Healthcare Resource Utilization and Costs in an At-Risk Population with Diabetic Retinopathy

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INTRODUCTION

Background
- Diabetic Retinopathy (DR) is the leading cause of blindness between ages 20-74 in the U.S.[1,2,3] and disproportionately affects Blacks, Hispanics and the elderly (>65 years).[4]
- DR progression to vision-threatening forms is associated with severity at presentation[5] and duration of diabetes.[6]

Problem Statement
- The cost-effectiveness of earlier screening, management of risk factors and early treatment for DR is well established.[7,8,9]
- However, implementation and compliance with preventative measures such as annual eye exams in vulnerable populations is inadequate, suggesting a need for targeted interventions. [10,11]

Question
- What is the extent of health care utilization and cost of delayed care by insurance type in a vulnerable patient population.

Hypothesis
- We hypothesized that delayed presentation of DR leads to increased downstream health care utilization and costs for patients with limited insurance.

Aim
- The aim of this study is to provide insight into improving preventative care for the underserved.

METHODS

Participants and study design
- Retrospective cohort study between January 2014 and December 2020.
- Patients were from the Denver Health Eye Clinic at Denver Health Medical Center (DHMC), a safety net institution for the underserved.

Patient Classification
- Patients were classified by insurance status into Medicare, Medicaid, private, uninsured and discounted healthcare groups. Discounted healthcare included the Colorado Indigent Care Program (CICP) and the Denver Financial Assistance Program (DFAP).
- Severity of DR was determined at the initial visit and stratified into 5 categories according to the International Clinical Disease Severity Scale for DR[13]: 1) no retinopathy; 2) mild non-proliferative retinopathy (NPDR); 3) moderate NPDR; 4) severe NPDR; and 5) proliferative diabetic retinopathy (PDR).

Outcome Measures
- Current Procedural Terminology (CPT) codes for DR were used in the 24-month period following the initial visit to the DHMC Eye Clinic.
- Codes for the following procedures were assessed: patient visits (excluding visits within the 90-day post-operative period), intravitreal injection (IVI), panretinal photocoagulation (PRP), and vitreoretinal surgery.
- The cost of each CPT code was defined by the facility price for a hospital setting in Colorado, adjusted to 2022 values.

Statistical Analysis
- Standard summary descriptive statistics were used to assess differences in demographic and clinical characteristics across insurance groups.
- Comparisons across groups was performed using the Chi-square or Fisher's exact test for categorical variables and ANOVA or Kruskal-Wallis test for continuous variables.

RESULTS

Table 1: Demographic and Clinical Characteristics by Insurance Status

Baseline characteristics	Medicaid n 120	Medicare n = 74	Private n = 18	DFAP/CICP n = 64	Uninsured n = 37	p-value
Race/Ethnicity						
White	29(24.2%)	11(14.9%)	6(33.3%)	3 (4.7%)	5 (13.5%)	
Hispanic	66(55.0%)	49(66.2%)	9(50.0%)	50(78.1%)	26 (70.3%)	0.017
Black	19(15.8%)	13(17.6%)	1 (5.6%)	5 (7.8%)	2 (5.4%)	
Asian	2 (1.7%)	0	1 (5.6%)	3 (4.7%)	1 (2.7%)	
Other	4 (3.3%)	1 (1.4%)	1 (5.6%)	3 (4.7%)	3 (8.1%)	
Primary Language						
English	66(55.0%)	44(59.5%)	13(72.%)	6 (9.4%)	13 (36.1%)	<0.0001
Spanish	47(39.2%)	29(39.2%)	4(22.2%)	51(79.7%)	22 (61.1%)	
Other	7 (5.8%)	1 (1.4%)	1 (5.6%)	7 (10.9%)	1 (2.8%)	
Hypertension	78(65.6%)	62(84.9%)	12(70.%)	50(79.4%)	18 (58.1%)	0.010
DR Severity						
No PDR	8 (6.7%)	10(13.5%)	0 (0%)	3 (4.7%)	4 (10.8%)	
Mild	16(13.3%)	18(24.3%)	3(16.7%)	12(18.8%)	4 (10.8%)	
Moderate	39(32.5%)	14(18.9%)	2(11.1%)	13(20.3%)	3 (8.1%)	0.016
Severe	17(14.2%)	8 (10.8%)	2(11.1%)	9 (14.1%)	3 (8.1%)	
PDR	40(33.3%)	24(32.4%)	11(61.1%)	27(42.2%)	23 (62.2%)	
Vitreous Hemorrhage	17(14.2%)	14(18.9%)	6 (33.3%)	16(25.0%)	13 (35.1%)	0.036

There was no significant difference between HbA1c levels, duration of diabetes, diabetic macular edema or neovascular glaucoma between insurance groups
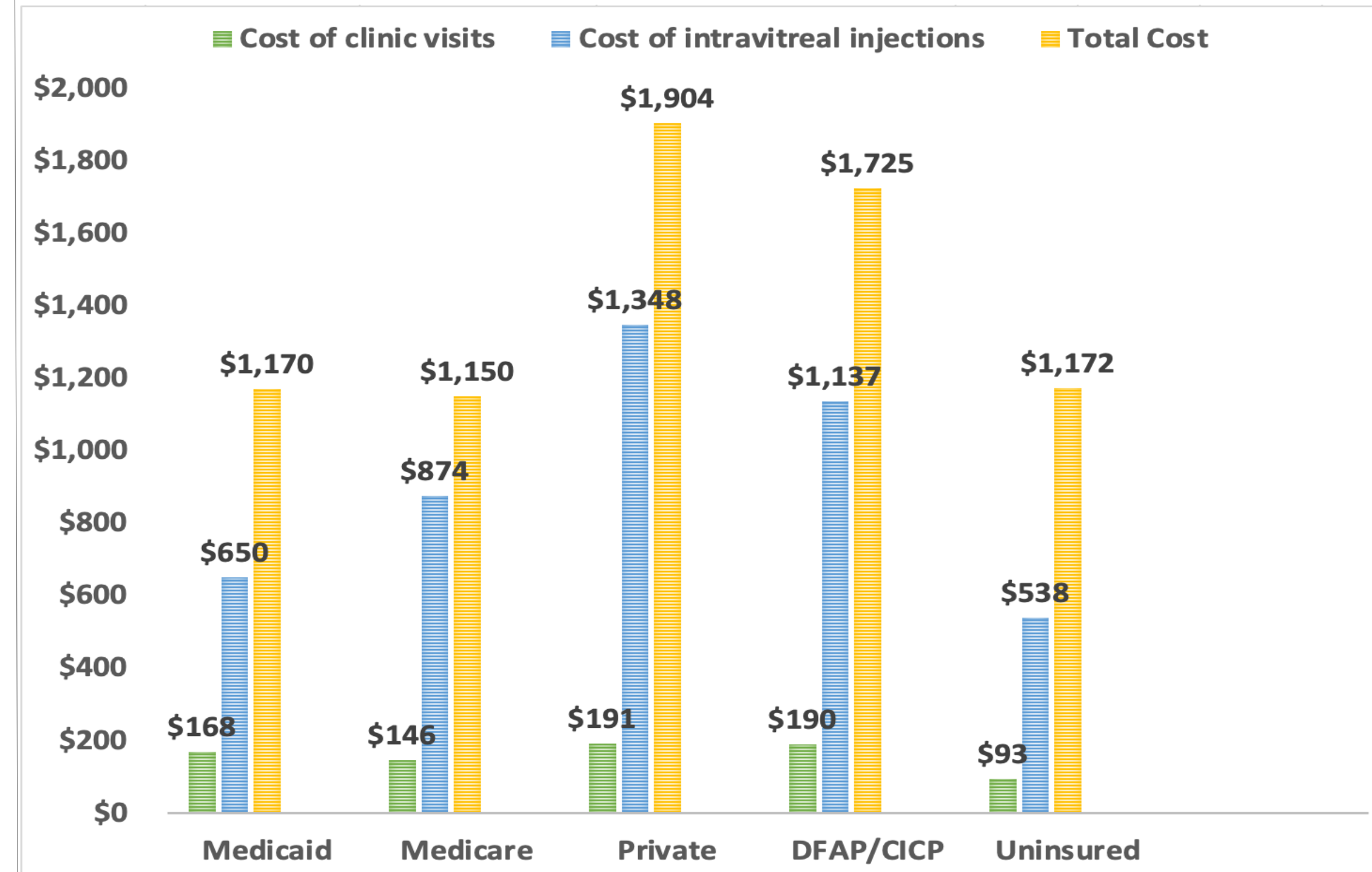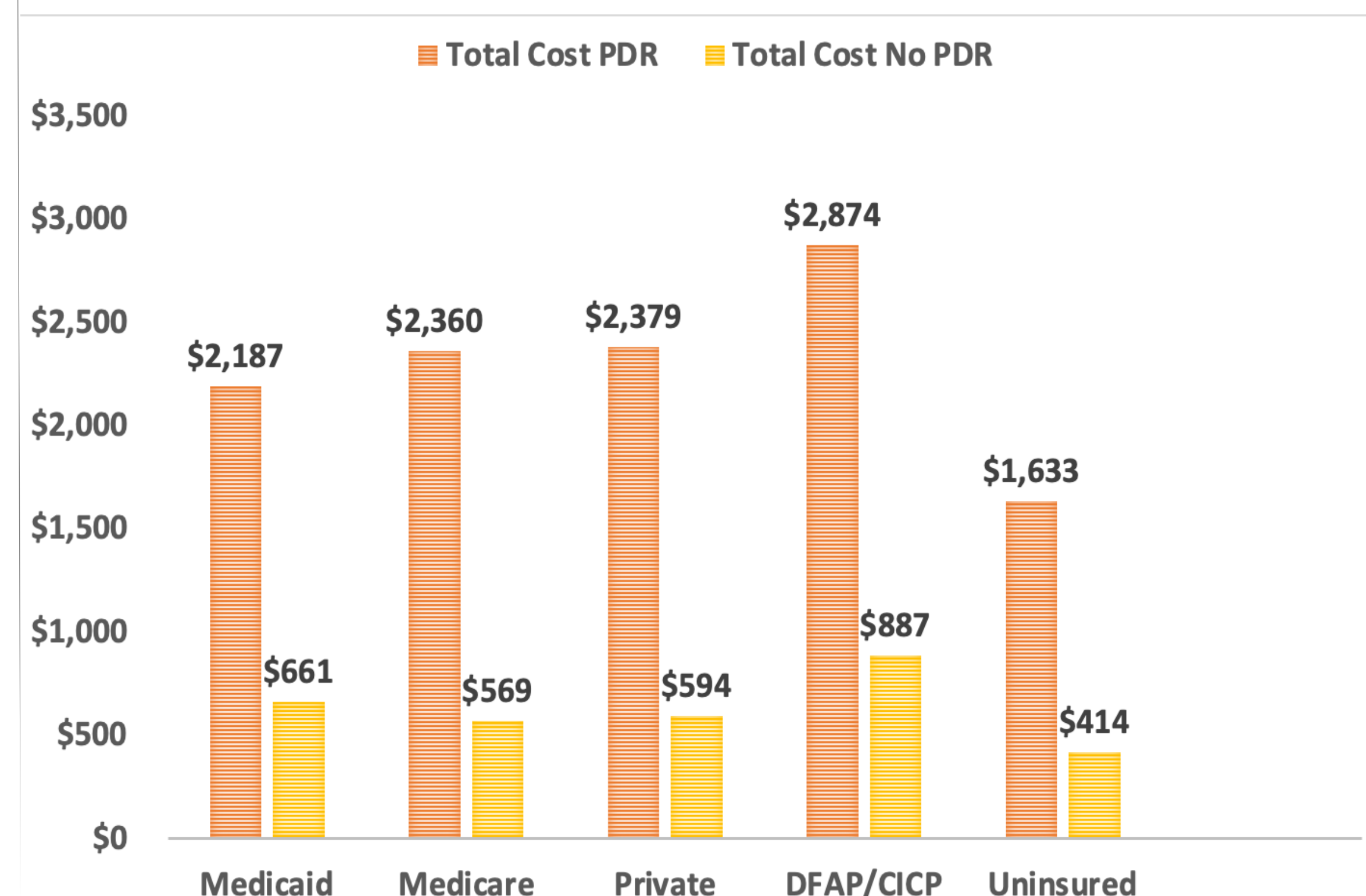

Figure 2: Mean Costs Stratified by PDR Status

KEY FINDINGS

- The uninsured group had the greatest levels of PDR and vitreous hemorrhage and the lowest mean number of eye clinic visits.
- The DFAP/CICP discount healthcare group had the highest number and total cost of eye clinic visits.
- The private insurance and DFAP/CICP groups had the highest frequency and cost of intravitreal injections.
- When stratified by PDR, costs to the healthcare system increased for all insurance groups compared to NPDR.

CONCLUSIONS

- DFAP/CICP and private insurance groups cost the most given initial severe disease and ability to pay for care.
- Medicaid/Medicare patients had the lowest costs likely due to lower rates of PDR and covered health care.
- The uninsured group had low costs. They were likely less able to follow-up due to finances despite severe disease.
- Inadequate insurance[13] and eye clinic visits[14] are associated with higher rates of PDR and severe DR at presentation[15,16,17].
- Early identification and treatment of DR is expected to lead to decreased healthcare costs and DR related vision losses.[18,19,20]
- Our study indicates insurance coverage for earlier screening and prevention in the underserved is needed.

LIMITATIONS

- Our findings might not be generalizable to populations with higher socioeconomic status and different ethnic diversity.
- A 24-month follow-up period may not be sufficient to fully observe differences in costs and outcomes with a slowly progressing disease such as DR.

REFERENCES

CONFLICT OF INTERESTS

- None of the authors have any proprietary interests or conflicts of interest related to this project.

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