attend well-care visits (Johnson et al., 2008). Provider and practice-level characteristics are also associated with low immunization rates and include the lack of adequate reminder systems (Johnson et al., 2008) as well as financial barriers and inadequate reimbursement, which specifically limits the abilities of small practices to stock and supply vaccines to their patients (Hurley et al., 2014).

A number of evidence-based interventions have been shown to increase immunization rates in primary care settings. The Community Preventive Services Task Force organizes these strategies into three key areas: (1) enhancing access to vaccination services, which includes providing immunizations in convenient settings and reducing out-of-pocket costs; (2) increasing demand among patients, via patient reminders and community education; and (3) provider- or system-based interventions such as reminders, modified work flow, standing order programs, or electronic immunization tracking (“Guide to Community Preventive Services,”). Although these strategies are known to be effective, they are not consistently implemented (Stinchfield, 2008). The process of implementing change within primary care settings is often complex and requires a range of facilitative supports (Crabtree et al., 2011).

The 4 Pillars™ Practice Transformation Program (formerly known as the 4 Pillars™ Immunization Toolkit) was designed to support practices in implementing recommended immunization strategies. The 4 Pillars™ Program is a web-based practice improvement program and transformation dashboard based on the implementation science framework of Fixsen et. al. (D. L. Fixsen, Naoom, Blase, & Friedman, 2005), which emphasizes staff selection, pre-service training, coaching, evaluation, and development of facilitative supports. The 4 Pillars™ Program provides background information about adult immunizations emphasizing their importance, adverse reactions, and healthcare coverage of immunizations, as well as evidence-based solutions framed within the following four pillars: (1) convenient vaccine services, including extending the season for influenza vaccination; (2) patient communication; (3) enhanced office systems, including standing order programs; and (4) motivating staff through an “Immunization Champion.”

An early version of the 4 Pillars™ Program was shown to improve immunization rates, especially among high-risk adults and in practices that successfully implemented strategies across all four pillars (Nowalk et al., 2016; Nowalk et al., 2014)¹. The 4 Pillars™ Practice Transformation Program has since been improved and digitized, and tested in a randomized controlled cluster trial. The intervention was based on the RE-AIM evaluation framework, which suggests that the impact of an intervention is a function of its Reach, Efficacy, Adoption, Implementation, and Maintenance (Belza, Toobert, & Glasgow, 2007). Thus, RE-AIM provides an evaluation framework that improves interpretation of findings in applied settings, extending evaluation domains beyond *a priori* primary outcomes, such as changes in immunization rates, to include broader evaluation domains such as practice setting and adoption (Kessler & Glasgow, 2011).

Results from the randomized cluster trial are not included herein; however, changes in rates varied across sites. This variability was not fully explained by intervention efforts and is consistent with previous research, which documents the fact that even when evidence-based strategies explain *what* must occur to improve public health outcomes, there is a significant gap in the practice of *how* change occurs (D. Fixsen, Scott, Blase, Naoom, & Wagar, 2011). The context in which change occurs is a critical factor when implementing evidence-based approaches to care (Tomoaia-Cotisel et al., 2013).

Herein we share findings from a mixed methods evaluation of the intervention’s implementation, including the use of the 4 Pillars™ Program and its impact on immunization rates within primary care practices, and describe characteristics of a practice environment that are conducive to effective practice change. The mixed-methods approach provides valuable detail about the setting and context in which implementation takes place and therefore improves interpretation of results (Klassen, Creswell, Plano Clark, Smith, & Meissner, 2012).

¹Additional information regarding the 4 Pillars Practice Transformation Program can be found at <http://www.4pillarstransformation.pitt.edu>.

Methods

The study was approved by the Institutional Review Boards of the two universities and one Texas health system that collaborated on this research. This randomized cluster trial was conducted in 2013–2015 in twenty-four primary care practices that had a majority of adult patients, baseline immunization rates for at least one adult vaccine <50%, and a willingness to participate in the study to improve vaccination rates. Nineteen of the practices were located in Southwestern Pennsylvania and affiliated with a large, private integrated healthcare delivery system. The remaining 6 practices were located in Houston, Texas and were part of a county health system that contracted with a nearby health sciences university to provide physician care within these safety net clinics.

Twelve practices received the intervention in Year 1 (2013–14) (one practice dropped out in Year 1) and twelve practices serving as control sites during Year 1 received the intervention in Year 2 (2014–15). Four practices which took part in the active intervention in Year 1 elected to maintain active engagement in the study during Year 2. This study focuses on the eleven practices that completed the intervention in Year 2 and three of the Year 2 re-intervention practices. One Year 2 re-intervention practice was not able to schedule an interview within the dedicated study period.

The intervention included an initial visit to each site by one of the study investigators to introduce the study and the 4 Pillars™ Program and to identify site-specific strategies for implementation. Practices identified an Immunization Champion to be responsible for interacting with the web-based 4 Pillars™ Program to guide strategy implementation. Other roles for the Immunization Champion included biweekly telephone-call coaching with the research liaison to ensure that chosen strategies were being implemented. The practices were given bi-weekly graphs delineating their progress toward immunization goals.

Influenza and Tdap immunization data were collected using de-identified information from practices' electronic medical records from January 2012 through January 2015. The population consisted of all patients 18 years of age with at least one visit to the practice during each year of the study. Immunization rates were calculated using the patient census as the denominator and the number of patients who received influenza vaccine as the numerator. Tdap vaccination was calculated as a cumulative value for each year. Because three of the practices were held over to receive a second year of the intervention, the differences in rates were calculated for each practice based on the first year it received the intervention versus the year immediately preceding the intervention.

Paired samples t-tests (alpha <.05) were conducted in SPSS 22 to examine changes in immunization rates by type of practice.

Qualitative data were collected with the primary goal of understanding implementation success, specifically, *how* implementation took place and *why* differential rates of implementation occurred. RE-AIM was used as an organizing framework. In Year 1 of the study, qualitative interviews had been conducted with each of the 13 practices that received the intervention that year, in order to assess the extent to which 4 Pillars™ strategies were

implemented, or *the degree to which* implementation took place. Findings from Year 1 observations also informed the interview protocol for Year 2 of the qualitative evaluation.

In Year 2, the aim of the qualitative evaluation was to understand how implementation took place and *why* differential rates of implementation occurred. During the winter of 2014–2015, a qualitative researcher visited all the Year 2 intervention sites for onsite observation and individual or small-group interviews with practice staff members such as ICs, physicians, medical assistants, practice managers, and other team members identified by each practice as being integral to immunization efforts. A semi-structured protocol (Table 1) was used to assess barriers to and facilitators of implementation within the context of the reach, effectiveness, adoption, implementation, and maintenance of the 4 Pillars™ Program strategies. Interviews were audio-recorded and subsequently reviewed for thematic analysis by two qualitative researchers. These themes were then used to develop systematic classification into groups to describe practice characteristics and explain the level of implementation of the intervention.

Four practice characteristics were identified from the thematic analysis of the interviews as being important to intervention implementation, namely, degree of quality improvement history, communication and practice leadership, Immunization Champion leadership effectiveness, and organizational flexibility. A scoring system was developed in which each practice was ranked by the researcher who conducted the interviews as being low (score = 1), medium (2), or high (3) in relation to each of these four practice characteristics, and the scores were summed across characteristics. Thus, the lowest possible score a practice could receive was 4, and the highest possible score was 12, with high scores indicating high readiness for success in implementing practice change for quality improvement. A fifth characteristic that was included was system affiliation; the practices in Pennsylvania and Texas differed significantly in governance, culture, and size. Members of the intervention team who had provided 4 Pillars™ Program orientation and support and were familiar with practice characteristics also assigned scores to each practice in order to triangulate results, i.e., provide multiple perspectives.

Each of the practices was then examined for implementation success, stratified by the five-level practice classification system. Implementation success was assessed by the qualitative researcher, who conducted the site observations and documented the number of strategies that were implemented as well as degree of implementation. Implementation success was also scored by the intervention team. High Implementer practices, with the highest practice characteristic scores, implemented the most 4 Pillars™ Program strategies, with the fullest degree of uptake. Staff members at these practices could readily describe the strategies that were implemented as well as the impact that they had on immunization rates. Low Implementer practices implemented the fewest 4 Pillars™ strategies, and strategies were only superficially implemented. For example, Low Implementer practices that implemented standing order programs had staff members who could not accurately describe how standing orders worked, or which staff members were able to give immunizations. Mid-Implementer and Public/University practices demonstrated mid-range implementation success.

The four practice characteristics that were scored for grouping practices into types were as follows.

Quality Improvement History

Some practices had extensive experience implementing rapid improvement cycles or other outcomes-based care initiatives, and that this experience better prepared them for 4 Pillars™ Program implementation. Each of the practices was scored as having: no quality improvement experience (score = 1); some quality improvement experience (score = 2); or a high degree of quality improvement experience (score = 3).

Communication and Practice Leadership

Two items comprised this characteristic: the manner in which decision-making took place; and communication patterns between leadership and the rest of the staff about system changes and other issues. Communication and Practice Leadership was scored as: top-down, in which information flowed in one direction, and was typified by the physician giving directives rather than engaging in active conversation with staff members (score = 1); mid-level, wherein physicians and staff members engaged in active conversation but with an evident power differential (score = 2); and, two-way, in which information between physicians and staff members flowed in both directions, reflecting physician buy-in and a mutual respect for ideas (score = 3).

Immunization Champion Leadership Effectiveness

The leadership and effectiveness of the IC included his/her stature in the practice, commitment to the project, and ability to motivate the staff. This was rated as low, in which the IC did not actively lead the practice in 4 Pillars™ Program implementation, was not well versed in 4 Pillars™ Program strategies, and/or was not recognized as a clinical or management leader within the practice (score = 1); mid-level, where ICs carried out some limited activities to motivate 4 Pillars™ Program strategy implementation (score = 2); or motivational, where the IC was respected for his or her leadership and/or clinical role and was able to lead staff in making office systems changes (score = 3).

Organizational Flexibility

This characteristic describes the degree to which practices were amenable to implementing study strategies. Fixed practices were observed as being resistant to change. Staff members in fixed practices often reported that there was no need to change or explore new approaches to care (score = 1). Mid-level practices demonstrated some historical attempts at implementing change and were willing but challenged by the concept of change (score = 2). Open practices were assessed as being nimble and embracing of positive change (score = 3).

Affiliation

Practices were either part of the private integrated health delivery system (Pennsylvania sites) or the Public/University partnership system (Texas sites). This characteristic was not scored numerically.

After assigning each practice a score for the above characteristics, the practices were grouped into a five-level practice typology (Table 2) *Low Implementer* practices were assessed as having mostly “1” scores, with total scores 5. These practices had no quality improvement experience, top-down communication patterns, limited IC leadership, and fixed approaches to patient care, resulting in low adoption of 4 Pillars™ Program strategies. *Moderate Implementer* practices were practices with mostly “2” scores, with some quality improvement experience, mid-level communication patterns, mid-level IC leadership in the 4 Pillars™ study, and some demonstrated interest in change implementation. Total scores for these practices ranged from 7–8. *High Implementer* practices were those with mostly “3” scores and totaling 10–11, and were more likely to have quality improvement experience, two-way communication patterns, effective ICs, and open organizational flexibility. The last set of practices included all of the sites in the *Public/University* health system. Structurally, these practices differed from all of the Pennsylvania sites because of their two-employer system. All of the support staff was employed by the county, whereas the physicians, who typically provide leadership in primary care practices, were employed by the local university medical school.

Results

Four of the practices were assigned as *Low Implementers*, four of the practices were assigned as *Moderate Implementers* and four of the practices were assigned as *High Implementers*. The split loyalty of the University/Public practices made implementing changes in office systems difficult to manage, because physicians expressed that they had limited freedom to implement staffing or practice-wide policies. Even though these practices frequently demonstrated high degrees of quality improvement experience, two-way communication patterns, motivated Immunization Champion leadership, and organizational flexibility, these characteristics were dominated by the health system structure thus did not always effectuate practice change.

Some 4 Pillars™ Program strategies occurred more frequently within specific practice types. For example, High Implementer and Public/University practices were more likely than Moderate- and Low Implementer practices to have fully implemented standing order protocols, as well as to have Immunization Champions with clinical responsibility and authority within the practice setting. Moderate- and Low Implementer practices were less likely to have fully adopted standing order protocols or to have Immunization Champions with authority, who were less able to motivate the team to improve immunization rates. Also, staff members from High Implementer and Public/University practices more frequently reported that the progress graphs they received were motivational and inspired a sense of “healthy competition,” because they wanted to outperform other practices. Moderate- and Low Implementer practices were more likely to express doubts about the accuracy of the data in the progress graphs, or to not use them at all. Table 3 shows examples of 4 Pillars™ Program strategies that were evaluated using the RE-AIM framework with examples of each of the practice types.

Practice type was related to changes in immunization rates for influenza and Tdap. At baseline, mean vaccination rates for both influenza and Tdap were lowest among Low

Implementers and highest among High Implementers (Table 4). At the end of the study period, High Implementer practices significantly increased average influenza uptake (3.0 percentage point difference; $p = .038$) and average Tdap vaccination rate (9.3 percentage point difference; $p = .006$) and Public/University practices significantly increased average Tdap vaccination rate (6.5 percentage point difference; $p = .012$), while Moderate and Low Implementer practices did not significantly improve rates for either vaccine.

Discussion

Because of its value in predicting implementation success and public health impact, the use of RE-AIM in translational research has grown consistently since its development, with at least 144 published studies citing use of this framework in the past 14 years (Shoup, Gaglio, Varda, & Glasgow, 2015). In keeping with the RE-AIM model, primary care practices in this study were supported through the intervention using the 4 Pillars™ Practice Transformation Program, which included approaches such as improving patient notification and accessibility of immunizations (Reach); implementing evidence-based interventions including standing order protocols (Effectiveness); increasing the number of staff members who were skilled at delivering 4 Pillars™ Program strategies and creating an Immunization Champion role (Adoption); supporting the use of site-specific immunization strategies via conference calls and an online dashboard to track progress (Implementation); and motivating staff by sharing progress towards goals via monthly progress charts (Maintenance). The 4 Pillars™ Program is designed to be adaptable to a wide range of practices because strategies can be chosen and modified to fit the unique culture and structure of each. Given the complexities associated with practice-level change (Crabtree et al., 2011) and the fact that practices do not uniformly achieve desired increases in adult vaccination rates, an in-depth examination of the process and degree of implementation of the intervention was warranted.

This qualitative evaluation provided a critical view of the participating practices' barriers and facilitators to implementation of toolkit strategies. This approach is supported by previous implementation studies that demonstrate the need to qualitatively evaluate the process for change in conjunction with *a priori* quantitative target outcomes (Balasubramanian et al., 2015). By using the RE-AIM framework to examine implementation success and the resulting changes in immunization rates by practice type, it is apparent that pre-existing practice characteristics may help to explain implementation success. Practices with histories of outcomes-based care and that demonstrated open communication patterns, organizational flexibility, and motivational and involved Immunization Champion leadership implemented a greater number of 4 Pillars™ Program strategies than other practices, and these strategies were more likely to be fully implemented. Although practices affiliated with the University/Public setting scored similarly to the High Implementers, their success with implementing the Toolkit and changes in vaccination rates were less pronounced. System characteristics appeared to outweigh practice characteristics.

This study has several limitations. First, generalizability of results is limited by the fact that only 14 primary care practices were studied, and parsing these practices into four different types limits power for the quantitative analysis. In addition, on-site observations and

qualitative interviews were conducted by one researcher. This limitation is partially mitigated by the fact that the scoring of practices was also conducted by members of the implementation team who were also familiar with the participating practices in order to triangulate the results. Conducting qualitative interviews with practice leadership and staff members gave practices the opportunity to articulate challenges and strategies for overcoming them. When paired with quantitative findings, these qualitative results provide a richer dataset, contributing to the development of best practices in improving immunization rates at the practice level.

The value of this study is two-fold in that the findings have implications for clinical providers who are seeking to undertake quality improvement projects, as well as researchers who are designing practice change interventions. From a clinical perspective, these findings may be useful in helping other practices to implement practice change strategies. A practice assessment based on the four-level practice typology may help providers better prepare for implementation of the 4 Pillars™ Practice Transformation Program and other practice change approaches and may be an enhancement to the 4 Pillars™ Program. Previous research shows that a one-size-fits all approach is not successful in primary care practices (Crabtree et al., 2011). Recognizing characteristics that prepare for positive change can enable investigators to adjust intervention methods to align more closely with baseline practice characteristics. Consequently, they may experience greater rates of success in improving immunization and other patient care outcomes.

These findings also have several implications for researchers. When designing future randomized cluster trials in primary care settings it may be useful to stratify practices not just by patient population and location, but also by practice type to gauge a practice's readiness for change. Doing so may present a clearer picture of barriers that need to be addressed before or as an intervention is executed. Additional research is needed to test and refine the practice typology as suggested here, and to assess the degree to which modifying the intervention in response to practice characteristics will improve adult immunization rates.

The ability to implement change within primary care settings requires more than intent to participate, especially when considering methods to improve adult immunizations rates. Practice characteristics such as experience with quality improvement or practice change research projects, leadership and communication style, organizational flexibility, as well as the potential effectiveness of the selected immunization champion may be critical factors in predicting success of the intervention.

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Table 1

Interview Protocol

| | |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Question | <i>Tell me about how your practice became involved with this study?</i> |
| Prompts | <ul style="list-style-type: none"> • How did you/your practice find out about the study? • Who made the decision to participate? • Why did he/she want to participate? • (If not the decision maker): Would you have decided to participate in the study if it were up to you? Why or why not? • Does this practice have previous experience with participating in research studies or outcomes-based care? |
| Question | <i>I understand that you have used the following strategies from the Toolkit. Let's talk about them.</i> |
| Prompts | <ul style="list-style-type: none"> • Of the strategies you are using, which are new since enrolling in the study? • How many staff members are involved in the implementation of the chosen strategies? • To what extent has the strategy been incorporated into usual care? • Has the Toolkit helped with implementation of strategies? • How is it working? What are the barriers to implementing strategies? |
| Question | <i>Tell me about your practice's experience with Standing Orders.</i> |
| Prompts | <ul style="list-style-type: none"> • Are they in use here? • What triggers a standing order? Vital signs? • Is this a system-wide policy? <ul style="list-style-type: none"> – For practices who have initiated them: – How has the staff used SOPs? – Were they in place prior to this study? – How have patients reacted? – Have there been any problems? How have you resolved them? – Have you used the statements in the toolkit to assist with encouraging patients to be vaccinated? <p>For practices that have not: What has stopped your practice from implementing standing orders?</p> |
| Question | <i>Tell me about your experience with the Toolkit.</i> |
| Prompts | <ul style="list-style-type: none"> • What has changed from [the beginning of the study implementation period] to the present with regards to using the toolkit? • Do you feel the toolkit is easy or difficult to use? <ul style="list-style-type: none"> – How much time does it take you to update tasks? • Was there any aspect of the toolkit you found to be particularly useful? What did you like best? |

| | |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | <ul style="list-style-type: none"> • What were the barriers to using this online toolkit website (choose all that apply)? • In using the 4 Pillars™ Immunization Toolkit would you say that you learned new information, refreshed or re-enforced what you already knew, or did not learn anything new? • Do you have any suggestions for improvement? |
| Question | <i>Does your staff know if you are reaching your vaccination targets?</i> |
| Prompts | <ul style="list-style-type: none"> • How is that information being transmitted? |
| Question | <i>What activities has the Immunization Champion done to encourage increased vaccination efforts?</i> |
| Prompts | <ul style="list-style-type: none"> • How has your staff responded to ideas about changing immunization efforts? |
| Question | <i>Knowing what you now know about the study, if you could go back in time, what would you change about this study?</i> |

Table 2

Practice Classifications

| | Degree of QI History | Communication and Practice Leadership | Immunization Champion Leadership Effectiveness | Organizational Flexibility | Affiliation | Total Score |
|--------------------------|----------------------|---------------------------------------|------------------------------------------------|----------------------------|-------------|-------------|
| Low Implementers | | | | | | |
| Site 1 | 1 | 1 | 1 | 2 | U | 5 |
| Site 2 | 1 | 1 | 1 | 2 | U | 5 |
| Site 3 | 1 | 1 | 1 | 2 | U | 5 |
| Mid-Implementers | | | | | | |
| Site 4 | 1 | 2 | 2 | 2 | U | 7 |
| Site 5 | 1 | 2 | 2 | 2 | U | 7 |
| Site 6 | 1 | 1 | 3 | 3 | U | 8 |
| Site 7 | 3 | 2 | 1 | 2 | U | 8 |
| High Implementers | | | | | | |
| Site 8 | 2 | 3 | 3 | 3 | U | 11 |
| Site 9 | 1 | 3 | 3 | 3 | U | 10 |
| Site 10 | 1 | 3 | 3 | 3 | U | 10 |
| Site 11 | 2 | 3 | 3 | 3 | U | 11 |
| Public/University | | | | | | |
| Site 12 | 3 | 3 | 3 | 3 | P/U | 12 |
| Site 13 | 3 | 3 | 3 | 3 | P/U | 12 |
| Site 14 | 3 | 3 | 2 | 3 | P/U | 11 |

¹ Degree of QI History: 1 = No experience with outcomes-based care; 2 = Some experience with outcomes-based care; 3 = High degree of experience with outcomes-based care.

² Communication/Practice Leadership: 1 = Top-down, information flows in one direction; 2 = Mid-level. Staff and physicians engage but power differential is evident; 3 = Two-way communication, information flows in both directions, mutual respect for ideas.

³ Immunization Champion Leadership Effectiveness: 1 = Limited, Immunization Champions did not actively lead the practice in 4 Pillars™ Program implementation; 2 = Mid-level: Immunization Champions carried out some activities to motivate for Toolkit implementation; 3 = Motivational: Immunization Champions are leaders and integrate 4 Pillars™ strategies.

⁴ Organizational Flexibility: 1 = Fixed, resistant to change; 2 = Mid-level, some attempts at change, practice is willing but struggles with implementing change; 3 = Open, practice is nimble, embraces positive change.

⁵ Health system affiliation: P = Private integrated health delivery system; P/U = Public/University health system.

Table 3
Examples of Interview Responses by Practice Classification Using the RE-AIM Framework

| RE-AIM Component | Corresponding 4 Pillars™ Strategy | Low Implementers | Moderate Implementers | High Implementers |
|-----------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Reach | Patient Notification Express vaccination services. | Staff members report that patient notification is not needed because “patients just know” that flu shots are recommended and available. | Flu clinics are scheduled “when there is room in the schedule or when physicians are on vacation.” | MAs have stopped asking “Do you want your shot?” and instead ask, “Did the doctor already give you your shot?” When patients call to ask about flu shots, they are asked “When do you want to come in?” to ensure low-threshold access. |
| Effectiveness | Evidence based practices are used, including standing orders. | As noted by one Office Manager, “I am not sure MAs will ever be comfortable doing immunizations without physician approval.” | Although standing orders for immunizations are in place, Medical Assistants express discomfort in administering immunizations without checking with the physician first. Immunizations are “pending” in EMR rather than administered via standing orders. | Standing orders were implemented for Tdap after a successful experience implementing standing orders for influenza. As per one Immunization Champion, “It’s just a matter of implementing a new process.” |
| Adoption | Strategies are encouraged via staff training and the creation of an IC role. | IC is not a practice leader but was placed in this role by default: “I went to Disney, I came back, and Bam! I was the Immunization Champion...I’m not sure what I’m supposed to do.” | IC responsibilities are limited to administrative tasks; no leadership or motivational role. | IC is recognized as an informal and natural leader. She is on top of the administrative and managerial aspects of getting this study off the ground, but also encourages whole team approach. Her supervisor noted that the IC is naturally enthusiastic and encouraging, so people “just fall into step behind her.” This IC also developed a process for streamlining immunization, documenting, VIS, and discharge to make this process work smoother. |
| Implementation | Ongoing support through regular conference calls and online 4 Pillars™ Program. | IC states that she is “Not sure about all of this” and that “No one has time in this office to sit and read articles or to watch videos.” | Online 4 Pillars™ Program is used primarily for tracking progress and checking off completion of steps. | Online 4 Pillars™ Program is used to gather ideas and develop tools for planning. |
| Maintenance | Motivation through monthly progress charts. | Progress as documented through charts is not shared with staff. | IC notes that at some point she might share graphs more consistently but right now “staff is not very interested in them.” | IC shared with MAs during a morning informal huddle: “Hey, guys, we got the highest percentage in Tdap and flu! Congratulations!” |

Note: EMR=electronic medical record; IC=Immunization Champion; MA=medical assistant

Relationships of Practice Classifications with Implementation and Vaccination Outcomes

Table 4

| Practice Type | INFLUENZA IMMUNIZATION RATES | | | | TDAP IMMUNIZATION RATES | | | |
|-----------------------------|------------------------------|-----------------------------|-------------------------------------------|-------------|----------------------------|-----------------------------|-------------------------------------------|-------------|
| | Mean % Pre intervention | Mean % Post intervention | Percentage point Difference, Mean (SD) | p-value* | Mean % Pre intervention | Mean % Post intervention | Percentage point Difference, Mean (SD) | p-value* |
| Low Implementers (n=3) | 42.8 | 44.9 | 2.1 (6.2) | .627 | 25.5 | 30.3 | 4.8 (2.0) | .056 |
| Moderate Implementers (n=4) | 51.3 | 51.3 | 0.0 (4.3) | 1.00 | 44.0 | 49.4 | 5.5 (1.9) | .062 |
| High Implementers (n=4) | 61.8 | 65.7 | 3.9 (2.2) | .038 | 53.4 | 62.8 | 9.3 (2.7) | .006 |
| Public/University (n=3) | 44.7 | 47.7 | 3.0 (2.3) | .146 | 41.8 | 48.3 | 6.5 (1.2) | .012 |

* Paired samples t-test