



Trends in Vitreoretinal Procedures for Medicare Beneficiaries, 2000 to 2014

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Topic: The purpose of this study was to identify changes in use for vitreoretinal procedures by measuring the number of allowed services using data from the US Medicare Part B Fee-for-Service (FFS) beneficiaries and their providers.

Clinical Relevance: To analyze vitreoretinal procedural trends, which may indicate standard of care and importance of developing methods of treatments.

Methods: Medicare Part B National Summary Data Files for calendar years 2000 to 2014 were used to identify the number of allowed services for vitreoretinal procedures and commonly used pharmacologic agents. Linear regression analysis was performed to identify trends in use.

Main Outcome Measures: To analyze vitreoretinal procedural trends, which may indicate standard of care and importance of developing methods of treatments.

Results: Vitreoretinal procedures grew 6-fold from 2000 to 2014. Intravitreal injections were the primary driver of growth. A total of 2922 injections were performed in 2000, compared with 2 619 950 injections in 2014 ($P < 0.01$). Scleral buckling declined from 6502 procedures in 2000 to 1260 procedures in 2014 ($P < 0.01$), whereas vitrectomy use for retinal detachment increased from 13 814 surgeries in 2008 to 19 288 surgeries in 2014 ($P < 0.01$). Focal laser treatments declined from 188 351 procedures in 2002 to 83 379 procedures in 2014 ($P < 0.01$). Panretinal photocoagulation treatments declined from 109 840 procedures in 2004 to 81 005 procedures in 2014 ($P < 0.01$).

Conclusions: Vitreoretinal practice patterns changed significantly from 2000 to 2014. Intravitreal injections increased by 89 563%. Intravitreal injections accounted for 0.55% of all vitreoretinal procedures in 2000 and increased to 87% in 2014. Scleral buckling sharply declined, and preference for retinal detachment repair shifted further toward vitrectomy with a distribution of 83% vitrectomy, 5% scleral buckling, and 12% pneumatic retinopexy in 2014. Use of laser photocoagulation significantly declined for treatment of macular edema and proliferative retinopathy. Cryotherapy procedures declined across all indications. *Ophthalmology* 2017;■:1–7 © 2017 by the American Academy of Ophthalmology

The vitreoretinal field has witnessed significant advances over the last 2 decades. A wide array of treatment options is now available for many retinal conditions, including macular degeneration,^{1,2} diabetic retinopathy,^{3,4} and vascular occlusions.^{5,6} Pharmacologic innovations have played a particularly prominent role, expanding treatment options beyond traditional modalities, such as laser photocoagulation, cryotherapy, and preserved triamcinolone. Vitreoretinal specialists can not only select treatments from different drug classes but also choose among multiple agents within a single drug class. Likewise, vitreoretinal surgeons are afforded discretion when choosing surgical techniques.⁷ For retinal detachments, surgeons have the option to repair by pneumatic retinopexy, scleral buckling, or vitrectomy. Although scleral buckling historically served as the preferred technique, significant advances in vitrectomy have altered surgical sentiment.

The rapid pace of innovation has not only expanded treatment options but also changed practice patterns⁸ in the vitreoretinal subspecialty. The purpose of this study is to identify significant shifts in procedural preferences over

the past 15 years in a Medicare Fee-for-Service (FFS) population.

Methods

Part B National Summary Data Files for calendar years 2000 to 2014 were downloaded from the Centers for Medicare and Medicaid Services website (<https://www.cms.gov/Research-Statistics-Data-and-Systems/Downloadable-Public-Use-Files/Part-B-National-Summary-Data-File/Overview.html>; accessed October 12, 2016). These data files are in the public domain and are limited to Medicare FFS Part B Physician/Supplier data and do not include data from Medicare managed care or non-Medicare plans.

The number of allowed services was determined for each year for Current Procedural Terminology (CPT) codes 67005 to 67229 and for Healthcare Common Procedure Coding System (HCPCS) codes J7312, J3396, J3300, J2278, J0178, and J7316. The HCPCS codes for ophthalmic drugs with nonophthalmic uses, such as bevacizumab (J9035) and triamcinolone (J3301), were excluded from the analysis because the dataset did not report on specialty-specific use. To determine the number of treatments performed

with each pharmacologic agent, the number of allowed services was divided by the number of allowed services per treatment (2 units for aflibercept, 5 units for ranibizumab, 7 units for dexamethasone intravitreal implant, 40 units for preservative-free triamcinolone, 150 units for verteporfin, and 4 units for ocriplasmin).

Numeric computations were performed using a spreadsheet package (Excel 2003; Microsoft, Redmond, WA). Statistical analysis was performed using linear regression analysis.

This study did not require institutional review board approval because human subjects were not directly involved and the data elements were de-identified and publicly available. This study adhered to the tenets of the Declaration of Helsinki, Health Insurance Portability and Accountability Act, and all federal or state laws in the United States.

Results

The number of total allowed services for each vitreoretinal CPT code from 2000 to 2014 is presented in Table 1. The total number of procedures performed increased every year, with the greatest increase of 22% observed from 2006 to 2007. Over the 15-year interval, vitreoretinal procedures increased approximately 6-fold, with 527 050 procedures in 2000 and 3 014 629 procedures in 2014 ($P < 0.01$).

Intravitreal injections (CPT 67028) accounted for the majority of growth in vitreoretinal procedures. A nominal 2922 injections were performed in 2000, compared with 2 619 950 injections in 2014 ($P < 0.01$). Intravitreal injections accounted for 87% of all vitreoretinal procedures performed in the final year of our study.

Accompanying the sharp increase in intravitreal injections was a marked decline in other medical and surgical modalities for treatment of exudative age-related macular degeneration. Photodynamic therapy (CPT 67221) and laser photocoagulation (CPT 67220) both experienced sharp recessions over the study period ($P < 0.01$). Use of photodynamic therapy peaked with 126 870 procedures in 2004 and declined precipitously to 4222 procedures in 2014. Likewise, laser photocoagulation of choroidal neovascularization lesions declined from 48 968 to 6336 procedures over the study period. The role of surgical management (CPT 67043) for choroidal neovascular membranes also declined significantly ($P = 0.02$).

Treatments associated with diabetic retinopathy have undergone significant changes. Laser treatment use declined for both panretinal photocoagulation for proliferative retinopathy (CPT 67228) and focal laser for macular edema (CPT 67210) ($P < 0.01$). Panretinal photocoagulation procedures peaked with 109 840 procedures in 2004 and steadily declined to 81 005 procedures in 2014. Focal laser treatments declined from 188 351 procedures in 2002 to 83 379 procedures in 2014. Cryotherapy treatment of diabetic retinopathy (CPT 67227) exhibited an even steeper decline in use from 1332 procedures in 2000 to 296 procedures in 2014 ($P < 0.01$).

Procedural preference for retinal detachment repair has undergone major changes in the past 15 years. Scleral buckling procedures (CPT 67107) have declined significantly from 6502 in 2000 to 1260 in 2014 ($P < 0.01$), whereas vitrectomy procedures (CPT 67108) have increased from 13 814 in 2008 to 19 288 in 2014 ($P < 0.01$). Pneumatic retinopexy procedures declined over the study period ($P < 0.01$), with a maximum of 3809 procedures in 2004 and a steady decline to 2791 procedures in 2014 ($P < 0.01$). Laser photocoagulation repair of localized detachments (CPT 67105) has increased from 4379 procedures in 2000 to 6024 procedures in 2014, whereas cryotherapy use (CPT 67101) has declined from an apex of 1827 procedures in 2005 to 641 procedures in 2014 ($P < 0.01$).

Greater preference for laser photocoagulation over cryotherapy treatment also is reflected in procedural use for retinal detachment prophylaxis. From 2000 to 2014, laser photocoagulation procedures for retinal tears or lattice degeneration (CPT 67145) increased from 15 899 to 24 428, whereas cryotherapy treatment (CPT 67141) procedures declined from 2653 to 1648.

Use of vitrectomy in several settings increased for a number of CPT codes. Pars plana vitrectomy (CPT 67036) increased from 12 902 to 20 912 procedures from 2000 to 2014. Complex retinal detachment repair (CPT 67113) increased from 11 673 to 15 335 procedures from the introduction of the CPT code in 2008 to 2014 ($P = 0.01$). Pars plana vitrectomy with removal of the internal limiting membrane (CPT 67042) increased from 25 588 to 36 528 procedures over the same time frame.

Use of pharmacologic agents is reported in Table 2. Verteporfin use (HCPCS J3396) declined significantly with the introduction of anti-vascular endothelial growth factor (VEGF) treatments. Use peaked in 2005 with 100 278 treatments, which declined precipitously 1 year later to 39 510 treatments. In 2014, only 3836 treatments were performed. Ranibizumab treatments (HCPCS J2278) were 72 459 in 2006 and declined to 43 767 in 2007. Use steadily increased to a peak of 112 925 treatments in 2012 and declined in the following years with the introduction of aflibercept. Adoption of novel steroid treatments with dexamethasone intravitreal implant (HCPCS J7312) and preservative-free triamcinolone (HCPCS J3300) has increased steadily since their respective introductions.

Discussion

This study analyzed vitreoretinal procedures in the Medicare FFS population from 2000 to 2014. Our findings reveal significant changes in practice patterns. The principle findings are as follows: (1) Intravitreal injections grew exponentially and now represent the second most commonly performed procedure in ophthalmology. (2) Retinal detachment repair changed significantly, with sharp declines in scleral buckling and pneumatic retinopexy in favor of vitrectomy. (3) Laser procedures declined for treatment of macular edema and proliferative retinopathy. (4) Cryotherapy procedures declined across all indications.

The remarkable increase in intravitreal injection procedures has significantly affected the vitreoretinal subspecialty. In 2000, intravitreal injections accounted for only 0.55% of all vitreoretinal procedures (2922 of 527 050). In 2014, this percentage increased to 87% (2 619 950 of 3 014 629), representing an 89 563% increase. Intravitreal injections are the second most commonly performed ophthalmic procedure, only trailing cataract surgery (CPT 66984) with 3 019 928 surgeries in 2014.

Intravitreal injections are simply a mechanism of drug delivery, and the rapid increase in procedural volume is not only a consequence of frequent dosing needs but also a reflection of the profound benefits of pharmacologic therapy on vitreoretinal diseases. In 2000, vitreoretinal drug use was largely limited to off-label use of preserved triamcinolone. Over the next 15 years, the pharmaceutical armamentarium expanded rapidly with the introduction of therapeutics, such as verteporfin, bevacizumab, ranibizumab, aflibercept, preservative-free triamcinolone, dexamethasone intravitreal implant, and ocriplasmin. These innovations not only propelled the rapid growth in procedural volume but also

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