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Cancer patients' use of pharmaceutical patient assistance programs in the outpatient pharmacy at a large tertiary cancer center

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Abstract

Purpose—To report on the use of pharmaceutical patient assistance programs (PAPs) in the outpatient pharmacy at the largest tertiary cancer center in the United States.

Methods—We conducted a retrospective (July 1, 2006–Dec 31, 2007) cross-sectional analysis of outpatient pharmacy, medical, and cancer registry records at the cancer center. The cancer center identified 104 medications available through PAPs. Study-eligible patients received at least one of these medications, either as a PAP case patient or as a PAP control non-user. Binary logit regression models predicted PAP use, and descriptive statistics compared PAP user and non-user medication fills.

Results—Of 25,552 cancer patients at who received an outpatient medication during the study period, 1,929 met study criteria (n=950 PAP users, 979 PAP non-users). In comparison to controls, PAP users were more likely to be uninsured (odds ratio (OR)=4.60, 95% confidence interval (CI): 2.118, 9.970), indigent (OR=16.95, 95% CI: 6.845, 41.960), and < 65 years old (OR=2.31, 95% CI: 1.517, 3.509). Of the most frequently dispensed medications to PAP users from PAPs (n=5,271), 88% (n=4,936) were for supportive care (e.g., nausea/vomiting). PAPs

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provided 35% (n=842) of the most common anticancer agents administered to PAP users (n=1,296), accounting for a monthly mean of \$55,000 in pharmaceutical expenditures.

Conclusions—In the cancer center's outpatient pharmacy, PAPs provided financial support for about a third of the most commonly used therapies, primarily for supportive care indications, for a small percentage of eligible cancer patients.

Keywords

cancer; supportive care; medication assistance; anticancer agents; outpatient pharmacy

1. Introduction

Oral anti-cancer and supportive care agents administered to cancer patients are costly, and are associated with large copayment requirements or are often not fully reimbursed by private health insurers or Medicare [1]. In an effort to facilitate access to oral medications, pharmaceutical manufacturers developed patient assistance programs (PAPs) that provide selected oral medications for free or at reduced cost to financially eligible patients. Eligibility criteria, application processes, and program administration for PAPs differ by manufacturer and by product, which can ultimately present logistical barriers [2–4]. A systematic review of PAPs found improvements in disease indicator outcomes for patients with common chronic diseases who access these programs [5]. However, knowledge about the use of PAPs among cancer patients is limited [6].

The University of Texas M.D. Anderson Cancer Center (MDACC), the largest tertiary care cancer center in the country, has developed a systematic approach to administering a large number of PAPs. In 1996, the MDACC established an institutional program staffed by hospital pharmacy personnel who navigate cancer patients through PAPs in the inpatient and outpatient settings. This program removes operational and administrative barriers often experienced by patients in smaller clinical settings. Cancer patients eligible for PAPs at MDACC include those who are uninsured, under-insured, those whose pharmacy benefit limits have been reached, and those whose private health or government insurance has denied coverage of certain oral medications. For example, the Texas Medicaid program limits its low-income beneficiaries to 3 prescriptions per month, which may lead some of them, particularly those with cancer, to need additional medication assistance through PAPs. As of April 2008, this institutional program established formal relationships with 29 pharmaceutical companies who provide 104 therapeutic or supportive care agents through PAPs to eligible cancer patients in the MDACC outpatient pharmacy.

The purpose of this study was to describe the characteristics of the cancer patients at MDACC who accessed PAPs and the types of oral agents administered to these patients; and to compare these findings with the characteristics of patients and agents administered to patients at MDACC who received similar medications whose costs were not supported by PAPs.

2. Methods

2.1. Data source

Approval for this study was obtained from the University of Texas M.D. Anderson Cancer Center (MDACC) Institutional Review Board. We conducted a retrospective, secondary analysis of non-investigational prescription medications from the outpatient pharmacy at MDACC. Data from July 1, 2006 to December 31, 2007 were extracted from computerized pharmacy, medical, and cancer registry databases at MDACC. Prescriptions had to include both patient medical record and social security numbers to validate patient identity, as well

as date of pick-up to validate that the medication had been dispensed during the study period. When date of pick-up was missing but billing was documented, the date the medication was dispensed was used as the pick-up date. All data were de-identified prior to analysis.

2.1.1. Patient Assistance Programs—Prescriptions for oral medications were available to financially-eligible individuals via two types of PAPs at MDACC: individual enrollment (n=60 distinct medications) and bulk drug replacement (n=44 distinct medications). Individual enrollment requires that an eligible patient apply directly to a pharmaceutical company's PAP for the medication (s) needed. Once approved, the requested medication can be mailed directly to the patient or dispensed in the MDACC pharmacy. Given the purpose of this study, we were only interested in those PAP prescription medications dispensed at the outpatient pharmacy.

Bulk replacement PAPs provide available prescription medications in bulk quantities on a monthly (in some cases quarterly) basis to MDACC's pharmacy to replace medications dispensed to patients who were classified as "indigent" by MDACC-established criteria. Financially indigent patients were those who were 1) Texas residents; 2) uninsured or insured by Medicaid; and 3) not responsible for charges billed to MDACC. All eligible patients could apply for the 60 medications available through individual PAP enrollment, but only indigent patients qualified for the 44 medications available through bulk drug replacement to MDACC.

2.1.2. Patient classifications—Prescription data were extracted from a pharmacy administrative dispensing database; a systematic process was developed to identify case patients (based on financial eligibility) and control patients (similar to case patients with respect to treatments received, but were non-users of PAP programs). Only patients who were potentially eligible for PAPs were included in the study. The case selection was based on MDACC's determination of a patient's ability to pay, referred to as credit rating, at the time of a patient's registration at the institution. Regardless of health insurance status, patients who had a low credit rating (responsible for 0% to 50% of their charges) were classified as being potentially eligible for PAPs. Patients with low credit ratings also included those who were indigent. The control selection identified a set of insured patients, including those with high credit ratings (responsible for 100% of their charges), who had been referred for special financial assistance to obtain specific medications through PAPs.

To be included in the study, patients identified based on a low credit rating had to receive at least one of the 104 medications through a PAP to be classified as a PAP user; these patients could receive other medications through traditional payment. PAP non-users had to receive at least one of the 104 medications associated with PAPs, but through traditional payment or other third party source, and not through a PAP (Figure 1). Patients who had been referred for special assistance had to receive one or more of the PAP medications they initially requested from a PAP. To be verified as a PAP prescription medication, the pharmacy record could not have documentation of third party payer or patient payment for the PAP medication. The only exception made for payer and patient payment was for prescription medications provided by one particular pharmaceutical company that required a \$10 co-pay for their PAP medications. Once PAP and non-PAP prescriptions were verified, they were aggregated by a unique patient identifier to yield prescription use data for individual patients who were categorized as PAP users versus PAP non-users.

2.1.3. Patient characteristics—Data on patient gender, race/ethnicity, age, insurance status, and primary cancer site were extracted. Gender was classified as male or female. Race/ethnicity was categorized as White, Black, Hispanic, or Asian/Other. Age was

calculated as of July 1, 2006 from the patient's birth date. Insurance status was based on the patient's insurance status at the time of registration at MDACC and categorized as follows: no insurance (include self-pay and patients referred from the county public hospital), Medicare, Medicaid, or any of a variety of private/commercial insurances. Private insurances were combined into one category. Information on each patient's primary cancer site was categorized as blood, breast, genital and urinary, head and neck, or other, (primarily brain, central nervous system, and those with an unknown primary site).

The gender and insurance variables had some missing data. When there was conflicting data for a particular patient's gender, we coded gender as missing. When insurance type was missing, data on the patient's insurance status at the time of registration at MDACC was retrieved from MDACC's financial department.

2.1.4. Prescription Medication Fills—Data on prescription medication name (generic or brand) and institutional billing charges per fill were extracted from pharmacy records. Prescriptions were aggregated by generic and brand names, regardless of strength, dosage form, or method of administration, to identify the 20 most frequently dispensed medications overall and for the treatment of cancer. We then used Rxlist.com, an online medication reference program, to identify each medication's clinical indication(s) (www.rxlist.com). For example, the brand named medication, "Zofran" would be aggregated with its generic, "ondansetron," and be considered as one medication indicated for nausea and vomiting.

We extracted patient billing charge per medication fill in dollars by the date of pick up in the outpatient pharmacy. Patient billing charge included patient copayments, and did not include any payments from the patient's payer or health plan. If the billing charge was missing for a medication fill, we applied a comparable charge from a prescription medication of the same name, dosage, quantity, date of pick up, and patient insurance status. When quantity, date or patient insurance status differed, the lowest available charge was used. All charges were adjusted to the year 2008 using the U.S. Bureau of Labor's Annual Producer Price Index for pharmaceutical preparation and manufacturing [7].

2.2. Data Analysis

For patient-level analyses, a *PAP user* was a patient who received at least 1 medication through a PAP during the study period. We used descriptive statistics to compare patient characteristics of PAP users versus PAP non-users. Next, we conducted separate unadjusted binary logit regression analyses (interpreted with odds ratios and 95% confidence intervals) to estimate the differences in the probability of being a PAP user for each of the patient characteristics. All patient characteristics that were statistically significant at $p < 0.20$ for the unadjusted analyses [8] were included in the final multivariable model. The a priori level of significance was set at $p < 0.05$ for the multivariable model.

For other analyses conducted at the prescription level, a *PAP medication* was a medication verified as being provided through a PAP. We used descriptive statistics to compare the 20 most frequently dispensed prescription medications (overall and for anti-cancer agents specifically) by PAP status and clinical indication. Analyses were conducted in Microsoft Excel and STATA Version 11[9].

3. Results

3.1. Study patients and prescription medications

During the 18-month observation period, a monthly mean of 1,550 patients received a monthly total of 19,000 non-investigational medications in the outpatient pharmacy. Of these patients, 7.5% ($n=1,929$) met study eligibility criteria of being eligible for PAPs, and

having received 1 of the 104 medications provided through PAPs. Thus, there were 979 PAP users and 950 PAP non users in the final study population. In total, the study population received 23.3% (n=77,592) of all outpatient medications administered during this period, of which anti-cancer agents represented 4% (n=3,105) (Table 1).

3.2. Comparison of patient characteristics

In comparison to PAP-non users (Table 2) PAP users were, on average, younger (48 versus 52 years,) indigent (73% versus 19%), not African American or Hispanic (53% versus 47%), and not covered by private health insurance (26% versus 80%). PAP users also had more prescriptions fills (median= 30 versus 20) during the study period at the institution. Univariate analyses showed that all patient characteristics, except gender, significantly predicted PAP use (Table 3). Given the strong correlation of indigent and insurance status to PAP use, we conducted post-hoc analyses to assess the potential for multi-collinearity between the two patient characteristics. The variance inflation factor (VIF=4.57) did not indicate multicollinearity concerns.

In the adjusted model, patients who were indigent (OR=16.95, 95% CI: 6.845, 41.960), uninsured (OR=4.60, 95% CI: 2.118, 9.970), and under the age of 65 years (OR=2.31, 95% CI: 1.517, 3.509) were two- to 17-fold more likely than others to be PAP users. Blacks were 31% (p=0.020) less likely to access PAPs compared to Whites.

3.3. Overall prescription medication fills

The top 20 prescription medication fills from the MDACC outpatient pharmacy differed by PAP user group and PAP status (Table 4). For PAP users, 88% of their most common medications obtained from PAPs were supportive care agents, including treatments for bacterial infections (n=887 (49/month)), anti-emetics (n=492 fills (27/month)), and GERD (n=429 fills (27/month)). Conversely, treatments for neutropenia and anticoagulation represented nearly half (\$1.8 million) of the total charges avoided through PAPs to PAP users (\$3.9 million). The most common medications not obtained from PAPs were for treatment of pain (PAP users=292 fills/month, non-users=218 fill/month), versus only 13 fills/month for pain medications from PAPs. Medications indicated to treat pain and nausea/vomiting accounted for the largest proportion of charges for medications not filled by PAPs for both PAP users and non-users.

3.3.1. Anti-cancer agent prescription fills—For both PAP users and non-users, the top 20 anti-cancer oral agent fills represented 93% (n=2,892 of 3,105) of all anti-cancer oral fills (Table 5), with 16% (n=454) of these oral fills being provided through PAPs. Among PAP users, anti-cancer agents from PAPs accounted for 40% of their total charges, and 35% of total number of agents. Temozolomide (mean charge/fill= \$3,346) represented the highest amount of total charges (\$220,857) from PAPs, whereas, imatinib (mean charge/fill=\$5,372) and dasatinib (mean charge/fill=\$5,221) accounted for the highest average charges per fill. Anastrozole (n=178 fills (10/month), capecitabine (n=91 fills (5/month), and temozolamide (n=66 fills (4/month), accounted for 70% of agents from PAPs. PAP users who received bicalutamide received 100% of those agents from PAPs. Five of the 7 oral anti-cancer agents with no fills from PAPs had initial FDA approval years before 2000.

4. Discussion

At the MDACC, PAPs are designed to help cancer patients overcome financial barriers to accessing oral supportive and anti-cancer agents. Over an 18-month observation period, less than 5% of the cancer patients at MDACC who received prescription medications from the outpatient pharmacy were enrolled in a PAP- and these PAPs provided 13% of their

medication fills, representing an annualized \$3.6 million in pharmaceutical expenditures. In interpreting our findings, several factors should be considered.

Oral anti-cancer agents accounted for 4% of all prescription medication fills during the study period. Comparatively, an analysis of the 2007 National Ambulatory Medical Care Survey showed that less than 1% of cancer patients were prescribed at least one oral anti-cancer agent [10]. This indicates that both nationally and at MDACC chemotherapy continues to be largely provided parenterally, as there is more of a financial benefit from intravenous therapies that are often reimbursed by insurers, as well as PAPs. In the outpatient pharmacy at MDACC, PAPs provided nearly one-third of oral anti-cancer fills for PAP users--totaling a mean of \$500,000 per month in expenditures. However, three agents, anastrozole (for breast cancer), capecitabine (for breast and GI cancers, primarily), and temazolamide (for brain tumors) accounted for 75% of all of the anti-cancer agents provided by PAPs. We also found that pharmaceutical companies provided expensive newer, targeted, anti-cancer agents (primarily dasatinib and imatinib, the two agents with the greatest pharmaceutical per-person expenditures by the PAP program) through PAPs.

While PAPs filled a strong and focused need for a small number of oral chemotherapy agents for some individuals with breast, GI and brain cancers, they did not provide much benefit for a wide range of supportive care agents, particularly those that are schedule C and used to treat cancer pain. Pain is the most prevalent symptom reported by cancer patients [11], but there were very few schedule C pain medications among the most common medications provided through PAPs. These substances are generally not provided by PAPs because of legal and substance abuse concerns [12]. However, these medications were commonly prescribed to PAP users and PAP non-users alike, outside of the PAP program. It would be important to evaluate the comparative success in treating pain among cancer patients at MDACC who receive a limited array of pain medications from PAPs (usually agents that are not substance-controlled by the Drug Enforcement Administration) versus treatment of pain experienced by patients whose medications are not reimbursed by PAPs.

We found that being less than 65 years old, being indigent, and having no health insurance were the strongest predictors of using a PAP. This was expected, given that U.S. adults under the age of 65 are ineligible for outpatient prescription medication coverage through Medicare Part D. However, contrary to expectations, about 45% of PAP users had either private or governmental-supplied health insurance. Because it is not uncommon for cancer patients to endure economic hardship (including bankruptcy) when trying to finance their care [13], healthcare professionals could recommend PAPs and other relevant assistance programs to all of their cancer patients. With the expansion of health insurance through the Patient Protection and Affordable Health Care Act of 2010, it is hoped that the need for cancer patients to enroll in PAPs is diminished; yet, given the reality of the high cost of anti-cancer agents, reimbursement policies for these agents, and tiered formularies among insurers which leads to high out-of-pocket costs for patients, the need for PAPs is likely to remain. While PAPs can be a viable option for some patients, healthcare professionals should be aware that there are a number of concerns about these programs, including their complex and burdensome application process and often limited variety of drugs available[14].

This study is not without its limitations. First, we may have underestimated our sample of PAP patients due to the fact that MDACC did not electronically or systematically track the use of PAPs within their pharmacy database at the time of the study. The institution is in the process of developing such a system. Second, the data used in this study cannot be assumed to reflect a "closed pharmacy" setting because some patients, particularly those with health insurance with prescription medication coverage, may have received some of their

medications from outside pharmacies. Third, because insurance status is not necessarily a static characteristic, insurance status in this study was classified based on that at the time of registration with MDACC's financial department and no account was taken of changes that might have occurred. Last, our results are not necessarily generalizable to all cancer populations, time periods, or settings. Cancer patients treated in academic centers such as MDACC may be different from those who are treated in community settings. In particular, fewer than 10% of patients at MDACC qualified for indigent financial assistance in 2007[15], which is likely to have impacted the number of patients who were potentially eligible for PAPs. It is also likely that had our study been conducted prior to the implementation of Medicare Part D, our sample of PAP patients would have been older. Nevertheless, our results may be generalizable to cancer patients receiving care in other academic cancer centers.

5. Conclusion

This study builds upon a previous description of implementing PAPs in a comprehensive cancer center [16], as well as contributes to our limited knowledge of the use of PAPs among cancer patients [6]. Future studies should prospectively examine cancer patients' experiences and satisfaction with PAPs from the process of applying to the point of receiving requested therapies, and evaluate the effect of PAPs on cancer outcomes in various care settings. Multidisciplinary teams, including pharmacists and clinicians, should establish and recommend clinical endpoints that are valid and relevant for researchers to use in effectiveness studies of PAPs and cancer patients, particularly as relates to oral anti-cancer agent use. Given that these oral agents represent over 25% of cancer therapies in development [17], future studies of PAPs are ideal for evaluating concerns of accessibility, affordability and compliance related to these agents.

The MDACC is a unique resource for observers of PAPs- as it is the largest cancer center in the United States. Despite this, few cancer patients at MDACC were eligible for and accessed PAPs in the outpatient pharmacy. While smaller cancer centers may not be able to devote the same degree of financial and personnel resources of MDACC to their patients, these centers could seek to build relationships with specific pharmaceutical companies that provide PAPs for oral anti-cancer and supportive care therapies that are most commonly prescribed and administered at their centers. Scarce resources could also be utilized in other ways, such as developing public-private risk pools for establishment of indigent care funds.

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Figure 1.
Process of identifying and classifying study-eligible patients

Table 1

Summary of the number of study-eligible patients by prescription medication fills during 18-month study period

	PAP users (n=979)		PAP non-users (n=950)		Row total
Received anti-cancer agents?	NO	YES	YES	NO	
Total study-eligible patients	703	276	309	641	1,929
Supportive care Rx from PAPs	3,685	1,379	0	0	5,064
Supportive care Rx not from PAPs	25,002	12,031	10,353	22,037	69,423
Anti-cancer agents from PAPs	0	477	0	0	477
Anti-cancer agents not from PAPs	0	915	1,713	0	2,628
Total Rx during study period	28,687	14,802	12,066	22,037	77,592

Table 2

Summary of patient characteristics by patient assistance program user status

Patient characteristics	PAP non-users n=950 (%)	PAP users n=979 (%)	p-value
Age in years	52.1 ± 18.60	47.8 ± 13.77	<0.001
(Range)	<1, 100	1,82	
No. of prescriptions dispensed	35.9 ± 46.08	44.4 ± 44.07	<0.001
Median (Range)	20 (1,412)	30 (1,307)	
Gender			0.617
Male	351(37.0)	383 (39.1)	0.326
Female	598 (63.0)	595 (60.8)	
Missing	1 (0.1)	1 (0.1)	0.983
Indigent status			<0.001
Non-indigent	767 (80.7)	263 (26.9)	
Indigent	183 (19.3)	716 (73.1)	
Race/Ethnicity			0.006
White	404 (42.5)	486 (49.6)	0.002
Black	217 (22.8)	166 (17.0)	0.001
Hispanic	296 (31.2)	297 (30.3)	0.705
Asian/Other	27 (2.8)	23 (2.4)	0.498
Missing	6 (0.6)	7 (0.7)	0.823
Insurance Status			<0.001
Private	330 (34.7)	155 (15.8)	<0.001
Medicare	426 (44.8)	87 (8.9)	<0.001
Medicaid	168 (17.7)	192 (19.6)	0.277
Uninsured	26 (2.74)	545 (55.67)	<0.001
Cancer type			0.056
Blood	196 (20.6)	242 (24.7)	0.032
Breast	184 (19.4)	155 (15.8)	0.041
Genital & Urinary	175 (18.4)	163 (16.7)	0.306
Head & Neck	86 (9.1)	105 (10.7)	0.219
Other/unknown	309 (32.5)	314 (32.1)	0.832

Table 3

Unadjusted and adjusted odds ratios (OR) and 95% confidence intervals from logistic regression models predicting patient assistance program user status by patient characteristics

Patient Characteristics	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Indigent status		
Non-indigent	REF	REF
Indigent	11.41 (9.208, 14.139) ***	16.95 (6.845, 41.960) ***
Age		
65 years and older	REF	REF
Under 65 years old	7.86 (5.696, 10.851) ***	2.31 (1.517, 3.509) ***
Gender		
Male	REF	
Female	1.10 (0.912, 1.318)	N/A
Race/Ethnicity		
White	REF	REF
Black	0.64 (0.500, 0.810) ***	0.69 (0.500, 0.942) *
Hispanic	0.83 (0.677, 1.027)	0.79 (0.604, 1.044)
Asian/Other	0.71 (0.400, 1.254)	0.88 (0.423, 1.844)
Insurance Status		
Private	REF	REF
Medicare	0.43 (0.322, 0.587) ***	0.62 (0.439, 0.869) **
Medicaid	2.43 (1.836, 3.225) ***	0.17 (0.063, 0.431) ***
Uninsured	44.63 (28.820, 69.106) ***	4.60 (2.118, 9.970) ***
Cancer type		
Blood	REF	REF
Breast	0.68 (0.513, 0.907) **	0.44 (0.301, 0.645) ***
Genital & Urinary	0.75 (0.568, 1.003) *	0.56 (0.380, 0.827) **
Head & Neck	0.99 (0.703, 1.392)	0.91 (0.0584, 1.412)
Other/unknown	0.82 (0.644, 1.052) *	0.71 (0.516, 0.979) *

* represents $p < 0.20$ for unadjusted and $p < 0.05$ for adjusted estimates;

** $p < 0.01$;

*** $p < 0.001$

N/A: not applicable

Table 4

Summary of the clinical indications of the 20 most frequently dispensed medications by patient assistance program (PAP) user status (in rank order of total billing charges)

PAP users (n=979)						PAP non-users (n=950)					
Top medications from PAPs			Top medications not from PAPs			Top medications not from PAPs			Top medications not from PAPs		
Clinical indication	Total billing charges(\$)	% total (\$)	N	% total (n)		Clinical indication	Total billing charges(\$)	% total (\$)	N	% total (n)	
neutropenia, infection	\$968,739	25%	227	4%		nausea/vomiting	\$772,003	35%	546	4%	
anticoagulation	\$904,323	23%	238	5%		pain	\$550,487	25%	5,259	42%	
nausea/vomiting	\$565,662	14%	492	9%		nerve pain	\$233,524	11%	969	8%	
Cancer	\$487,877	12%	335	6%		gastro reflux disease	\$217,262	10%	980	8%	
fungal infection	\$421,783	11%	148	3%		fungal infection	\$134,678	6%	433	3%	
bacterial infection	\$202,507	4%	887	17%		supplementation	\$111,955	5%	1,020	8%	
gastro reflux disease	\$125,766	3%	492	9%		anticoagulation	\$90,903	6%	869	7%	
herpes (labialis, genital)	\$112,008	3%	470	9%		anxiety/sedation	\$30,525	1%	484	4%	
hyperlipidemia	\$40,996	1%	248	5%		heart failure, hypertension	\$23,168	1%	401	3%	
Pain	\$31,630	0.8%	238	5%		immuno-suppression	\$17,680	1%	668	5%	
asthma, COPD	\$23,032	0.6%	80	2%		bacterial infection	\$12,204	1%	443	3%	
heart failure, hypertension	\$36,812	0.9%	794	15%		constipation	\$9,659	0.4%	598	5%	
hypothyroidism	\$17,243	0.4%	622	12%							
Total	\$3,938,379		5,271				\$2,204,047		12,670		
							\$3,153,050				

Table 5

Summary of the 20 most frequently dispensed anti-cancer agents by patient assistance program (PAP) user status (in rank order of total billing charges from PAPs)

Anti-cancer agent characteristics		PAP users (n=276)								PAP non-user (n=309)	
Generic Name (FDA approval)	Cancer Indication	Cancer agents from PAPs		Cancer agents not from PAPs		Total cancer agents for PAP users		% of total cancer agents from PAPs		Total cancer agents for PAP non-users	
		\$	N	\$	N	\$	N	\$	N	\$	N
Temozolomide (1999)	Brain	\$220,857	66	\$185,072	49	\$405,929	115	54%	57%	\$645,982	209
Capecitabine (1998)	Abdominal cavity viscera, Breast	\$162,146	91	\$139,727	69	\$301,872	160	54%	57%	\$379,474	189
Sorafenib (2005)	Abdominal cavity viscera, Genital & Urinary	\$134,469	28	\$74,603	11	\$209,072	39	64%	72%	\$90,819	17
Anastrozole (1995)	Breast	\$105,210	178	\$77,289	110	\$182,499	288	58%	62%	\$131,674	205
Imatinib (2001)	Abdominal cavity viscera, Blood	\$75,220	14	\$45,504	11	\$120,724	25	62%	56%	\$880,822	117
Erlotinib (2004)	Abdominal cavity viscera, Chest cavity viscera	\$62,655	13	\$247,149	33	\$309,804	46	20%	28%	\$345,708	75
Dasatinib (2006)	Blood	\$46,990	9	\$107,671	22	\$154,662	31	30%	29%	\$114,629	20
Bicalutamide (1995)	Genital & Urinary	\$12,930	20	\$0	0	\$12,930	20	100%	100%	\$14,008	20
Bexarotene (1999)	Blood	\$12,112	4	\$134,545	35	\$146,657	39	8%	10%	\$489,686	124
Letrozole (1997)	Breast	\$6,529	19	\$12,605	21	\$19,134	40	34%	48%	\$46,925	88
Megestrol Acetate (1971)	Breast, Genital & Urinary	\$1,894	4	\$37,558	100	\$39,452	104	5%	4%	\$19,516	52
Lomustine (1976)	Brain, Blood	\$145	2	\$467	8	\$612	10	24%	20%	\$1,771	28
Cyclophosphamide (1959)	Blood, Breast	\$100	6	\$3,151	23	\$3,913	29	3%	21%	\$4,715	31
Exemestane (1999)	Breast	\$0	0	\$14,021	33	\$14,021	33	0%	0%	\$26,167	60
Hydroxyurea (1967)	Blood, Genital & Urinary, Head & Neck	\$0	0	\$4,718	32	\$4,718	32	0%	0%	\$7,072	28
Interferon Alfa 2b (1995)	Blood	\$0	0	\$1,363	2	\$1,363	2	0%	0%	\$96,114	50
Mercaptopurine (2004)	Blood	\$0	0	\$24,300	82	\$24,300	82	0%	0%	\$28,534	86
Methotrexate (1953)	Blood, Breast, Head & Neck, Genital & Urinary, Chest cavity viscera, Gestational	\$0	0	\$19,084	103	\$19,084	103	0%	0%	\$17,809	83

Anti-cancer agent characteristics		PAP users (n=276)								PAP non-user (n=309)	
Generic Name (FDA approval)	Cancer Indication	Cancer agents from PAPs		Cancer agents not from PAPs		Total cancer agents for PAP users		% of total cancer agents from PAPs		Total cancer agents for PAP non-users	
		\$	N	\$	N	\$	N	\$	N	\$	N
Sunitinib (2006)	Abdominal cavity viscera, Genital & Urinary	\$0	0		\$116,042	13	\$116,042	13	0%	\$386,237	54
Tamoxifen Citrate (1977)	Breast	\$0	0		\$18,480	85	\$18,480	85	0%	\$13,392	60
Column Total		\$841,257	454	\$1,263,349	842	\$2,105,268	1,296	40%	35%	\$3,741,054	1,596