HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH

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

Background – Vaccines

- 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]

Background – USPTF Interventions for Adults[4]

- 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 – Pharmacists

- Pharmacists have a growing vaccination footprint
- Pharmacists provided 25% of flu in 2015-2016 season, contrasted to just 6% in 2005-2006[5,6]
- Accessible healthcare professional
  - Additional 20 hours of vaccination training[7]
  - Pharmacists can vaccinate in 50 states[7]
  - Pharmacy within 5 miles of 95% of Americans[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

Methods – Randomization

- 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

Methods – Outcomes and Data-sources

- 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

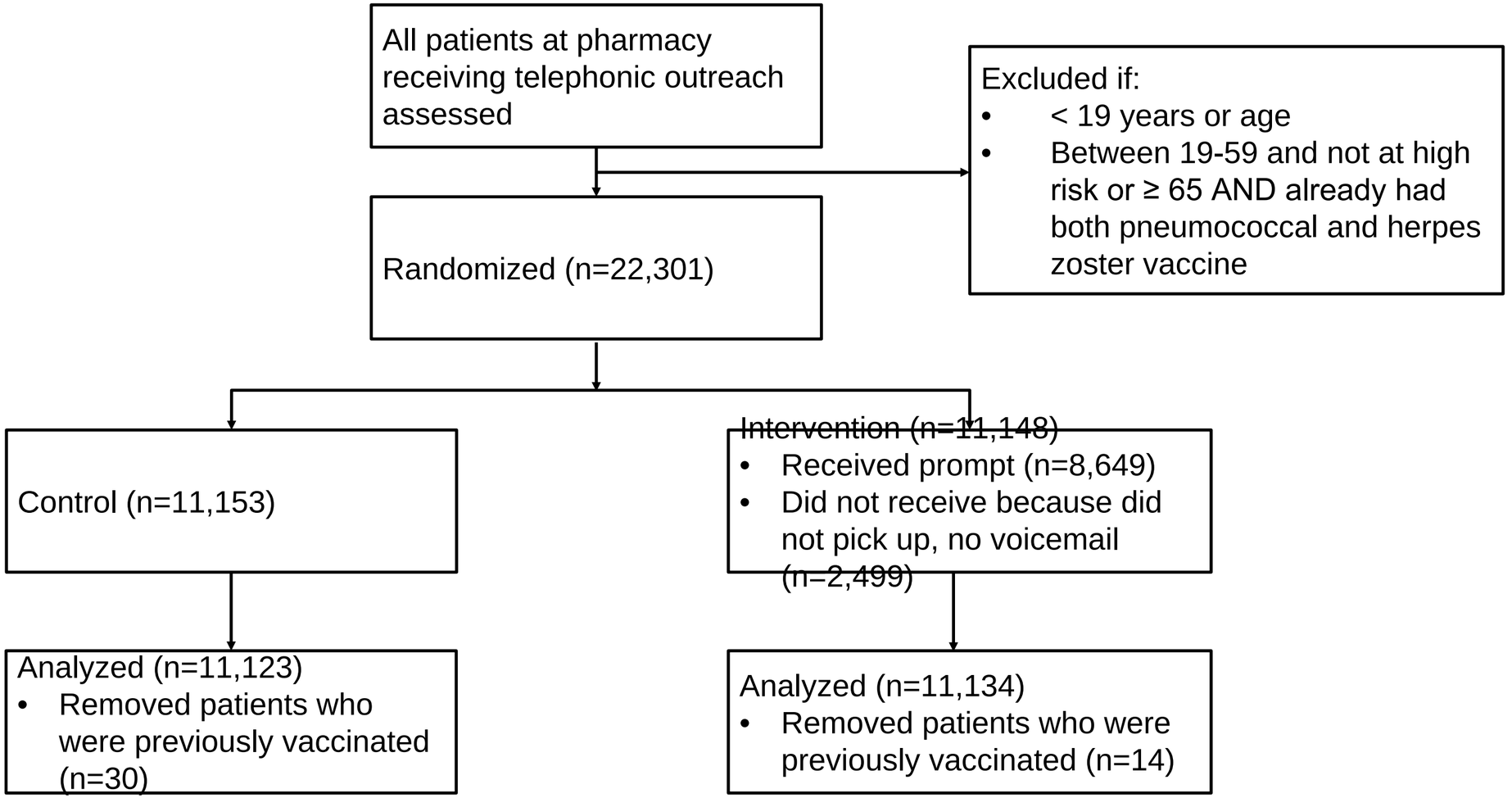
Methods – Statistical Analysis

- 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



Results – Sociodemographics at Baseline

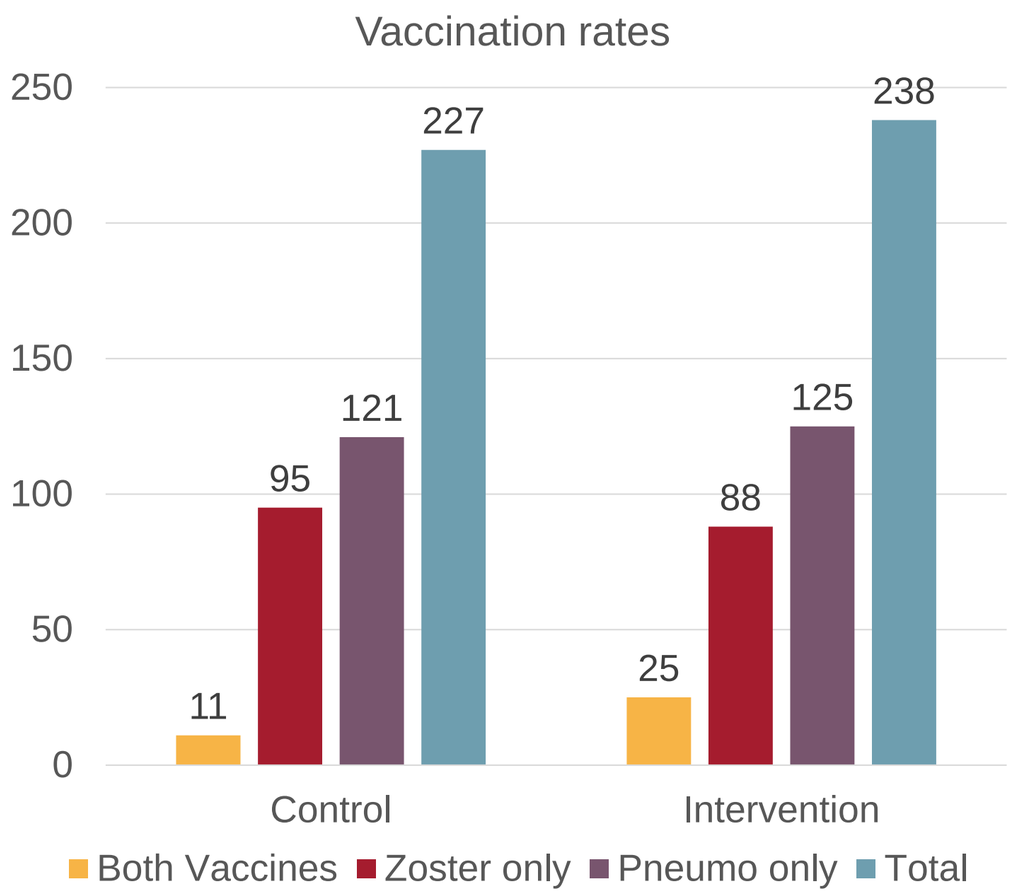
Characteristics	Randomization Assignment	
	Control	Intervention
No.	11,153	11,148
Age, mean, y	63.3	63.2
Female, %	57.6	56.8
Median income, mean in ZIP code, $	67,069	67,025
Black race, mean % in ZIP code, %	5.0	4.8
Education, %undergrad or higher in ZIP code, %	26.8	26.6

Results – Intervention Reach

- Large percentage of calls not listened to completely
  - 1st call result—79.6% incomplete (voice mail, hang-up, no answer)
  - 2nd call result—93.9% incomplete
  - 3rd 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: 227/11,123 = 0.0204
  - Intervention vaccination rate: 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



Results – Subanalyses

Outcome	vs Control Odds Ratio (95% CI) Unadjusted*	p-value
Primary	1.05 (0.88-1.27)	0.58
Age, y		
< 60	1.57 (0.80-3.07)	0.19
≥ 60	1.02 (0.84-1.24)	0.21
Sex		
Female	1.12 (0.88-1.43)	0.36
Male	0.96 (0.72-1.27)	0.77

*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%)

Results – Vaccination Prompt Results

- 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

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