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Background: Respiratory tract infections are among the leading causes of hospitalization in rheumatoid arthritis (RA) and *Streptococcus Pneumoniae* (Sp) is one of the most frequent pathogens involved. For these patients, the CDC recommends a combined vaccination scheme (CVS) using two types of Sp vaccines but evidence on its effectiveness remains insufficient.¹

Objectives: To assess the impact of the combined vaccination scheme on the incidence of Sp infections in patients with RA treated with DMARD.

Methods: A cohort was nested in a register including patients with RA who were prescribed a bDMARD or tsDMARD -either naïve or switch- from 2000 to March 2019. The target outcomes were invasive pneumococcal disease (IPD) and all-cause community-acquired pneumonia (CAP), as defined by relevant MedDRA codes. Demographic and clinical features were also retrieved. Each participant centre informed about the date when they implemented a systematic Sp vaccination protocol and whether they were using the CVS. Those not adopting this practice were excluded from the analysis.

Crude incidence rates (IRs) were calculated for each outcome as well as for its combination (combined variable defined as "Sp infections"). Exposure was split into two periods, considering the date when the CVS was officially recommended in Spain (May 2015). The incidence rate ratio (IRR) comparing pre and post implementation periods was estimated with a Poisson regression model adjusted for sex, age and comorbidities (Charlson Index).

Results: 1704 patients were included, their characteristics are shown in table 1. One centre was excluded for not using any Sp vaccination protocol while the remaining ones reported using the CVS. Crude IRs by periods (pre and post CVS implementation) and age groups are shown in table 2. The IRR of the post-vaccination period after adjusting for age, sex and comorbidities (Charlson index) was 0.40 (95% CI: 0.29 - 0.56), $p < 0.001$.

Table 1. Baseline features of the cohort.

Demographics	
Age, years *	60.6 (12.5)
Female	1356 (79.6%)
Current smoking	287 (16.8%)
RA clinical characteristics	
Disease duration, years*	9.1 (7.9)
RF positive	875 (74%)
ACPA positive	831 (71%)
DAS28*	4.6 (1.4)
Other clinical characteristics	
Body Mass Index*	27.5 (5.2)
Charlson index*	2.3 (1.5)
Chronic pulmonary Disease	125 (9.3%)
Diabetes mellitus	147 (9%)

*Data presented as mean (standard deviation).

Table 2. Crude IRs (95% CI) of the outcomes of interest split by age.

Overall		<65		≥65	
Pre	Post	Pre	Post	Pre	Post
SP-Infections					
33 (27.4-39.9)	12.7 (9.8-16.4)	28 (22.4-35)	11.8 (8.9-15.6)	60.3 (42.4-85.8)	19.5 (10.8-35.2)
IPD					
—	0.4 (0.1-1.6)	—	0.4 (0.1-1.8)	—	—
All cause CAP					
23.6 (19.0-29.3)	11.5 (8.8-15)	18.7 (14.4-24.4)	10.4 (7.7-14)	50.8 (34.8-74)	19.5 (10.8-35.2)

Conclusion: The incidence of Sp infections experienced a decrease in RA patients taking bDMARD or tsDMARD after the introduction of the stepwise combined vaccination scheme that is not related to age, sex or comorbidities.

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[1] Furer V, et al. *Ann Rheum Dis* 2019;0:1–14

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SAT0064

VACCINATION RATE AND RISK FACTORS FOR NON-VACCINATION IN RHEUMATOID ARTHRITIS: A CROSS-SECTIONAL PROSPECTIVE MULTICENTRIC OBSERVATIONAL STUDY

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Background: Rheumatoid arthritis (RA) patients are at increased risk of infections, some of which could be prevented in part by vaccination (1). Influenza and pneumococcal vaccines are recommended in RA (2). However, vaccination coverage of these patients remains very low. Five years ago, we found in a previous study that vaccination rates in France were 55% for pneumococcal and 60% for influenza vaccines (3).

Objectives: The aim of our study was to evaluate the vaccination rate among RA patients, compare it with our previous results, and identify factors associated with non-vaccination.

Methods: We conducted a cross sectional multicentric observational study in the rheumatology departments of 5 university hospitals in France. Data were collected from December 2018 to July 2019. Outpatients and hospitalized adult patients with RA according to the ACR/EULAR 2010 criteria were included. Data were collected during a single visit through an anonymous questionnaire completed by the patients. Pearson Chi-squared analysis and multivariable logistic regression were used to compare characteristics of vaccinated versus non vaccinated patients.

Results: 584 patients (77.9% of women, mean age 61.8±12.6 years old) were included. 81.7% were RF and/or ACPA positive, with a mean RA duration of 15.7±10.5 years, 58.2% were treated with methotrexate (MTX), and 68.6% with a biologic. Vaccination rate against pneumococcal was 78.9% (versus 55% in 2013, $p < 0.0001$) and 60.4% for influenza (versus 60% in 2013). The main reason for non-vaccination was absence of vaccine proposal (59.2%) for pneumococcal, and fear of vaccines (56.7%) for influenza. In the multivariate analysis, a higher level of education (OR [CI95] 4.4 [2.3-8.4], $p < 0.0001$), a very good opinion on vaccination (2.1 [1.1-4.1], $p = 0.003$), vaccination against influenza done (2.3 [1.3-4.2], $p = 0.006$), and exposure to biologics (4.0 [2.2-7.4], $p < 0.0001$) were associated with vaccination against pneumococcal. Age over 65 years old (2.0 [1.2-3.2], $p = 0.006$), participation in a patients' association (3.6 [1.4-8.9], $p = 0.006$), vaccination against pneumococcal done (2.4 [1.3-4.5], $p = 0.004$), exposure to biologics (2.1 [1.2-3.7], $p = 0.006$), a good (3.3 [1.4-8.9], $p = 0.03$) and a very good opinion on vaccination (6.6 [2.8-15.6], $p < 0.0001$) were associated with vaccination against influenza.

Conclusion: Vaccination rate against pneumococcal increased over the last 5 years but remained stable for influenza vaccine in French RA patients. This could be improved with patient's information and education, especially in patients age under 65, biologic naïve and with a bad opinion about vaccination.

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SAT0065

TIMING OF PNEUMOCOCCAL VACCINATIONS IN RELATION TO STARTING DISEASE-MODIFYING ANTI-RHEUMATIC DRUGS IN RHEUMATOID ARTHRITIS

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Background: Pneumococcal vaccinations are recommended for patients with rheumatoid arthritis (RA). There is evidence that pneumococcal vaccinations are less effective when administered after starting conventional synthetic disease-modifying anti-rheumatic drugs (csDMARDs). Vaccination guidelines have changed over time, since 1992 UK guidelines recommend pneumococcal vaccination for the immunocompromised, and in 2003 was expanded to all individual's age ≥ 65 years. Guidelines from British Society of Rheumatology (2011) and EULAR (2019) advise to vaccinate prior to starting csDMARDs where possible. There is little evidence about whether these guidelines are being followed.

Objectives: The aims of this study were to explore the timing of pneumococcal vaccination in patients with RA in relation to starting csDMARDs and examine whether this has changed over time.

Methods: This was a cross-sectional study using UK electronic health records from primary care between 1st January 2000 and 31st December 2018. To be included in the study patients needed to 1) have a diagnosis of RA, 2) be prescribed csDMARDs up to 3 months prior to, or after RA diagnosis date and 3) have received a pneumococcal vaccination. Index date was considered the start of csDMARDs and vaccinations were required to be up to 5 years prior to the index date or after index date until leaving the practice, death or the end of the study period. For each patient it was determined if the first vaccination was prior to starting csDMARDs. For those vaccinated up to 3 years prior to, or up to 3 years after starting csDMARDs, the time between vaccination and starting csDMARDs in months was determined and this distribution was plotted in a bar chart. To explore how timing of vaccination has changed over time the proportion (with 95% confidence intervals (CI)) of people vaccinated prior to starting csDMARDs was plotted by year.

Results: Of 21461 people with RA identified who were prescribed their first csDMARD on or after 1st January 2000, there were 8205 (38.2%) patients vaccinated and eligible to be included in the study. The cohort had a mean age 62 years, 66.4% were female. There were 2997 (36.5%) patients vaccinated prior to starting csDMARDs. Those vaccinated prior to starting csDMARDs were older, with 72% ($n=2168$) being aged 65 years or over vs 28% ($n=1465$) in those vaccinated after starting csDMARDs. 5358 (65.3%) were vaccinated up to 3 years prior to, or up to 3 years after starting csDMARDs. The distribution showed that the most frequent time of vaccination was in the 3 months after starting csDMARDs and the frequency was higher in the months after starting csDMARDs than in the months preceding (Figure 1). Of those vaccinated outside these times, 1000 (12.2%) were vaccinated >3 years prior and 1844 (22.5%) were vaccinated >3 years after starting csDMARDs. The proportion vaccinated prior to starting csDMARDs has increased over time from a minimum of 17.2% in 2001 to a maximum of 55.6% in 2016. The greatest increases were seen between 2003 and 2007 (Figure 2).

Figure 1. Time between starting csDMARDs and pneumococcal vaccination

Figure 2. Proportion and 95% confidence interval of those vaccinated prior to starting csDMARDs by year.

Conclusion: This study shows that timing of pneumococcal vaccination is improving with a trend towards increasing vaccination prior to starting csDMARDs and a high proportion of patients were vaccinated around the time of csDMARD initiation. However, just over a fifth (22.5%) were vaccinated more than 3 years after starting csDMARDs. Rheumatologists need to continue to work to raise awareness of the importance of vaccinations through better communications to patients and primary care physicians, to ensure best practice is being followed.

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SAT0066

BURDEN OF MALIGNANCY, VENOUS THROMBOEMBOLISM, ANEMIA, AND INFECTIONS IN PATIENTS WITH RHEUMATOID ARTHRITIS WHO SWITCHED FROM A FIRST CONVENTIONAL SYNTHETIC DISEASE-MODIFYING ANTIRHEUMATIC DRUG TO ANOTHER DISEASE-MODIFYING ANTIRHEUMATIC DRUG REGIMEN

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Background: EULAR and ACR guidelines recommend a variety of treatment options for rheumatoid arthritis (RA) patients who failed a first conventional synthetic disease-modifying antirheumatic drug (csDMARD). The recent launches of Janus kinase inhibitors (JAKi) have stimulated interest in comorbidities such as malignancy, venous thromboembolism (VTE: deep vein thrombosis [DVT] or pulmonary embolism [PE]), anemia, and infections in patients with RA. Understanding the epidemiology of these conditions can help optimize treatment decisions within the treat-to-target approach following the first csDMARD.

Objectives: Estimate the real-world prevalence, incidence, and costs of these comorbidities among patients switching from a first csDMARD to another DMARD.

Methods: From a large US health claims database, the study selected adults with RA (≥ 2 RA claims ≥ 30 days apart) who started a csDMARD regimen as first DMARD, then switched (index date [ID], 1/1/2012–3/31/2017) to another DMARD regimen (monotherapy or combination with csDMARD). All patients had continuous enrollment 1 year before and ≥ 1 year after the ID. The study estimated baseline prevalence (%) and on-treatment incidence (per 100 patient-years [P100PY]) of malignancy, VTE, anemia, and infections (any, serious, opportunistic, and herpes zoster). Generalized linear models with gamma distribution and log link function estimated the impact of baseline characteristics on mean annualized healthcare costs per-patient-per-year (PPPY) associated with incident conditions. The recycled prediction method calculated adjusted total costs differences of these conditions.

Results: Among study patients ($N = 7,816$, median age 54 yrs, 74% female), the 38% on monotherapy index treatments had mean (standard deviation) treatment