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Trends in Medicare Reimbursement and Service Volume of Vitreoretinal Procedures: 2000 to 2021

Eric S. Li, BS[1,2], and Ron A. Adelman, MD, MPH[1,2]

Abstract

Purpose: To characterize trends in service volume and inflation-adjusted Medicare reimbursement of vitreoretinal procedures over the past 2 decades. **Methods:** Medicare Part B National Summary Data Files were accessed to identify the number of allowed services for vitreoretinal procedures. The Medicare Physician Fee Schedule was accessed to identify average annual national reimbursement rates. The Spearman correlation coefficient was used to evaluate time trends for each procedure. All analyses were conducted using Prism 9.5.1 software with 2-sided significance testing and statistical significance set at $P \leq .05$. **Results:** From 2000 to 2021, the 2-tailed Spearman correlation showed that 20 of 38 procedures had statistically significant decreases in service volume over time. Intravitreal injections increased more than 1000-fold, from 2922 in 2000 to 3 444 500 injections in 2021 ($\rho = 0.997$; $P < .001$). Panretinal photocoagulation treatments declined from 104 865 to 48 533 procedures ($\rho = -0.966$; $P = .003$). Scleral buckling declined from 6502 to 587 procedures ($\rho = -0.999$; $P < .001$). Pars plana vitrectomy–associated procedures increased from 71 039 to 95 429 ($\rho = 0.691$; $P < .001$). From 2000 to 2021, the 2-tailed Spearman correlation showed that 29 of 38 procedures had statistically significant decreases in reimbursement over time. No procedure had a significant increase in payment. **Conclusions:** Vitreoretinal practice patterns have changed dramatically over the past 2 decades, with significant declines in inflation-adjusted Medicare reimbursement for most procedures. Awareness of service volume and reimbursement trends is vital to assessing economic viability and patient coverage under the current Medicare payment policies.

Keywords

Medicare, service volume, vitreoretinal procedures, Medicare reimbursement

Introduction

The vitreoretinal field has evolved significantly over the past 2 decades, with significant shifts in utilization of and reimbursement rates for procedures performed for Medicare fee-for-service beneficiaries. Such changes not only reflect advancements in vitreoretinal treatments but also relate to the broader dynamics of healthcare policy, demographic shifts, and economic viability.

Medicare plays a pivotal role in shaping the accessibility and viability of these treatments, with reimbursement rates and policies influencing physician adoption of procedures and the financial sustainability of healthcare practices. Medicare enrollment expanded from 39.6 million people in 2000 to 62.6 million in 2021. With projected growth to go beyond 80 million people in 2030, the topic of Medicare reimbursement and sustainable delivery of healthcare becomes ever more prevalent in the setting of increasing healthcare demands.[1–3] Multiple specialties have experienced decreases in Medicare reimbursement, including general surgery, emergency medicine, otology, and dermatology.[4–7] After adjusting for inflation, Medicare physician reimbursement declined 26% from 2001 to 2023, with an additional 2% reimbursement reduction in 2023.[8]

In ophthalmology, understanding the trends in service volume and reimbursement for vitreoretinal procedures under Medicare can provide valuable insights into how these treatments can be strengthened and sustained in the coming years. The purpose of this study was to identify significant shifts in service volume and reimbursement rates for vitreoretinal procedures in the Medicare fee-for-service population over the past 2 decades.

Methods

This study was exempt from institutional review board approval and informed consent because human subjects were not directly involved. All data used were publicly available and de-identified. This study adhered to the tenets of the Declaration of Helsinki.

[1] Yale School of Medicine, New Haven, CT, USA
[2] Department of Ophthalmology and Visual Science, Yale School of Medicine, New Haven, CT, USA

Corresponding Author:
Eric S. Li, BS, Yale School of Medicine, Department of Ophthalmology and Visual Sciences, 333 Cedar St, New Haven, CT 06510, USA.
Email: eric.s.li@yale.edu

Medicare trends for 38 vitreoretinal procedures were evaluated from 2000 to 2021 (Supplemental Table S1). Part B National Summary Data Files were downloaded from the US Centers for Medicare & Medicaid Services (CMS) website.[9] The number of allowed services was determined for each year for each Current Procedural Terminology (CPT) code. The annual Medicare Part B enrollment was extracted from the CMS website,[10] and trends in service volume were normalized to patient population.

The Medicare Physician Fee Schedule was accessed using the CMS website and its online look-up tool.[11] The average reimbursement per year for each CPT code was determined by identifying the national average facility price each year (national estimate of procedure reimbursement adjusted for regional cost variations). If legislation altered Medicare reimbursements mid-year (2008, 2010, 2012, and 2015), the unweighted mean pricing from the 2 data files was used for that particular year (eg, 2008A, 2008B). Using Consumer Price Index data from the US Department of Labor's Bureau of Labor Statistics, reimbursement rates were adjusted for inflation to 2020 dollars.[12] The cumulative percentage change and compound annual growth rate were calculated for each vitreoretinal procedure. The annual inflation-adjusted reimbursement total for all vitreoretinal procedures was calculated from the average inflation-adjusted reimbursement for each procedure multiplied by the service volume for the corresponding procedure.

To evaluate trends, the Spearman correlation was determined for between (1) year and service volume, (2) year and service volume adjusted for Medicare Part B enrollment, (3) year and reimbursement rate, and (4) service volume and reimbursement rate for each procedure. All analyses were conducted using Prism 9.5 software (GraphPad) with 2-sided significance testing; statistical significance was set at $P \leq .05$.

Results

Figure 1A shows the total number of allowed services for each vitreoretinal procedure, and Supplemental Table S2 shows the total percentage change from 2000 to 2021. Figure 1B shows the total number of allowed services normalized to annual Medicare Part B enrollment, and Supplemental Table S3 shows the total adjusted percentage change. The total number of vitreoretinal procedures increased 6-fold during this time period, from 527 050 procedures in 2000 to 3 758 290 in 2021. The 2-tailed Spearman correlation between time and service volume showed that 20 of the 38 analyzed procedures had statistically significant decreases in service volume (Supplemental Table S4), with 10 having significant increases in service volume. After adjusting for patient population, the 2-tailed Spearman correlation between time and service volume showed that 23 of the 38 analyzed procedures had statistically significant decreases in service volume, with 10 having significant increases in service volume (Supplemental Table S5).

Intravitreal (IVT) injections (CPT 67028) increased from 2922 injections in 2000 to 3 444 500 injections in 2021 ($P < .001$), accounting for the majority of the increase in total vitreoretinal procedures. This increase was accompanied by the decline in other treatment modalities, in particular in lasers and cryotherapy for the conditions of diabetic retinopathy (DR), exudative age-related macular degeneration (AMD), and macular edema (ME). Panretinal photocoagulation (PRP) for proliferative DR (PDR) (CPT 67228) declined from a peak of 109 840 procedures in 2004 to 48 533 in 2021 ($P < .001$). Cryotherapy for DR (CPT 67227) declined from 1332 procedures in 2000 to 37 in 2021 ($P < .001$). During the same period, cryotherapy for retinal lesions (CPT 67208) dropped from 644 procedures to 105 ($P < .001$). Laser photocoagulation for retinal lesions (CPT 67210) and choroidal lesions (CPT 67220) dropped from a peak of 188 351 (year 2002) and 48 968 (year 2000) procedures to 42 742 and 2176 procedures, respectively, in 2021 ($P < .001$). Photodynamic therapy (PDT) for the destruction of choroidal lesions (CPT 67221) declined from a peak of 126 870 procedures in 2004 to 1594 in 2021 ($P < .001$).

Procedures involved in retinal detachment (RD) repair also had dramatic changes in use over the past 2 decades. Vitrectomy procedures for RD (CPT 67108) increased from 14 984 procedures in 2000 to 22 299 procedures in 2021 ($P = .001$). Scleral buckling (CPT 67107) declined from 6502 procedures in 2000 to 587 in 2021 ($P < .001$). Pneumatic retinopexies decreased from a peak of 3809 procedures in 2004 to 2225 in 2021 ($P < .001$). Cryotherapy (CPT 67101) declined from a peak of 1827 procedures in 2005 to 301 in 2021 ($P < .001$). There has also been a shift in RD prophylaxis, with laser photocoagulation preferred over cryotherapy. Laser photocoagulation for RD prophylaxis (CPT 67145) increased from 15 899 procedures in 2000 to 31 249 in 2021 ($P < .001$), whereas cryotherapy for RD prophylaxis (CPT 67141) decreased from 2653 to 1172 procedures ($P < .001$).

Pars plana vitrectomy (PPV) (CPT 67036) increased from 12 902 procedures in 2000 to 25 833 procedures in 2021 ($P < .001$). PPV with endolaser PRP (CPT 67040) decreased from a peak of 20 531 procedures in 2005 to 9919 procedures in 2021 ($P < .001$). PPV with removal of preretinal cellular membrane decreased by 44%, whereas PPV with removal of internal limiting membrane increased by 44% from 2008 to 2021.

Figure 2 shows the average inflation-adjusted payment per vitreoretinal procedure. Supplemental Table S6 shows the total percentage change from 2000 to 2021. The cumulative inflation-adjusted reimbursement of all vitreoretinal procedures increased from $535 million to a peak of $742 million in 2010 and has since decreased to $514 million in 2021. The mean percentage change in inflation-adjusted reimbursement from 2000 to 2021 was −32%. The 2-tailed Spearman correlation between time and inflation-adjusted Medicare fee-for-service reimbursements showed that 29 of the 38 procedures had statistically significant decreases in payment over time (Supplemental Table S7). No procedure had a significant increase in payment. IVT injections (67028) had a strong negative correlation ($\rho = 0.974$; $P < .001$), with a total payment decrease of 66% (compound annual growth rate, −5.02%). The largest payment decrease was for PRP, with a 73% decrease over the past 2 decades and a compound annual growth rate of −6.01%. Other procedures with very large reimbursement cuts were cryotherapy for retinopathy (CPT 67227), cryotherapy for RD (CPT 67101), and laser photocoagulation repair of RD (CPT

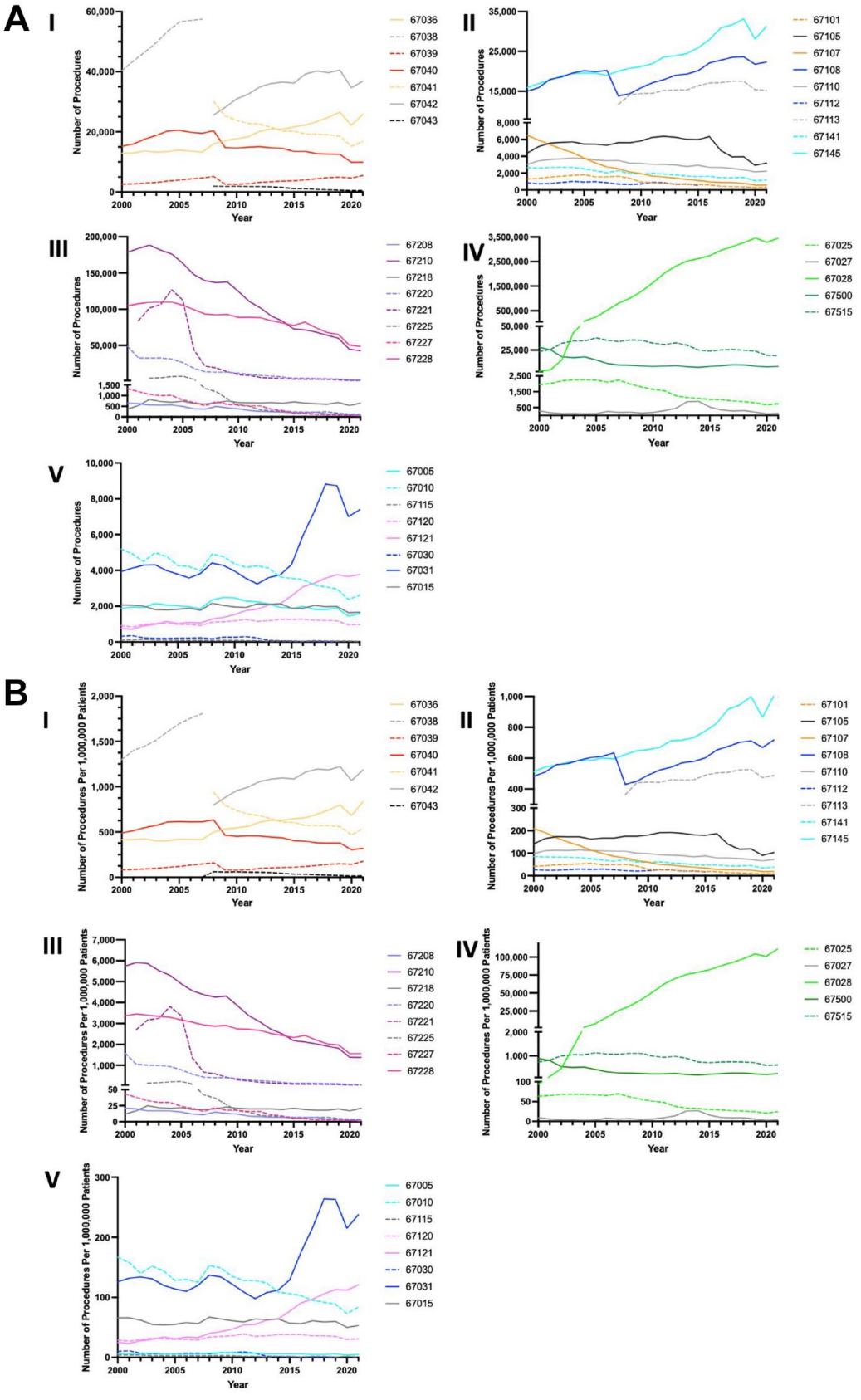

Figure 1. (legend on next page)

Figure 1. (A) Annual service volume of vitreoretinal procedures for Medicare fee-for-service beneficiaries from 2000 to 2021 for (I) pars plana vitrectomies (PPVs); (II) retinal detachment (RD) repair/prophylaxis; (III) destruction of retinal or choroidal lesions/edema/neovascularization; (IV) vitreous/Tenon capsule/retrobulbar injection; (V) other vitreoretinal procedures (posterior sclerotomy, removal/release of vitreous, destruction of vitreous strands). Procedures and their corresponding Current Procedural Terminology (CPT) codes are listed in Supplemental Table S1. (B) Annual service volume of vitreoretinal procedures adjusted for annual Medicare Part B enrollment from 2000 to 2021 for (I) PPVs; (II) RD repair/prophylaxis; (III) destruction of retinal or choroidal lesions/edema/neovascularization; (IV) vitreous/Tenon capsule/retrobulbar injection; (V) other vitreoretinal procedures (posterior sclerotomy, removal/release of vitreous, destruction of vitreous strands). Procedures and their corresponding CPT codes are listed in Supplemental Table S1.

67105), with a −69% reduction (compound annual growth rate, −5.37%), −65% reduction (compound annual growth rate, −4.89%), and −63% reduction (compound annual growth rate, −4.60%), respectively.

The 2-tailed Spearman correlation between service volume and reimbursement rate showed that 20 of the 38 procedures had a significant monotonic correlation (Supplemental Table S8). Fourteen procedures had significant positive Spearman *r* values, where a decrease in reimbursement was associated with a decrease in service volume. Six procedures had a significant negative Spearman *r* value, where there was an inverse relationship between reimbursement and service volume. IVT injection (CPT 67028), PPV (CPT 67036), PPV with focal endolaser (CPT 67039), repair of RD with vitrectomy (CPT 67108), and removal of implanted material (CPT 67121) all had a decrease in reimbursement associated with an increase in service volume. Retrobulbar

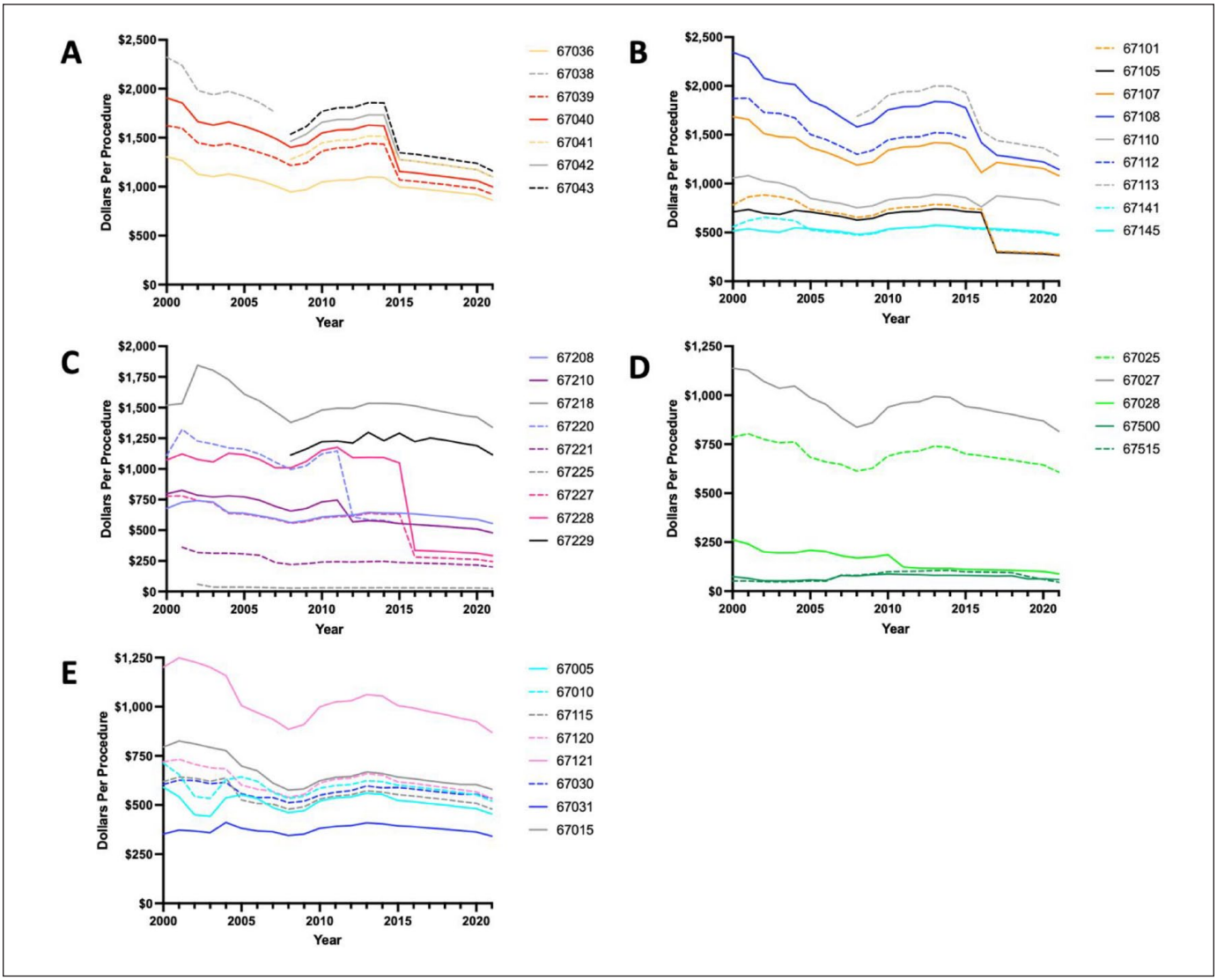

Figure 2. Annual inflation-adjusted Medicare fee-for-service reimbursement of vitreoretinal procedures from 2000 to 2021 for (A) pars plana vitrectomies; (B) retinal detachment repair/prophylaxis; (C) destruction of retinal or choroidal lesions/edema/neovascularization; (D) vitreous/Tenon capsule/retrobulbar injection; (E) other vitreoretinal procedures (posterior sclerotomy, removal/release of vitreous, destruction of vitreous strands). Procedures and their corresponding CPT codes are listed in Supplemental Table S1.

injection (CPT 67500) was the only procedure that had a significant increase in reimbursement associated with a decrease in service volume.

Conclusions

There have been significant changes in practice patterns and reimbursement rates of vitreoretinal procedures over the past 2 decades. Although total Medicare enrollment has increased significantly over that period, Medicare Part B enrollment has remained relatively stable for the past 20 years; the majority of the total Medicare enrollment increase came as a direct result of Medicare Advantage growth (Table S9). Thus, our findings on service volume when normalized to Medicare Part B enrollment (Figure 1B) show overall trend lines similar to those of the raw unadjusted service volume data (Figure 1A).

The overall findings can be summarized as follows:

1. IVT injections have exponentially increased over the past 20 years, while there has been a concurrent decline in other treatment modalities.
2. Cryotherapy has declined for all indications, and laser procedures have declined in the treatment of DR and ME.
3. RD repair practice patterns have shifted toward more vitrectomies with a decline in pneumatic retinopexies and lone scleral buckles.
4. Inflation-adjusted reimbursement has declined over the past 2 decades across all vitreoretinal procedures, with the largest decreases occurring for IVT injection, PRP, and cryotherapy.
5. The Spearman correlation between reimbursement and service volume showed that procedures with the greatest proportional growth in service volume were significantly associated with a decrease in reimbursement.

With the introduction of antivascular endothelial growth factor (anti-VEGF) agents, such as ranibizumab (Lucentis) in 2006, aflibercept (Eylea) in 2011, and the recently approved faricimab (Vabysmo), IVT injections have taken the center stage in service volume for treatment of conditions such as AMD and DR. Clinical trials over the past decade, such as Diabetic Retinopathy Clinical Research Protocol S, that indicate the noninferiority of IVT anti-VEGF agents compared with PRP in the setting of PDR likely contributed to its rise in prevalence.[13] In the wake of the exponential increase in IVT injections, there has been a steady decline in alternative surgical and medical treatment modalities, most notably laser photocoagulation, PDT, and cryotherapy.

RD repair has largely shifted away from lone scleral buckles, with vitrectomies increasing in prevalence. This could be the result of a multitude of factors, such as a substantial improvement in vitrectomy systems over the past 2 decades, shorter operating times, and higher patient satisfaction in terms of minimizing pain during the procedure for vitrectomies compared with scleral buckling.[14–16] Another possibility is the decline in scleral buckling teaching in training programs. The Association of University Professors of Ophthalmology's Fellowship Compliance Committee set guidelines that reduced the minimum number of required scleral buckle cases from 75 in 2007 to 20 in 2015.[17]

Despite the increase in the total number of procedures (annual total service volume by procedural category in Supplementary Figure S1), the vitreoretinal field has faced steep reimbursement cuts, with an inflation-adjusted mean change of −32% from 2000 to 2021. The inflation-adjusted average reimbursement amount in 2020 dollars by procedure category and inflation-adjusted annual reimbursement of vitreoretinal procedures as a percentage change from reimbursements in the year 2000 are shown in Supplemental Figure S2 and Supplemental Figure S3, respectively. In comparison, dermatology, otology, emergency medicine, general surgery, and orthopedic trauma surgery have experienced average reimbursement cuts of −4.8% (2007–2021), −21.2% (2000–2020), −24.4% (2000–2018), and −29.13% (2000–2020), respectively.[4–6,18,19] The total number of vitreoretinal procedures increased 5-fold from 2000 to 2021; however, the sum of inflation-adjusted reimbursement for all vitreoretinal procedures has decreased by 4.0%, with the cumulative inflation-adjusted reimbursement of all vitreoretinal procedures decreasing from a peak of $742 million in 2010 to $514 million in 2021 (Supplemental Figure S4). All vitreoretinal procedures were reimbursed less in 2021 than in 2000 after inflation adjustment.

Procedures with the greatest proportional increase in service volume were significantly associated with reimbursement cuts. The Spearman correlation between service volume and reimbursement showed 5 procedures with a significant monotonic relationship in which service volume increased while reimbursement decreased. Four of these 5 procedures are those with the greatest proportional increase in service volume over the past 20 years; that is, IVT injection (CPT 67028), PPV (CPT 67036), PPV with focal endolaser (CPT 67039), and removal of implanted material (CPT 67121).

The advent of innovative technologies and pharmacological agents has reshaped procedure utilization over the past 2 decades. The combination of reimbursement cutbacks and the increased number of total vitreoretinal procedures performed raises concerns about the sustainability of the current healthcare reimbursement model, affecting patient care and limiting the economic viability of certain practices. To sustain their practices and compensate their staff during inflation, physicians may have to prioritize patients with private insurance. With the projected growth of Medicare enrollment in the coming decade, ensuring adequate patient vision coverage and a sustainable reimbursement practice model is essential. It is important to highlight these trends, which not only inform vitreoretinal specialists but also have broader implications for policymakers, insurers, and patient advocacy groups striving for effective, affordable, and accessible eye care solutions.

Limitations of this study include the inability to assess data from non-Medicare payers. A study of patients younger than 65 years and those receiving care outside of Medicare fee-for-service programs would be desirable. There are limitations in extrapolating epidemiologic trends purely from CPT codes because a single procedure could be performed in the setting of multiple diagnoses

with multiple International Classification of Diseases codes. Furthermore, there are instances in which 2 separate procedures can be bundled together and billed under 1 code, limiting our ability to accurately track and analyze the volume of certain procedures. Specifically, CPT 67108 encompasses RD repair by combined PPV and scleral buckling. Our study may have undercounted the total amount of scleral buckle surgeries performed by vitreoretinal surgeons in the past 2 decades. Reimbursement data collection as well as inflation adjustment were all done in the setting of national averages, and further studies are necessary to identify possible regional differences in Medicare reimbursement. The strength of the study is the large population of Medicare beneficiaries from which data were extracted.

Ethical Approval

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval for this study was waived by the Yale University Institutional Review Board because it did not involve human participants.

Statement of Informed Consent

This study did not involve human participants, and informed consent was not obtained.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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ORCID iD

Eric S. Li https://orcid.org/0000-0003-1804-6915

Supplemental Material

Supplemental material is available online with this article.

References

1. Centers for Medicare & Medicaid Services. Updated October 09, 2024. Accessed October 29, 2023. http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareMedicaidStatSupp/Downloads/2012_Section2.pdf#Table2.4
2. Gaudette É, Tysinger B, Cassil A, Goldman DP. Health and health care of Medicare beneficiaries in 2030. *Forum Health Econ Policy*. 2015;18(2):75-96. doi:10.1515/fhep-2015-0037
3. MedPAC. The Next Generation of Medicare Beneficiaries (June 2015 report). 2015. Updated June 2015. Accessed October 29, 2023. https://www.medpac.gov/wp-content/uploads/import_data/scrape_files/docs/default-source/reports/chapter-2-the-next-generation-of-medicare-beneficiaries-june-2015-report-.pdf
4. Haglin JM, Eltorai AEM, Richter KR, Jogerst K, Daniels AH. Medicare reimbursement for general surgery procedures: 2000 to 2018. *Ann Surg*. 2020;271(1):17-22. doi:10.1097/sla.0000000000003289
5. Pollock JR, Bollig TR, Haglin JM, Sandefur BJ, Rappaport DE, Lindor RA. Medicare reimbursement to physicians decreased for common emergency medicine services from 2000 to 2020. *Ann Emerg Med*. 2020;76(5):615-620. doi:10.1016/j.annemergmed.2020.06.017
6. Schartz DA, McCool RR. Trends in Medicare reimbursement for otology procedures from 2000 to 2020. *Otol Neurotol*. 2021;42(4):505-509. doi:10.1097/mao.0000000000003010
7. Pollock JR, Chen JY, Dorius DA, et al. Decreasing physician Medicare reimbursement for dermatology services. *J Am Acad Dermatol*. 2022;86(5):1154-1156. doi:10.1016/j.jaad.2021.04.059
8. AMA Media & Editorial. Medicare physician payments need overhaul STAT. 2023. Updated September 11, 2023. Accessed December 19, 2023. https://www.ama-assn.org/press-center/press-releases/medicare-physician-payments-need-overhaul-stat#:~:text=Even%20before%20rampant%20inflation%20and,these%20cuts%20are%20factored%20in
9. Centers for Medicare & Medicaid Services. Part B national summary data file. Updated October 9, 2024. Accessed August 18, 2023. https://www.cms.gov/data-research/statistics-trends-and-reports/part-b-national-summary-data-file
10. Centers for Medicare & Medicaid Services. Medicare Advantage rates & statistics. Updated October 9, 2024. Accessed April 3, 2024. https://www.cms.gov/medicare/payment/medicare-advantage-rates-statistics/ffs-data-2015-2022
11. Centers for Medicare & Medicaid Services. Physician fee schedule look-up tool. Accessed October 9, 2023. https://www.cms.gov/medicare/physician-fee-schedule/search/overview
12. U.S. Bureau of Labor Statistics. Consumer Price Index (CPI) databases. Accessed September 29, 2023. https://www.bls.gov/cpi/data.htm
13. Writing Committee for the Diabetic Retinopathy Clinical Research Network; Gross JG, Glassman AR, et al. Panretinal photocoagulation vs intravitreous ranibizumab for proliferative diabetic retinopathy: a randomized clinical trial. *JAMA*. 2015;314(20):2137-2146. doi:10.1001/jama.2015.15217
14. Brazitikos PD, Androudi S, Christen WG, Stangos NT. Primary pars plana vitrectomy versus scleral buckle surgery for the treatment of pseudophakic retinal detachment: a randomized clinical trial. *Retina*. 2005;25(8):957-964. doi:10.1097/00006982-200512000-00001
15. Gauthier AC, Adelman RA. A quality of life study comparing scleral buckle and pneumatic retinopexy for the treatment of rhegmatogenous retinal detachment. *Clin Ophthalmol*. 2017;11:1069-1071. doi:10.2147/opth.S137227
16. Ribeiro L, Oliveira J, Kuroiwa D, et al. Advances in vitreoretinal surgery. *J Clin Med*. 2022;11(21):6428. doi:10.3390/jcm11216428
17. Adams OE, Culican SM. The dangerous decline in teaching scleral buckling procedures. *Clin Exp Ophthalmol*. 2023;51(6):511-513. doi:10.1111/ceo.14274
18. Mazmudar RS, Sheth A, Tripathi R, Bordeaux JS, Scott JF. Inflation-adjusted trends in Medicare reimbursement for common dermatologic procedures, 2007-2021. *JAMA Dermatol*. 2021;157(11):1355-1358. doi:10.1001/jamadermatol.2021.3453
19. Haglin JM, Lott A, Kugelman DN, Konda SR, Egol KA. Declining Medicare reimbursement in orthopaedic trauma surgery: 2000-2020. *J Orthop Trauma*. 2021;35(2):79-85. doi:10.1097/BOT.0000000000001947