Improving Pneumococcal Vaccination in Patients Treated with Tumor Necrosis Factor-alpha Inhibitors: A Multidisciplinary Education-Based Quality Improvement Project

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INTRODUCTION

- Immunosuppressed persons are at increased risk for numerous infections, including those due to *Streptococcus pneumoniae*.
- In 2012, the Advisory Committee on Immunization Practices (ACIP) recommended vaccination with the 13-valent pneumococcal conjugate vaccine (PCV13) and the 23-valent pneumococcal polysaccharide vaccine (PPSV23) for all immunocompromised adults ≥19 years.
- Unfortunately, rates of pneumococcal vaccination (PV) among immunosuppressed patients remain suboptimal.
- To address this, we conducted a Quality Improvement project to measure and improve the rates of PV among patients receiving TNF-alpha inhibitors (TNF-αI) at our institution following year-long implementation of patient and provider education-based interventions.

METHODS

- In Nov. 2020, educational pamphlets explaining the indications for PV were provided to Walter Reed National Military Medical Center pharmacies and primary infusion center, for distribution to patients picking up or receiving TNF-αI agents.
- Additional educational materials and pamphlets were provided to the clinical services primarily prescribing TNF-αI agents. In-person PV educational sessions were offered to these services.
- Up-to-date (UTD) on PV was defined as receipt of PCV13 and PPSV23 as per the ACIP guidelines in effect at that time.
  - The 20-valent pneumococcal conjugate vaccine (PCV20) became accessible at our institution in June 2022, after the conclusion of our intervention period. Thus, it was not included in our analysis.
- Study populations were defined as follows:
  - Vaccine Eligible: Unvaccinated persons, or within the appropriate time window for a PPSV23 booster dose.
  - Previous TNF-αI use: TNF-αI initiation prior to Jan. 1, 2021.
  - New TNF-αI use: TNF-αI initiation between Jan. 1 - Dec. 31, 2021.
- After a two month lead-in period (Nov. - Dec. 2020), full intervention implementation continued from Jan. 1 – Dec. 31, 2021.
- We then compared the PCV13 and PPSV23 immunization status of patients ≥18 years of age prescribed TNF-αI agents at baseline and again after the 12-month implementation period to determine if our education-based intervention resulted in improved rates of PV.

RESULTS

No. Previously Receiving TNF-αI Before Intervention Period	327
Prior to Intervention:	
No. Previously UTD on PV (%)	96 (23.9%)
No. Not Fully UTD on PV (%)	231 (70.6%)
No. With 1 Dose of PCV13(%)	174 (53.2%)
No. Eligible to Receive PCV13 (%)	153 (46.8%)
No. With ≥1 Dose of PPSV23(%)	176 (53.8%)
No. With Dose of PPSV23 Within Last 5 Years(%)	101 (30.8%)
No. Eligible to Receive PPSV23 Dose (%)	226 (69.1%)
No. Eligible to Receive Both PCV13 and PPSV23 (%)	116 (35.5%)
During Intervention (% Change Amongst Eligible):	
No. Received PCV13 Alone	13 (8.5%)
No. Received PPSV23 Alone	17 (7.5%)
No. Received Both PCV13 + PPSV23	2 (1.7%)
After Intervention: (% Change Amongst Eligible):	
No. Newly UTD on PV Vaccination (%)	16 (6.9%)
No. Still Requiring PCV13 (%)	138 (90.2%)
No. Still Requiring PPSV23 (%)	207 (91.6%)
No. Fully UTD on PV Vaccination (%)	112 (34.2%)

Table 1: Pre- and post-intervention pneumococcal vaccination rates for persons already prescribed TNF-αI agents. Pre-intervention period defined as any time prior to January 1, 2021. Intervention period defined as time between January 1 – December 31, 2021.

No. Newly Initiated on TNF-αI During Intervention Period	113
Prior to TNF-αI Initiation:	
No. Previously UTD on PV (%)	18 (15.9%)
No. Not Fully UTD on PV (%)	95 (84.1%)
No. With 1 Dose of PCV13 (%)	33 (29.2%)
No. Eligible to Receive PCV13 (%)	80 (70.1%)
No. With ≥1 Dose of PPSV23 (%)	38 (33.6%)
No. With Dose of PPSV23 Within Last 5 Years (%)	23 (20.4%)
No. Eligible to Receive a PPSV23 Dose (%)	90 (79.6%)
No. Eligible to Receive Both PCV13 and PPSV23 (%)	69 (61.1%)
During TNF Initiation (% Change Amongst Eligible):	
No. Received PCV13 Alone	8 (10.0%)
No. Received PPSV23 Alone	5 (5.5%)
No. Received Both PCV13 + PPSV23	4 (5.8%)
After Intervention (% Change Amongst Eligible):	
No. Newly UTD on PV Vaccination (%)	8 (8.4%)
No. Still Requiring PCV13 (%)	68 (85.0%)
No. Still Requiring PPSV23 (%)	81 (90.0%)
No. Fully UTD on PV Vaccination (%)	26 (23.0%)

Table 2: Pneumococcal vaccination rates for persons initiating TNF-αI agents during the intervention interval. Intervention period defined as time between January 1 – December 31, 2021.

Total No. TNF-αI Users At Intervention Conclusion	440
No. Eligible for PV During Intervention	326
Total Fully UTD on PV Series At Intervention Conclusion (%)	138 (31.3%)
Total Not UTD on PV Series At Intervention Conclusion (%)	302 (68.6%)
Newly UTD Overall (%)	24 (5.5%); p = 0.179*
Newly UTD Among Eligible (%)	24 (7.4%)
No. Still Requiring PCV13 (%)	206 (46.8%)
No. Still Requiring PPSV23 (%)	288 (65.5%)
No. Still Requiring Both PCV13 and PPSV23 (%)	179 (40.7%)

Table 3: Final pneumococcal vaccination rates amongst all TNF-αI users at the conclusion of the intervention interval.
*Calculated using Pearson Chi-Square analysis for 95% significance.

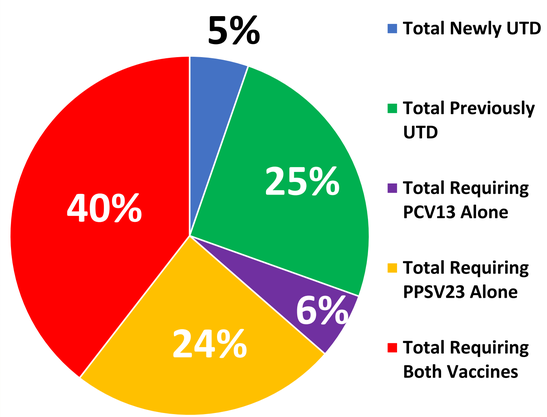

Figure 1: Graphical representation of vaccination rates and vaccine requirements at the conclusion of the intervention interval.

KEY FINDINGS

- 440 patients receiving TNF-αIs (327 previously on therapy; 113 newly started) between Jan. 1 – Dec. 31, 2021 were reviewed.
- Prior to intervention, 96 (23.9%) persons already on TNF-αIs were UTD on PV. At our intervention's conclusion, only 16 (6.9%) more had become fully UTD on their vaccination status (Table 1).
- 18 (15.9%) patients prescribed TNF-αIs during the intervention period were already UTD on PV. At the intervention's conclusion, only 8 (8.4%) more became fully UTD (Table 2).
- At the intervention's conclusion, 24 total patients were newly UTD on PV, representing 5.5% of the total TNF-αI population and 7.4% of those eligible for receipt of a PV (Table 3).
- Across all groups eligible for at least 1 vaccine, ≥85% of patients remained deficient for receipt of PCV13, PPSV23, or both.
- Overall, approximately 31.3% of all TNF-αI users at our institution are UTD on PV. Approximately 68.6% lacked documentation of complete PV, and may be at increased risk for pneumococcal infection.
- Statistical analysis of the prior TNF-αI users comparing PV rates before and after the intervention did not show a significant effect (p =0.179).

CONCLUSION

Despite frequent healthcare contact in a system where vaccination requires no out-of-pocket expense, overall rates of guideline-recommended PV were low in a high-risk cohort of TNF-αI users. Educational efforts targeting both patients and healthcare providers made marginal gains that did not achieve statistically significant change. Though the COVID-19 pandemic and a high prevalence of virtual health appointments may have partially contributed to the low levels of vaccination compliance we observed, it is unlikely to be solely responsible for the full extent of these findings.

New forms and simplified regimens for PV (15-valent and 20-valent conjugate vaccines) were FDA approved in the summer of 2021, and the ACIP has recommended their use since Oct. 2021. With effective means to reduce the risk of pneumococcal infection available, efforts to promote PV amongst high-risk cohorts are needed. Our findings suggest that provider and patient education alone may be insufficient, and more systemic or protocol-driven strategies may be required.

Next steps in our project will include an individualized review of vaccination rates within specific departments, with provision of feedback to the involved stakeholders. We also plan to investigate the implementation of protocolized notes and/or reminder forms that will include prompts to check patient vaccine status routinely.