Impact of automated immunization registry-based telephonic interventions on adult vaccination rates in community pharmacies: a randomized controlled trial

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1. Scientific Technologies Corporation
2. Pharmacy Quality Alliance
3. VoicePort
4. Harvard Medical School
Disclosures – Project Sponsors
Effective vaccines important advance in modern medicine

Vaccine-preventable illness rates higher than necessary

- US cases – 18.5M per year\(^1\)
- Economic burden $9B, 80% attributed to missing vaccines\(^1\)

Healthy People 2020

- Flu, pneumococcal and zoster goals: 90%, 90%, 30%\(^2\)
- Actual 2016 rates: 66%, 60%, 20%\(^3\)
Health department interventions
- Immunization Information Systems
- Postcards and mailings for individual reminders
- Community wide education

Provider level interventions
- Standing orders in institutional settings
- Educational programs at discharge
- Client reminder and recall
- Home visits

Insurer level
- Reduced out-of-pocket expenses
- Employer-based clinics

Background – USPTF Interventions for Adults
Pharmacists have a growing vaccination footprint

Pharmacists provided 25% of flu in 2015-2016 season, contrasted to just 6% in 2005-2006\textsuperscript{5,6}

Accessible healthcare professional

- Additional 20 hours of vaccination training\textsuperscript{7}
- Pharmacists can vaccinate in 50 states\textsuperscript{7}
- Pharmacy within 5 miles of 95% of Americans\textsuperscript{8}
- Open late, holidays and weekends
Goals/Aims

- Determine the impact of a novel immunization-registry based automated telephonic intervention on adult vaccination rates using prompts for pneumococcal and herpes zoster vaccination
Methods – Study Setting

- ImmuSMART—Immunization Services Model for Adult Rate Improvement
- Reviewed by Chesapeake IRB, registered with clinicaltrials.gov
- RCT among adult patients ≥19 years of age at three pharmacy chains in NY, PA, and VT
- Examining the effect of a novel immunization registry-based automated telephonic intervention in community pharmacies
  - State registry queried to determine adult patient vaccine gaps
  - Patient offered opportunity to receive missing vaccines at next visit to pharmacy
  - Pneumococcal and herpes zoster vaccine rates compared between control and intervention patients
Methods – Eligibility Criteria

- Among patients slated to receive an automated call
- Adult patients age ≥ 19 enrolled from March 31, 2016 until March 31, 2017
  - High-risk patients 19-59 years old
  - ≥60 years old
- Missing either a pneumococcal or herpes zoster vaccination according to IIS and/or pharmacy dispensing records
- Approved by Chesapeake IRB
Patients randomized to intervention or usual care (control)

Intervention patients received a telephonic prompt, e.g. “Our records indicate that you are eligible for a pneumonia vaccination. There are two types of pneumonia vaccines, with both recommended for people above the age of 65 or with certain medical conditions. Pneumonia is a serious illness that can lead to other medical complications. Would you like a pharmacist to call you back to schedule your pneumonia vaccine?”

The message came as part of an outbound communication that varied by pharmacy chain:

• Medication synchronization preappointment call at Kinney Drugs’ 100 stores
• Refill ready call at Tops Markets’ 58 stores
• Refill reminder call at Price Chopper’s 88 stores
Primary outcomes (pharmacy dispensing data)
- Adult patient vaccination rate (receipt of ≥1 vaccine)
- Individual rates
  - Pneumococcal rates
  - Herpes zoster rates

Secondary outcomes (call data)
- Age and sex based rates
- Rate that patients complete calls (listen to entire message)
- Rate that patients respond to prompt
Methods – Statistical Analysis

- Intention-to-treat analysis
- Missing data: multiple imputation using chained equations
- Primary analysis using logistic regression
  - Unadjusted model
  - Adjusted model with covariates for age, sex, income (patient ZIP code average), race and education level
- Two-sided test, p<0.05 as statistically significant a priori
- Software: Stata 14.0
Methods – Additional analyses

- Subgroup analyses
  - Vaccination rate differences by sex
  - Vaccination rate differences by age
  - Vaccine-specific analyses

- Additional analyses
  - Call result analyses
  - Per-protocol analysis
Results – Randomization

All patients at pharmacy receiving telephonic outreach assessed

Randomized (n=22,301)

Excluded if:
• < 19 years or age
• Between 19-59 and not at high risk or ≥ 65 AND already had both pneumococcal and herpes zoster vaccine

Intervention (n=11,148)
• Received prompt (n=8,649)
• Did not receive because did not pick up, no voicemail (n=2,499)

Control (n=11,153)

Analyzed (n=11,123)
• Removed patients who were previously vaccinated (n=30)

Analyzed (n=11,134)
• Removed patients who were previously vaccinated (n=14)
## Results – Sociodemographics at Baseline

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Randomization Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
</tr>
<tr>
<td>No.</td>
<td>11,153</td>
</tr>
<tr>
<td>Age, mean, Y</td>
<td>63.3</td>
</tr>
<tr>
<td>Female, %</td>
<td>57.6</td>
</tr>
<tr>
<td>Median income, mean in ZIP code, $</td>
<td>67,069</td>
</tr>
<tr>
<td>Black race, mean % in ZIP code, %</td>
<td>5.0</td>
</tr>
<tr>
<td>Education, % undergrad or higher in ZIP code, %</td>
<td>26.8</td>
</tr>
</tbody>
</table>
Results – Intervention Reach

- Large percentage of calls not listened to completely
  - 1\textsuperscript{st} call result—79.6\% incomplete (voice mail, hang-up, no answer)
  - 2\textsuperscript{nd} call result—93.9\% incomplete
  - 3\textsuperscript{rd} call result—99.0\% incomplete
- Overall completion: 3,696/11,134 = 33\%
- No crossovers; no loss to follow-up
Results – Primary Outcome and Analysis

- Adult vaccination rate (adults who received ≥1 vaccine)
  - Control vaccination rate: \( \frac{227}{11,123} = 0.0204 \)
  - Intervention vaccination rate: \( \frac{239}{11,134} = 0.0215 \)

- Logistic regression
  - OR = 1.05 (0.88-1.27); \( p = 0.58 \)
  - Identical results in crude model, and adjusting for age, sex, education, race and income

Vaccination rates:

- Control: 11 (Both Vaccines), 95 (Zoster only), 121 (Pneumo only), 227 (Total)
- Intervention: 25 (Both Vaccines), 88 (Zoster only), 125 (Pneumo only), 238 (Total)
## Results – Subanalyses

<table>
<thead>
<tr>
<th>OUTCOME</th>
<th>VS CONTROL ODDS RATIO (95% CI)</th>
<th>UNADJUSTED*</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMARY</td>
<td>1.05 (0.88-1.27)</td>
<td>0.58</td>
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<tr>
<td>AGE, Y</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>&lt; 60</td>
<td>1.57 (0.80-3.07)</td>
<td>0.19</td>
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</tr>
<tr>
<td>≥ 60</td>
<td>1.02 (0.84-1.24)</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td>SEX</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEMALE</td>
<td>1.12 (0.88-1.43)</td>
<td>0.36</td>
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</tr>
<tr>
<td>MALE</td>
<td>0.96 (0.72-1.27)</td>
<td>0.77</td>
<td></td>
</tr>
</tbody>
</table>

*Adjusted model for age, sex, race, income and education produced identical results
Results – Outreach Results

- Few patients accepted prompt to schedule vaccination within completed calls
  - Pneumococcal only acceptance rate: 23/3,086 (0.7%)
  - Herpes zoster only acceptance rate: 5/590 (0.8%)
  - Both offered (in same call) acceptance rate: 103/4,842 (2.1%)
Low administration of vaccines among patients who accepted vaccination prompt to schedule vaccine appointment

- Herpes zoster only prompt: 0/5
- Pneumococcal only prompt: 0/23
- Both vaccines prompt: 1/103

First call completed predictive of vaccination, compared to no answer

- OR (95%CI) = 1.79 (1.12-2.87); p = 0.015
Results – Per-protocol analysis

Per-protocol analysis of completed, voicemail, and hang-up calls vs control

- Zoster: OR 1.62 (1.22-2.16); p = 0.001
- Pneumococcal: OR 1.29 (1.01-1.66); p = 0.042
Conclusions

- Overall study, prompt was not predictive of vaccination
  - Under per-protocol analysis, vaccination prompt was predictive of vaccination
  - Per protocol analysis could be biased
- Low overall number of vaccination events resulting in underpowered sample
- Low conversion of patients who accepted vaccination prompt
Limitations

- Lower engagement rate; counterbalanced by large sample of patients
- Patients did not complete most messages that are sent
  - Often goes to voice mail or patient does not listen to entire message before hanging up
- Indirect integration into pharmacy workflow
- Patients who accepted vaccine prompt were not vaccinated
  - New program/novel intervention
  - Limited communication between PI and pharmacists
- Possible limited workflow integration or UI challenges
Next Steps

- Additional research is needed
- Develop ways to increase engagement; troubleshoot existing intervention and pharmacist UI utilization
- Test new intervention using additional modalities (such as text and mobile) with higher rates of connecting with patient
- Improve behavioral prompt
  - Create digital genotypes using additional consumer data sources
  - Identify barriers to vaccination (e.g. vaccine hesitancy, cost, etc.)
  - Customize behavioral messages using behavioral economic theory
  - Use rapid throughput A/B test environment with machine learning to refine cluster groups and improve behavioral messages
References


Acknowledgements

- Project sponsorship: Pfizer and Merck
- Project oversight: Pharmacy Quality Alliance
- Project partners: Kinney Drugs, Tops Markets, PriceChopper, Scientific Technologies Corporation and VoicePort
- Faculty advisor: Niteesh K. Choudhry, MD, PhD