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Spring 5-2024

Pneumococcal and Influenza Vaccine Co-Administration in the Incarcerated Population

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Recommended Citation

Stroh, Kaitlyn, "Pneumococcal and Influenza Vaccine Co-Administration in the Incarcerated Population" (2024). *Doctor of Nursing Practice Projects*. 347.

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The World Health Organization (WHO) has deemed IPD a leading cause of morbidity and mortality (Nace et al., 2016). According to the Centers for Disease Control and Prevention (2023), streptococcus pneumoniae is responsible for 20-60% of U.S. bacterial pneumonia cases and has a mortality rate of 10-30%. Invasive pneumococcal disease (IPD) occurs whenever streptococcus pneumoniae invades sterile sites (i.e. meningitis, sepsis). Following the Advisory Committee on Immunization Practices (ACIP) guidelines on pneumococcal vaccination is 60-70% effective at preventing IPD (CDC, 2023).

Incarcerated individuals present an increased risk of contracting pneumococcal disease due to the proximity of living quarters. The proportion of airway disease, immunocompromising conditions, and cigarette smoking are all higher in this population, further compounding the disease burden. Still, adherence to vaccination recommendations remains poor. A state-run department of corrections (DOC) has reported that upon admission, only 43% of incarcerated individuals younger than 65 years of age and 47% of those older than 65 years of age self-report receiving at least one pneumococcal vaccine—lower than the national average.

Literature Review

Pneumococcal conjugate vaccine seven (PCV7) was first approved for adults in 1983 and for use in children in 2000. Since 2000, the incidence of pneumococcal disease has dramatically decreased in all ages due to herd immunity (Matanock et al., 2019; Kobayashi et al., 2022). Newer versions (PCV13, PCV15, and PCV20) add additional strains of streptococcus pneumoniae to the vaccine's coverage. PCV20 has immunogenicity sufficient to provide adequate protection against IPD in a single dose (Kobayashi et al., 2022).

Adults 65 years or older or those with a history of cigarette smoking, asthma, COPD, Hepatitis C, and AIDS are particularly vulnerable to morbidity and mortality related to IPD (Matanock et al., 2019; Nace et al., 2017; Travers et al., 2017). If a person develops IPD, the fatality ranges from 10-30%. Moreover, 50.3% of cases occur among those without high-risk conditions (Vila-Corcoles et al., 2015). A common misconception about IPD-related mortality is that it occurs only in older and immunocompromised people. It can be dangerous for younger people with risk factors for deadly IPD—all of which are more common in the incarcerated population (Maruschak, 2016; Puglisi & Wang, 2021). Asthma is twice as common, HIV and Hepatitis B are three times more common, and Hepatitis C is almost six times more common compared to the general public (Puglisi & Wang, 2021).

In 2018, an outbreak of IPD occurred in a state prison. Sanchez et al. (2021) conducted a retrospective investigation of the outbreak. Of the 40 suspected cases, 70% occurred amongst inmates who smoked, making cigarette smoking the single most important predictor of disease. Incarcerated persons pose a significant risk of IPD due to close living spaces, crowds, and shared ventilation (Sanchez et al., 2021).

The strategy of coadministration of influenza and pneumococcal vaccines has been documented in the elderly. Influenza clinics occur cyclically and have high visibility. This differs from the administration of other vaccines as they are irregular and individualized, making widespread vaccine programs uncommon. Co-administration significantly reduces all-cause mortality, mortality from pneumonia, and vascular-related mortality (Chan et al., 2012; Poscia et al., 2017). One study compared an unvaccinated group, a quadrivalent influenza vaccination group, and a coadministration group. There was no statistical difference between the group

characteristics. At study completion, 37.3%, 27%, and 17.1% died, respectively, representing a synergistic benefit to the coadministration of these two vaccines (Chan et al., 2012).

Personal and program factors influence whether a person will choose to vaccinate. Programs that use medical providers as the source of vaccine information are more successful and vaccine-hesitant individuals are more likely to change their minds (Matanock et al., 2019). Programs that use promotional posters, leaflets, and videos are more likely to be successful (Chan et al., 2015; Garcia-Grossman et al., 2022). Improving perception about vaccine safety is crucial for vaccine-hesitant incarcerated persons as they often mistrust institutions.

Project Methods

The locations for this quality improvement project (QIP) were state-run DOC clinics serving 30,000 individuals who are mostly men (95.3%) with an average age of 39 and suffer from a wide array of chronic and acute medical conditions (IDOC, 2022). No individuals were excluded from this QIP.

To increase the percentage of participants who are up to date on the pneumococcal vaccine, co-administration of influenza and pneumococcal vaccines was made available during influenza clinics from September to November 2023. Participation was voluntary. Additionally, a Pneumococcal Vaccine Video was sent to DOC staff, and DOC clinic participants were shown updated infographics in English and Spanish about the eligibility and risk of harm from IPD.

This project received approval from Southern Illinois University Edwardsville's (SIUE) International Review Board (IRB) on April 25th, 2023.

Evaluation & Results

Primary data was collected directly by the Department of Corrections (DOC) as part of their standard process. The data was analyzed for the project timeframe of September to November 2023. After the Pneumococcal Vaccine Video was distributed via email link (July 2023), a post-intervention survey identical to the pre-intervention survey was emailed to DOC staff members (August 2023). Completed surveys were collected anonymously by a third-party website and responses were represented as conglomerate data. The responses for secondary outcomes were calculated into averages using a Likert scale of 1-5 for responses.

As of December 2023, 64 users viewed the Pneumococcal Vaccine Video 85 times. There were 22 pre-intervention and 34 post-intervention surveys completed. Over 3,000 copies of the English and Spanish brochures have been printed for DOC clinics to use, and more are still being requested. The goal of the Pneumococcal Vaccine Video was to increase knowledge about the 2021 updates to the ACIP guidelines and improve confidence in recommending these vaccines to eligible participants. The largest improvement was observed in DOC staff stating they feel knowledgeable about the 2021 updates to the ACIP guidelines.

The percentage of respondents who stated that:

- “They feel confident recommending pneumococcal vaccines for eligible recipients” increased from an average Likert score of 3.73 to 4.06 (8.8% increase; question 1).
- “They are knowledgeable about the 2021 updates to the ACIP guidelines for eligibility and choice of pneumococcal vaccine” increased from an average Likert score of 3.14 to 4.03 (28% increase; question 2).
 - Before the intervention, 32% (7/22) of respondents stated they felt either “not so confident” or “not at all confident” about their knowledge of the ACIP guidelines which decreased to 0% after the intervention

- After the intervention, 85% of responders (29/34) said they were either “extremely confident” or “very confident” about their knowledge about the ACIP guidelines
- “Finding and updating vaccine history in the patient record is simple and quick” increased from an average Likert score of 3.27 to 3.53 (7.9% increase; question 3).
- “Have no barriers with the act of administering vaccines” was unchanged (average Likert score of 4.27; question 4).

Furthermore, the percentage of DOC participants ≥ 65 years of age who were vaccinated increased from 43% (n=500) to 45% (n=523). The percentage of those who had ever been offered the vaccine increased from 48% (n=558) to 54% (n=651) from August 2023 to December 2023 (Illinois Department of Corrections, 2023).

Impact on Practice

This project led to an increase in individuals vaccinated against pneumococcal disease and an even larger increase in those being offered the vaccination. Vaccine uptake by individuals in custody and vaccine promotion by staff will likely continue to increase exponentially. Co-administration of vaccines and vaccine promotional materials have the potential to improve personal and public health, while reducing the financial burden of pneumococcal disease. Recommendations for the future include vaccine identification cards to help eliminate the risk of unnecessary or repeat vaccination, simple point-of-care algorithms for vaccine eligibility, and additional support for smoking cessation to decrease pneumococcal disease risk.

Limitations

Study participants were all incarcerated—a population with lower-than-average trust in authority figures including healthcare providers. In addition, this project occurred just three years after the COVID-19 pandemic. Mistrust of healthcare institutions is high—especially those recommending vaccinations. As of the completion of this project, there is a lawsuit against the DOC from employees challenging mandatory COVID-19 vaccination. This, in addition to many other confounding factors not listed, complicates the project's success. The DOC reports on vaccination data quarterly for those ≥ 65 years of age but for those < 65 years of age only annually. For this reason, the impact on younger incarcerated persons is difficult to extrapolate.

Conclusion

The percentage of DOC clinic patients who choose to be vaccinated against pneumococcal disease is multifactorial. The interventions of this project aimed at improving confidence in the vaccine by improving provider knowledge, decreasing complacency by updating brochures about the risk of IPD, and making the vaccine more convenient with co-administration. Those who still lack confidence in the provider's source of information, are complacent to the risk of disease despite knowledge of comorbidities and feel the inconvenience of being vaccinated is not worth the effort will choose to be unvaccinated despite efforts.

Co-administration of influenza and pneumococcal vaccines shows promise to increase the percentage of eligible individuals who are up to date on recommended vaccinations and, therefore, decrease the burden of pneumococcal disease. As shown in this QIP, the percentage of participants who chose to be vaccinated improved from 43% to 45% and there was a 6% increase in the percentage of those ≥ 65 being offered the vaccine. Healthcare clinic workers improved their knowledge (28% increase) and confidence (7.9% increase) in recommending pneumococcal vaccines. This shows a correlation between the study interventions and outcomes.

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