Patients' first line chemotherapy choice and treatment outcomes for HER2 positive breast cancer
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Background

Overexpression of human epidermal growth factor receptor 2 (HER2) occurs in up to 20% of breast cancer cases, presenting poor prognosis and aggressive phenotype in patients. The administration of Trastuzumab, a human monoclonal antibody which inhibits cell growth by binding to the extracellular domain of the receptor, receptor's extracellular domain, with chemotherapy has improved survival in patients with HER2 positive early stage and metastatic breast cancer. The most common regimens for HER2 positive breast cancer are TH (paclitaxel and trastuzumab), H (trastuzumab), HP (pertuzumab, trastuzumab), TCH (docetaxel, carboplatin, and trastuzumab), TCHP (trastuzumab, pertuzumab, carboplatin, and docetaxel), AC-TH (doxorubicin plus cyclophosphamide followed by paclitaxel plus trastuzumab), AC-THP (doxorubicin and cyclophosphamide followed by paclitaxel, trastuzumab, and pertuzumab), THP (docetaxel, trastuzumab, and pertuzumab). This leads to the necessity of figuring out what which regimens among these are more efficient, since all of these are associated to different efficacies in reducing breast cancer recurrence and overall survival. Thus, we will develop an algorithm to identify HER2- positive- based chemotherapy regimens with the better efficiency among the pool of currently used regimens.

Methods

We obtained data from Optum's de-identified Clinformatics® Data Mart Database and selected a cohort of women 18 years and older, which were diagnosed with HER2 positive breast cancer and received trastuzumab based chemotherapy. Each patient had a index date that defined by the 1st chemotherapy claim date. The algorithm includes 3 steps to define regimen for cancer patients based on this index date. First, we identified patients who had trastuzumab on the index date. We identified all chemotherapy drugs that patient received on the index date. Based on the combination of drugs, we defined patients' regimen. Second, we selected patients who received trastuzmab after the index date but within 30 days of the index date and defined their regimen. Last, for patients who received trastuzumab after 30 days from the index date but within 1 year since index date, we identified all the unique chemotherapy drugs the patients received and define their regimen. The outcome variable of this study is regimen that patient received, and the covariate variables are patients' age, race and year of breast cancer diagnosis.

Acknowledgments

Figure 1: Algorithm Flow Chart
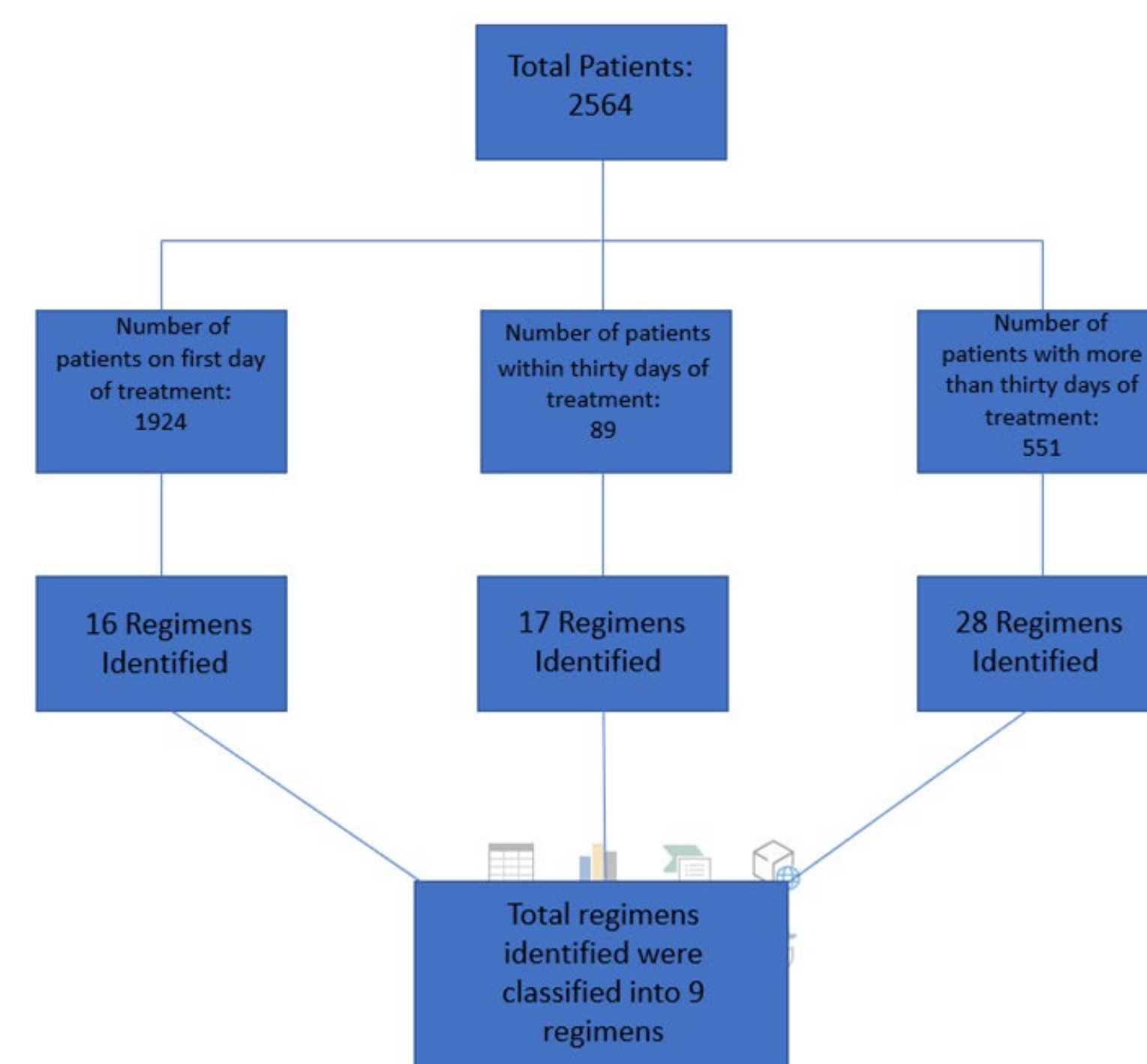
Results

Table 1: Patients' Characteristics

Date/Period of administered regimen				
Date	**Frequency**	**Percentage**	**Cumulative Frequency**	**Cumulative Percentage**
First day	1924	75.04	1924	75.04
Within thirty days	89	3.47	2013	78.51
More than thirty days	551	21.49	2564	100
Age of Patients (years)				
18-39	304	11.86	304	11.86
40-49	598	23.32	902	35.18
50-59	646	25.2	1548	60.37
60-64	292	11.39	1840	71.76
65+	724	28.24	2564	100
Race				
Asian	93	3.86	93	3.86
Black	318	13.18	411	17.04
Hispanic	263	10.9	674	27.94
White	1738	72.06	2412	100

Graph 1: Total Distribution of Regimen from 2007-2021
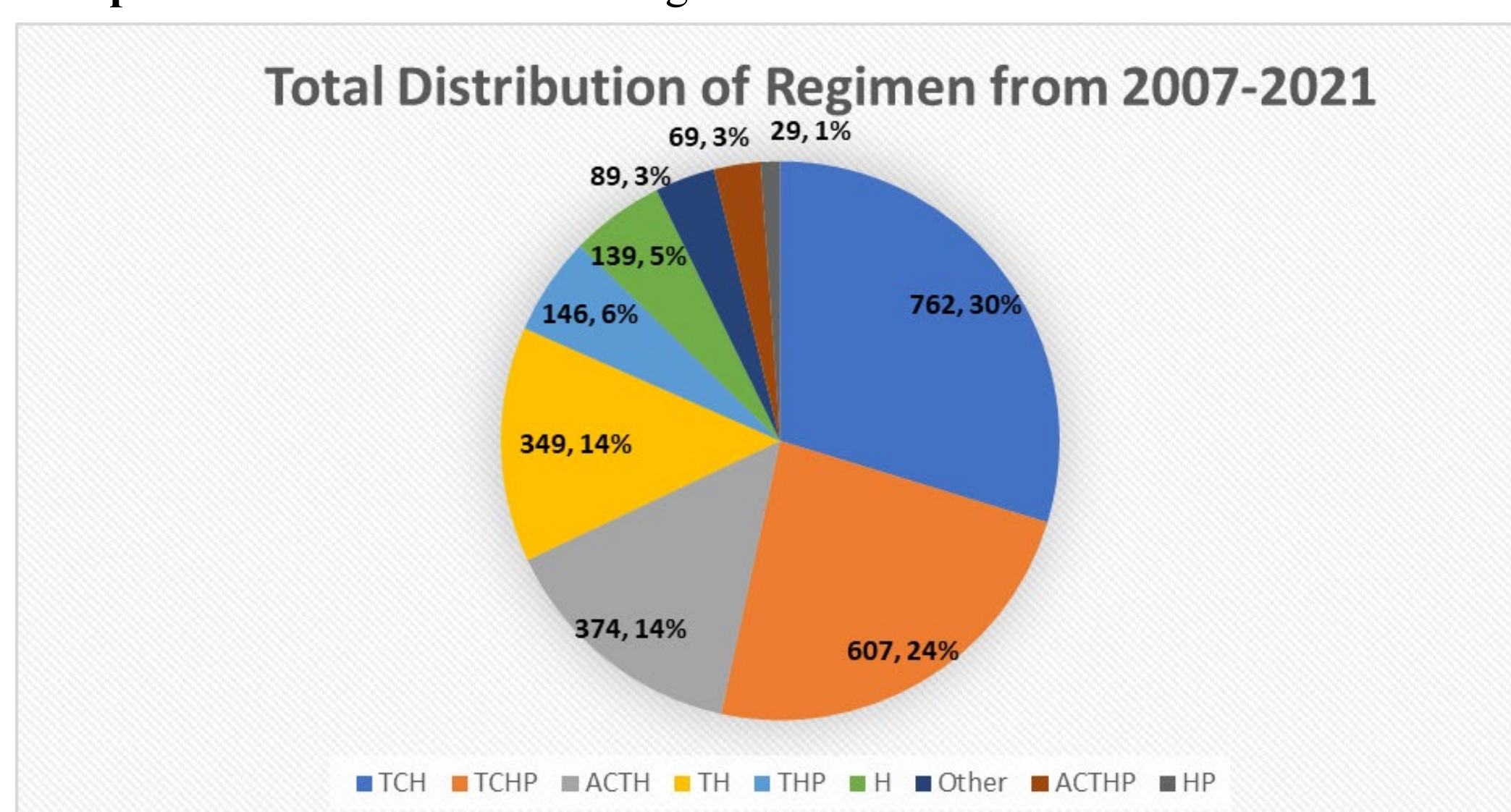
Graph 2: Frequency Usage of Regimen by Year, from 2007-2021
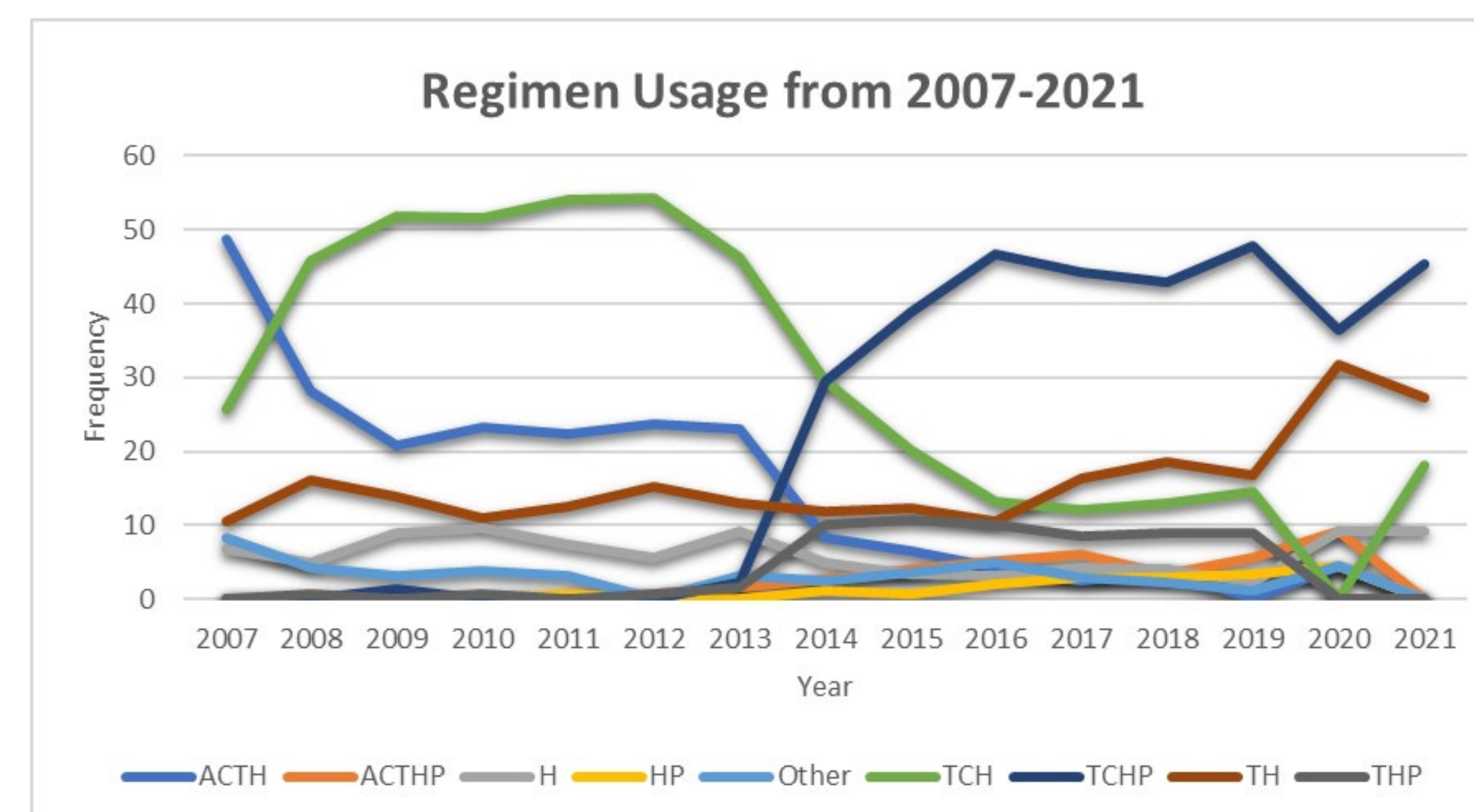
Conclusion

The algorithm is able to define patients' regimens based on chemotherapeutic agents received. The regimens defined were TH, H, HP, TCH, TCHP, AC-TH, AC-THP, and THP. Among these regimens the most commonly used were TCH, TCHP, and ACTH. Finally, it was observed that regimen patterns were changed over time during the study period between 2007 to 2022.

Discussion

The reason for the constant shift in frequency usage of various chemotherapy regimens is greatly affected by the approval of new chemotherapy agents by the FDA. Also, patients' characteristics, drug toxicity, physician's characteristics, and drug cost may play a role in the choice of regimens in patients' treatment.

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