Oral Oncology Proportion of Days Covered (PDC) Associations on Medical Costs and Hospitalization in Medicare MarketScan Data.

Pharmacy Quality Alliance (PQA) Annual Meeting, Nashville, TN, May 11 – 12, 2023.

Non-cycled oral antineoplastic medication PDC rates and the outcomes of total medical costs, hospitalizations and length of stay for a Medicare sample.

BACKGROUND

- Increasing utilization of oral non-cycled antineoplastic therapies has generated interest in applying a proportion of days covered (PDC) adherence metric, with adherence at PDC(≥80%).
- To investigate medical costs and health outcomes associated with adherent PDC for Medicare-eligible patients with monthly therapies.

METHODS

- This retrospective cohort study used MarketScan Supplemental and Coordination of Benefits databases from 2018--2020. PDC was calculated for 2019 or 2020 utilizing 25 non-cycled products from 15 therapeutic categories (**see Table 2**) per year.
- Continuous enrollment was required per year, as were ICD oncology diagnosis codes for those 65 plus years of age.
- Sample exclusion criteria were hospice care, inpatient transplant services, and low dose aromatase inhibitor therapy.
- Modeled outcomes of medical costs (total net inpatient and outpatient costs), hospitalizations, and length of days stay (LOS) are present for 2020 and combined 2019-2020. New therapy/diagnosis indications in 2020 were inferred from a look back into 2019 data.
- General Linear and Logistic models' covariates included adherent (PDC≥80% or not), gender (female vs. male), age (mean split of log transform), census region (western vs. other), metropolitan location (metro vs. not metro), number therapy classes (2+ therapy classes vs. 1), retail orders (all vs. mix or mail), new to therapy/diagnosis (PDC medications and ICD coding), presence of comorbidity (any non-cancer Charlson comorbidity index category) and COVID-19 indication (diagnostic or procedure codes). Explored covariate interactions with focus on interactions between adherent and indications of comorbidity and new to therapy and age, or metropolitan area and western regions.
- Finally, for patients retained in 2020 and meeting 2019 PDC criteria, combined yearly results were modeled for associations for patients matched across years on identifiers, gender, census region and age range. New to therapy in 2020 was retained as a covariate.

RESULTS

- A total of 2,568 patients met the 2020 PDC criteria ('2020 cohort'). Of those, 610 also had a 2019 PDC ('2019/2020 cohort'). Average 2020 PDC was 91.5% with 85.1% adherent, and average 2019 PDC was 93.3%. Adherence was at 78.4% across both years.
- As presented in **Table 1.** demographics and clinical features have some different rates between patients in 2020 and the subset also having a 2019 PDC measure. In combined years, rates where similar to 2020 on most variables except for about 10% fewer residing in metropolitan areas and about 10% more hospitalized. Also, in 2020 64.5% had at least 1 Charlson non-cancer index comorbidity category that increased 5.5% for combined years.

Table 1. Demographics and clinical characteristics for 2020 and 2019/2020 PDC Cohorts.

Cohort	Count	Female	Age (74+)	Western Region	Metro-area	Retail Only	COVID-19	Single Therapy Class	Comorbidity
2020	2,568	64.3%	48.2%	11.6%	43.2%	65.9%	4.6%	95.4%	64.5%
2019/2020	610	61.8%	46.7%	12.5%	33.1%	67.4%	3.8%	99.7%	70.0%

- In 2020, 19.9% were hospitalized with LOS=8.0 (s.d.=10.9), and 29.5% were hospitalized in both years with LOS=7.1 (s.d.=8.1).
- The most utilized antineoplastic drug classes were aromatase inhibitors (36.8%) followed by antiestrogens (14.8%) and androgen biosynthesis inhibitors (11.4%) in the 2020 PDC sample (**see Table 2**).

Table 2. Distribution of Index Therapy Classes for 2020 PDC on total fills

Therapy Class	Generic Products	Patient Count	Patients %
Androgen Biosynthesis Inhibitors	abiraterone	293	11.4
Antiandrogens	apalutamide, enzalutamide	269	10.5
Antiestrogens	tamoxifen	381	14.8
Antileprotics	thalidomide	7	0.3
Antineoplastic - ALK Inhibitors	alectinib, crizotinib	38	1.5
Antineoplastic - BCR-ABL Kinase Inhibitors	abiraterone	278	10.8
Antineoplastic - BRAF Kinase Inhibitors	dabrafenib, vemurafenib	5	0.2
Antineoplastic - EGFR Inhibitors	erlotinib	33	1.3
Antineoplastic - Multikinase Inhibitors	cabozantinib, sorafenib	58	2.3
Antineoplastic - Tyrosine Kinase Inhibitors	trametinib	1	<1
Antineoplastic - mTOR Kinase Inhibitors	everolimus	73	2.8

Antineoplastic Combinations	decitabine-cedazuridine, ribociclib	10	0.4
Aromatase Inhibitors	anastrozole, exemestane, letrozole	946	36.8
Cyclin-Dependent Kinases (CDK) Inhibitors	abemaciclib	35	1.4
Janus Associated Kinase (JAK) Inhibitors	ruxolitinib	141	5.5

- Models on the outcome of medication carrier net payments used for PDC calculations indicated higher adjusted medication costs for adherent patients compared to those non-adherent in 2020 by $8,207 (p<.003), and in the 2019/2020 cohort by only $5,865 (p<.6) (see **Table 3**).

- Model for 2020 found significant effects favoring the adherent cohort with reduced medical costs (-$10,751, p<.0001) (see **Table 3**). Other significant covariates indicated lower costs for younger patients (p<.0001) and females (p<.0001). Significantly higher medical costs were indicated for those with a comorbidly (p<.0001), or with COVID-19 infection (p<.0005), residing in metro areas (p<.02) and the western region (p<.004).

- As described in **Figure 1.** for the 2020 model, there was a significant 2-way interaction between age and adherence (p<.0001), such that significant decreased costs was present for the adherent groups, especially for the younger age group (-$19,059) compared to the older age group (-$2,443).

Table 3. Modeled Adjusted Costs for 2018 and 2018/2019 Outcomes of Prescription and Total Medical by Adherent Levels[1]

	2020		2019/2020	
Adherence	PDC Rx Payment	Total Medical Costs	PDC Rx Payment	Total Medical Costs
PDC<80	$29,231	$33,462	$59,412	$40,162
PDC 80+	$37,438	$22,711	$65,264	$19,198
delta	$8,207	-$10,751	$5,852	-$20,964

[1]Those adherent in both years as PDC80+ in table.

- Also, a significant 3-way interaction between new to therapy/diagnosis, comorbidity and adherence (p<.03) was present in 2020 (see **Figure 2**). Specifically, the decreased medical costs associated with adherence is greatest for patients with a comorbidity and new to therapy/diagnosis (-$15,516) and this difference was positive for those new to therapy/ diagnosis but without a comorbidity ($653). Decreased medical costs associated with adherence was at a similar level for those not new to therapy/diagnosis across comorbidity indications (between -$13.5--$14.5K).

- Model results on combined years indicated an adherence effect for reduced adjusted medical costs (-$20,964, p<.004) (see **Table 3**). Other significant covariates indicated lower costs for older ages (p<.0001) and females (p<.008). Similar to 2020, the interactions between adherence groups and age was significant (p<.007), with a greater decrease in adjusted costs for the adherent group (-$38,086) among the younger aged patients compared to the older age group (-$3,842) (see **Figure 1**.).

Figure 1. Difference in Adjusted Medical Costs 2020 and 2019-2020 models: Decreases for PDC80+ vs. PDC<80 groups by Age.

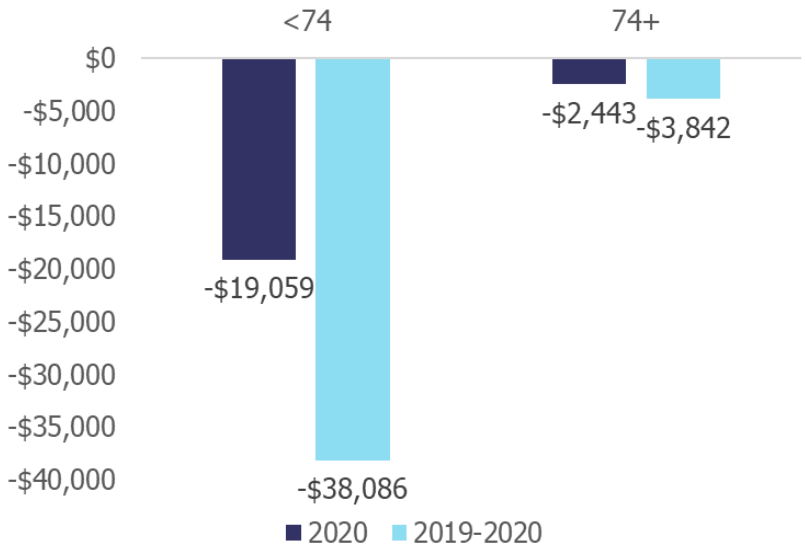
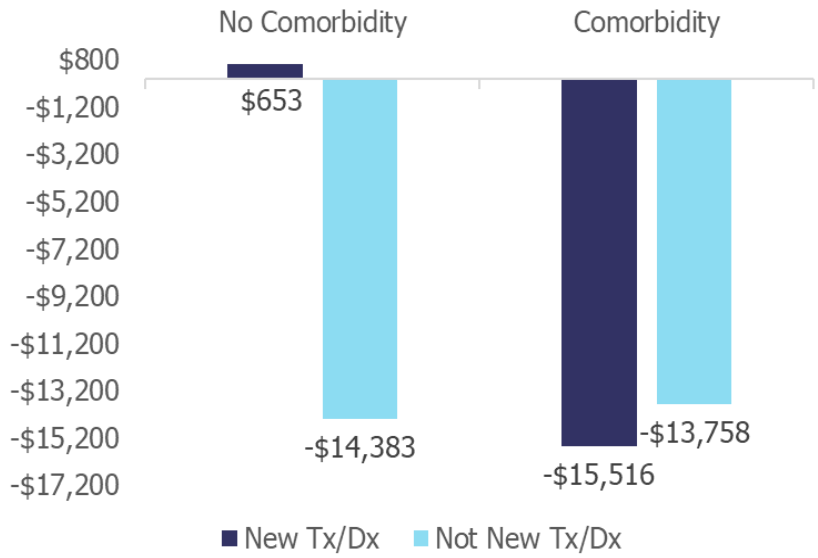


Figure 2. 3-way Interaction for Adjusted Medical Costs 2020 model: Decreases for PDC80+ vs. PDC<80 groups by Comorbidity and New to therapy/diagnosis



- As reported in **Table 4**, the 2020 logistic model on the 19% of hospitalizations indicated significant effects favoring the adherent cohort for reduced odds of hospitalization (0.55, p<.004). Additional significant covariates were decreased odds with age (p<.006), being female (p<.0001), using a single therapy class (p<.008), and residing in a metropolitan area (p<.05). Increased odds of hospitalization was present for those having a COVID-19 infection (4.4, p<.0001) or a comorbidity (7.1, p<.0001).

- In **Table 4.** the 2020 adherent group had significantly lower oncology-related LOS (-2.6 days, p<.03). The only other significant covariates was COVID-19 infection, with an increased LOS (4.3 days ,p<.004).

Table 4. Modeled Hospitalizations and LOS for 2020 or 2019/2020 Cohorts: Odds Ratio and Adjusted LOS of Adherence (reference: non-adherent).

Cohort	Lower Odds	Reduced Mean Hospitalization	Reduced Days Stay
2020	0.55	-0.60	-2.6
2019-2020	0.68	-0.22	-11.4

- Results for combined years on hospitalization rates (29.5%) indicated no univariate adherence effect, but adherence significantly interacting with metropolitan area. There are reduced odds for hospitalization for those outside of such areas (0.68, p<.05). There was only a significant covariate of comorbidities that increased odds with being hospitalized (10.3, p<.0001).

- For LOS over two years, there was a reduction for the adherent group by -11.4 days (p<.0008). The only other significant variable was an interaction between adherence and comorbidity (p<.007). Specifically, there was a much larger reduction in LOS based on adherence among those with no comorbidity (-20.3 days) versus only a -2.5 days reduction among those with comorbidities.

CONCLUSIONS

- An adherence metric for oral antineoplastic medications utilized by cancer patients had significant associations with yearly cost and utilization outcomes. Remaining adherent to oral antineoplastic therapy was associated with lower medical costs, fewer hospitalizations, and a shorter LOS, even across multiple years. These reductions were dependent with interactions between age, presence of non-cancer Charlson comorbidities, or new to therapy/diagnosis, and metropolitan areas for hospitalizations.

- In addition, these results help validate the PDC methodology presented. This metric can be used for yearly reporting requirements by implementing filters controlling for alternative conditions, late medication starts in the given year, and allowing product switching within a therapy class.

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