# An Assessment of the Total Cost of Pancreatic Cancer Using Real-World Evidence

Vincent J. Picozzi[1] Victoria G. Manax[2] Kelly Feehan[2] Zachary Wintrob[3] Michele Korfin[4] Giuseppe Del Priore[4] Robert Goldberg[5]

[1]Virginia Mason Hospital and Medical Center [2]Pancreatic Cancer Action Network (PanCAN) [3]ROAKETIN Inc. [4]TYME Inc. [5]Center for Medicine in the Public Interest

## BACKGROUND

- Over 55,000 patients are diagnosed with pancreatic cancer each year in the U.S. The prognosis is very poor, with 5-year survival at 9% (ACS, 2019).
- The aggregate health economic implications of pancreatic cancer are poorly understood, especially from the patient perspective.
- As a preliminary effort, we sought to better understand changes in type and quantity of medical expenditures over time, along with quality of life related costs, from this perspective.
- This preliminary research is part of a larger effort to understand how the introduction of new treatments affect both the outcome and costs of pancreatic cancer associated with care, patients, survivors, their families, and their communities.

## METHODS

- We analyzed patient-level data from the Medical Expenditure Panel Survey (MEPS, 1996 – 2017). MEPS data are derived from a set of large-scale surveys of families and individuals, medical providers and employers across the US on the type, frequency and cost of health services used. All analyses were performed using R version 3.6.1 on Ubuntu 19.04.
- Averages were computed for the total health care costs, including prescription drug costs for the period between 2009 – 2016 to include approval and use of (nab)-paclitaxel (Abraxane), FOLFIRINOX and erlotinib.
- Average individual annual cost estimates for the second year excluded individuals that were identified as having died prior to the first round of data collection in the second year.
- Interpretation of results may be limited by a relatively small sample size and may not be generalizable to specific demographic groups.
- The individual patient level ratios of prescription drug cost to other medical expenses was also computed.
- All expenditures are adjusted for inflation using 2012 USD.
- Included subjects (n=80) had a diagnosis of pancreatic cancer and available prescription data. Individual age and employment status were accounted for as covariates.

## RESULTS

TABLE 1
**DEMOGRAPHICS AND DESCRIPTIVE CHARACTERISTICS**

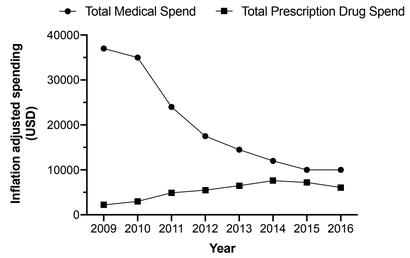
| | | |
|---|---|---|
| **Sex** | Female | 41 (51.25%) |
| | Male | 39 (48.75%) |
| **Race** | Asian | 7 (8.75%) |
| | Black | 10 (12.50%) |
| | White | 59 (73.75%) |
| | Not Available | 4 (5.00%) |
| **Employment Status** | Employed | 25 (31.25%) |
| | Will Return to Work | 1 (1.25%) |
| | Not Employed | 54 (67.50%) |
| **Received Social Security Income** | Yes | 10 (12.50%) |
| | No | 70 (87.50%) |
| **Insurance Status** | Any Private Insurance | 43 (53.75%) |
| | Public Insurance Only | 33 (41.25%) |
| | No Insurance | 4 (5.00%) |

TABLE 2: **PER PATIENT HEALTHCARE COSTS**

| ENROLLMENT YEAR | MEAN (SD) | MINIMUM | MAXIMUM |
|---|---|---|---|
| 1st Year (inflation-adjusted) | $25,957.55 ($41,054.70) | $0.00 | $280,443.46 |
| 2nd Year (inflation-adjusted) | $40,547.85 ($62,938.41) | $0.00 | $312,077.40 |

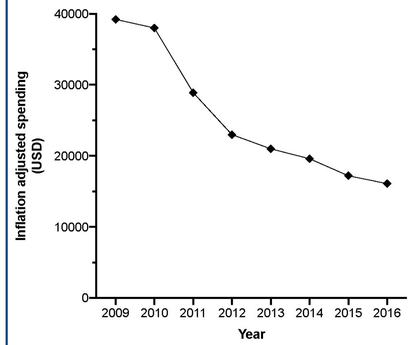
- Table 2 (above) shows mean inflation-adjusted patient level healthcare costs for patients with pancreatic cancer in the MEPS database.
- The few previous studies about the total cost of pancreatic cancer care have looked at the average dollars spent during a specific period of time. We replicated this approach and found that total pancreatic cancer costs averaged about $67,000 during the 1996-2017 time period, which is consistent with the findings of other analyses (Bao et al., 2018; O'Neill et al., 2012).
- However, such analyses are skewed by the fact that a small percentage of patients generate most of the cost. In this study, we attempt to capture statistically significant changes in spending and identify factors associated with such shifts.

FIGURE 1: **AS PRESCRIPTION DRUG SPENDING ROSE, OTHER MEDICAL SPENDING FOR PANCREATIC CANCER DECLINED**



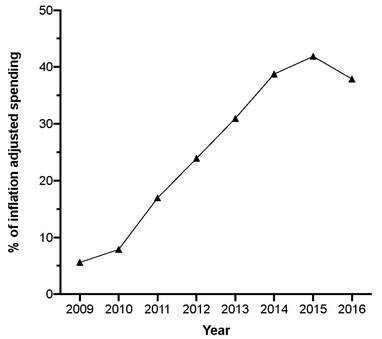

Between 2009 and 2016, inflation adjusted first- and second-year non-medication average per patient spending on pancreatic cancer care declined from $37,000 to $10,000. Prescription drug spending increased during the same time period.

FIGURE 2: **THE TOTAL COST OF PANCREATIC CARE (INFLATION ADJUSTED $) FELL FROM 2009 TO 2016**




The combined effect of decreased overall healthcare expenses and increased prescription drug expenses means that as a proportion of expense, prescription drugs have increased markedly in the last decade.

FIGURE 3: **PRESCRIPTION DRUG SPENDING AS A PERCENTAGE OF TOTAL SPENDING (INFLATION ADJUSTED $) INCREASED**




Specifically, between 2009 and 2016 prescription drug spending (not including the cost of administration) rose from approximately 6 percent to approximately 35 percent of inflation adjusted year 1 and year 2 total cost of care. At the same time, total inflation adjusted pancreatic cancer treatment costs declined by 73 percent per person.

## DISCUSSION

- As noted, this preliminary study suggests that the therapeutic benefit of increasing the use of prescription drugs is so great that it is driving a decrease in the actual cost of healthcare. This study period corresponds to the introduction of more effective, multi-agent chemotherapies for pancreatic cancer, such as gemcitabine/Abraxane and FOLFIRINOX. The introduction of these prescription drug-based therapies may have contributed to decreasing the overall costs of care.
- Further analysis of a larger, longitudinal set of patient-level data is needed to more fully explore the relationship between drug spending, total cost of care as well as improvements in quality of life.
- 42.5% of patients in this study were under the age of 65 and not receiving Social Security Income, indicating a high societal burden from lost productivity. This patient and societal impact is worthy of future study.

## CONCLUSIONS

- For every additional dollar spent on drugs for pancreatic cancer between 2009 and 2016, there was a reduction in non-drug spending of $8 – $9. This relationship is consistent with several other studies that have examined the impact of new medicines on total cost of care (Lichtenberg, 2018). The decline is directly related to a reduction in hospitalizations and emergency visits between 2009 and 2016.
- This preliminary study suggests that frequency or cost of necessary procedures is markedly reduced by allotting budget towards better pharmacotherapy.
- Development of more effective, better tolerated therapies for pancreatic cancer could lead to further decreases in the total cost of care and will also address the urgent patient need for additional treatment options.
- As even more therapies for pancreatic cancer have been developed in the past few years, it would be beneficial to conduct an update to this research periodically.

## REFERENCES

1. American Cancer Society. *Cancer Facts & Figures 2019*. Atlanta: American Cancer Society; 2019
2. Lichtenberg, F. (2018). The Impact of New Drug Launches on Life-Years Lost in 2015 from 19 Types of Cancer in 36 Countries. Journal of Demographic Economics, 84(03), 309–354. doi: 10.3386/w24536
3. Bao, Y., Maciejewski, R. C., Garrido, M. M., Shah, M. A., Maciejewski, P. K., & Prigerson, H. G. (2018). Chemotherapy Use, End-of-Life Care, and Costs of Care Among Patients Diagnosed With Stage IV Pancreatic Cancer. Journal of Pain and Symptom Management, 55(4). doi: 10.1016/ j.jpainsymman. 2017.12.335
4. O'Neill, C. B., Atoria, C. L., Oreilly, E. M., Lafemina, J., Henman, M. C., & Elkin, E. B. (2012). Costs and trends in pancreatic cancer treatment. Cancer, 118(20), 5132–5139. doi: 10.1002/cncr.27490
5. Manax et al. Designing clinical trials in 3L+ pancreatic cancer. J Clin Oncol 37, 2019 (suppl 4; abstr 226)
6. Noel et al. Annals of Oncology 2019, Volume 30, Issue Supplement_4, July 2019, mdz155058

**Corresponding Author:**
**Bob Goldberg** (e): Bob@drbobgoldberg.com