EXHIBIT #1

Green Mountain Surgery Center - Detailed Expenses

	Oringal				Revised				% increase/decrease			
	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4	Year 1	Year 2	Year 3	Year 4
Personnel Costs:												
Salaries and Wages	$1,497,600	$1,527,552	$1,558,103	$1,589,265	$985,463	$1,082,798	$1,105,579	$1,128,815	-34.20%	-29.12%	-29.04%	-28.97%
Payroll Taxes/Benefits	$494,208	$504,092	$514,174	$524,457	$328,488	$360,933	$368,526	$376,272	-33.53%	-28.40%	-28.33%	-28.26%
Total Personnel Costs	$1,991,808	$2,031,644	$2,072,277	$2,113,723	$1,313,951	$1,443,730	$1,474,105	$1,505,087	-34.03%	-28.94%	-28.87%	-28.79%
Clinical Expenses:												
Medical Supplies and Drugs	$1,596,966	$1,917,089	$2,013,711	$2,115,202	$949,591	$1,240,611	$1,282,482	$1,330,480	-40.54%	-35.29%	-36.31%	-37.10%
Medical Equipment Repairs	$50,000	$52,000	$54,080	$56,243	$26,378	$34,461	$35,624	$36,958	-47.24%	-33.73%	-34.13%	-34.29%
Laundry and Linens	$61,581	$73,926	$77,651	$81,565	$36,929	$48,246	$49,874	$51,741	-40.03%	-34.74%	-35.77%	-36.56%
Minor Equipment	$30,000	$31,200	$32,448	$33,746	$18,992	$24,812	$25,650	$26,610	-36.69%	-20.47%	-20.95%	-21.15%
Other Clinical Expenses	$48,000	$49,920	$51,917	$53,993	$23,212	$30,326	$31,350	$32,523	-51.64%	-39.25%	-39.62%	-39.77%
Total Clinical Expenses	$1,786,547	$2,124,135	$2,229,807	$2,340,749	$1,055,101	$1,378,456	$1,424,980	$1,478,311	-40.94%	-35.11%	-36.09%	-36.84%
Facilities/Equipment Costs:												
Building Lease	$489,402	$504,084	$519,207	$534,783	$798,498	$810,475	$822,633	$834,972	63.16%	60.78%	58.44%	56.13%
Equipment Leases	$638,843	$638,843	$638,843	$579,559	$538,416	$538,416	$538,416	$434,669	-15.72%	-15.72%	-15.72%	-25.00%
Total Facilities Expenses	$1,128,245	$1,142,927	$1,158,050	$1,114,342	$1,336,914	$1,348,892	$1,361,049	$1,269,641	18.50%	18.02%	17.53%	13.94%
Administrative Expenses:												
Legal and Accounting	$15,000	$15,600	$16,873	$18,980	$9,818	$11,592	$12,093	$12,617	-34.55%	-25.69%	-28.33%	-33.52%
Insurance - D&O	$40,000	$41,600	$44,995	$50,613	$26,182	$30,912	$32,248	$33,646	-34.55%	-25.69%	-28.33%	-33.52%
Marketing and PR	$5,000	$5,200	$5,624	$6,327	$3,273	$3,864	$4,031	$4,206	-34.55%	-25.69%	-28.33%	-33.52%
Telephone and Communications	$12,000	$12,480	$12,979	$13,498	$7,854	$9,273	$9,674	$10,094	-34.55%	-25.69%	-25.46%	-25.22%
Office Supplies and Expenses	$41,054	$49,284	$51,768	$54,377	$26,872	$31,726	$33,098	$34,533	-34.55%	-35.63%	-36.06%	-36.49%
Transcription	$35,922	$43,123	$45,297	$47,580	$23,513	$27,761	$28,961	$30,217	-34.55%	-35.63%	-36.06%	-36.49%
Equipment Maintenance	$10,000	$10,400	$10,816	$11,249	$6,545	$7,728	$8,062	$8,412	-34.55%	-25.69%	-25.46%	-25.22%
Computer Expenses	$24,000	$24,960	$25,958	$26,997	$15,709	$18,547	$19,349	$20,188	-34.55%	-25.69%	-25.46%	-25.22%
Mgt/Billing Fee	$584,871	$685,234	$702,468	$720,135	$382,822	$451,983	$471,527	$491,970	-34.55%	-34.04%	-32.88%	-31.68%
Miscellaneous Expenses	$36,000	$37,440	$38,938	$40,495	$23,563	$27,820	$29,023	$30,282	-34.55%	-25.69%	-25.46%	-25.22%
Total Administrative Expenses	$803,847	$925,321	$955,715	$990,249	$526,151	$621,206	$648,067	$676,165	-34.55%	-32.87%	-32.19%	-31.72%
Other Expenses:												
Depreciation Expense	$28,571	$28,571	$28,571	$28,571	$22,787	$22,787	$22,787	$22,787	-20%	-20%	-20%	-20%
Interest Expense	$47,088	$45,918	$44,664	$43,320	$0	$0	$0	$0	-100%	-100%	-100%	-100%
Total Other Expenses	$75,659	$74,490	$73,236	$71,891	$22,787	$22,787	$22,787	$22,787	-70%	-69%	-69%	-68%
TOTAL PROJECTED EXPENSES	$5,786,106	$6,298,517	$6,489,084	$6,630,954	$4,254,904	$4,815,071	$4,930,987	$4,951,991	-26%	-24%	-24%	-25%

EXHIBIT #2

Published in final edited form as:
Ophthalmology. 2014 April ; 121(4): 946–951. doi:10.1016/j.ophtha.2013.11.003.

Cost-Effectiveness of Retinal Detachment Repair

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Abstract

Objective—To evaluate costs and treatment benefits of rhegmatogenous retinal detachment (RD) repair.

Design—A Markov model of cost-effectiveness and utility.

Participants—There were no participants.

Methods—Published clinical trials (index studies) of pneumatic retinopexy (PR), scleral buckling (SB), pars plana vitrectomy (PPV) and laser prophylaxis were used to quantitate surgical management and visual benefits. Markov analysis, with data from the Center of Medicare and Medicaid Services (CMS), was used to calculate adjusted costs of primary repair by each modality in a hospital-based and ambulatory surgery center (ASC) setting.

Main Outcome Measures—Lines of visual acuity (VA) saved, cost of therapy, adjusted cost of therapy, cost per line saved, cost per line-year saved, cost per quality-adjusted life years (QALY) saved.

Results—In the facility, hospital surgery setting, weighted cost for PR ranged from $3,726 to $5,901 depending on estimated success rate of primary repair. Weighted cost for SB was $6,770, for PPV was $7,940 and for laser prophylaxis was $1,955. The dollars per line saved ranged from $217 to $1,346 depending on the procedure. Dollars per line-year saved ranged from $11 to $67. Dollars per QALY saved ranged from $362 to $2,243.

In the non-facility, ASC surgery setting, weighted cost for PR ranged from $1,961 to $3,565 depending on the success rate of primary repair. The weighted costs for SB, PPV and laser prophylaxis were $4,873, $5,793 and $1,255, respectively. Dollars per line saved ranged from

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Meeting presentation:
Submitted for consideration to American Academy of Ophthalmology, Annual Meeting, November 2013

Conflict of Interest:
JSC: none
WES: Consultant: Alimera

$139 to $982. The dollars per line-year saved ranged from $7–$49 and the dollars per QALY saved ranged from $232 to $1,637.

Conclusions—Treatment and prevention of RD is extremely cost-effective when compared to other treatment of other retinal diseases regardless of treatment modality. RD treatment costs did not vary widely, suggesting providers can tailor patient treatments solely on the basis of optimizing anticipated results since there were not overriding differences in financial impact.

Introduction

Rhegmatogenous retinal detachment (RD), the most common type of retinal detachment, has long been the defining target of surgical retinal efforts.[1] In 2009, the Medicare database reported a total of 21,762 RD repair procedures.[2] Untreated, retinal detachment usually leads to substantial, frequently severe, permanent vision loss, that might be accompanied by painful hypotony and phthisis. Many highly successful treatment options constitute the standard armamentarium including scleral buckling (SB), vitrectomy (PPV), and pneumatic retinopexy (PR). Many clinical trials and series comparing these methods of retinal detachment repair have shown comparable success rates, but have enumerated factors that are helpful in choosing the most suitable technique for certain subsets of patients.[3–19]

Few studies comparing cost-effectiveness of retinal reattachment surgery to other ophthalmologic or general medical treatments, or among techniques have been published.[14,19,20] Generally, cost considerations have not been a factor in clinical decision-making in choosing retinal reattachment treatments. Previous studies have outlined similar cost analyses for age-related macular degeneration (AMD),[20] diabetic macular edema (DME)[21] and retinal vein occlusion (RVO),[22] but treatment of RD has never been subjected to such an analysis of various treatment options.

The purpose of the current report is to calculate parameters of cost-effectiveness using a Markov decision-tree analysis for the main methods of RD repair: PR, SB and PPV.

Methods

Representative index studies were identified to ascertain representative anatomic success rates for each treatment modality of RD repair including PR,[8,14–19] SB,[4–8,10–13] PPV with or without SB[4–12] and laser prophylaxis of RD.[23] Based on these studies our models assumed 60%, 75%, or 90% success for PR, 85% success for SB, and 90% success for PPV with or without SB. Medicare fee data for 2013 were acquired from the Centers for Medicare and Medicaid Services (CMS) to ascertain the allowable cost (in United States dollars) associated with each procedure, study or office visit.[24–28] The costs were calculated for both facility (hospital-based with surgery performed in a hospital operating room) practice in the geographic area of Miami, FL, and also for a non-facility (i.e. office based clinical services with surgery performance in an ambulatory surgery center (ASC)) in the same geographic area to demonstrate the range of potential reimbursement. The purpose in this dichotomy was to calculate the range of maximum and minimum possible incident costs for the various procedures. The permutations of a practice utilizing facility-based clinic visits with ASC-based surgery, and non-facility-based clinic visits and hospital based surgery would fall in between these limits. PR and laser prophylaxis costs were calculated as if done in an office, without the use of an operating room or anesthesiologist in both models. It should be noted, the differential of professional fees of facility versus non-facility costs is only relevant for clinical visits, not for surgical and treatment procedures.

The dollars per relative value unit (RVU) used (conversion factor) was $34.023 since that was the established rate for most of 2013.[25] The cost for a given provider service is an equation that considers work (w) RVUs (professional fees), practice expense (pe) RVUs, and malpractice (mp) RVUs, each of which are subject to geographic modifiers that adjust for costs and relative malpractice risk.[25]

A Markov analysis[29] was performed to generate a cost for each procedure based on the anatomic success rates of index studies, but also for three different hypothetical success rates for PR. Four hypothetical treatment groups were modeled and analyzed (Figure 1) for each of the two different practice setting permutations described above.

The first model was treatment with PR (in an office, without hospital or anesthesia fees); failures were treated by PPV with or without SB (costs are the same), and any subsequent re-operations treated with PPV. The second model was treatment with SB; failures were treated by PPV, and subsequent failures treated with PPV. The third model was treatment with primary PPV; failures were treated by PPV with or without SB, and subsequent failures were treated with PPV. For contrast, a final model was treatment of laser prophylaxis (also assumed to be done in an office without operating room or anesthesia fees) for a retinal break (assuming 95% success), with failures treated initially with SB, and subsequent failures treated with PPV to provide a sense of the cost of prophylactic therapy as well.

All phakic PPV patients were assumed to also require cataract surgery (phacoemulsification with intraocular lens implantation). The incidence of patients who were phakic was assumed to be 70% for all groups, a frequency of previous RD treatment cohort studies.[7,17]

The current procedural terminology (CPT) codes used for the procedures were as follows: 67110 for PR, 67107 for SB, 67108 for PPV, 67112 for PPV in cases of re-operation, and 67145 for laser demarcation of retinal breaks (Table 1). In addition to the costs of the RD repair procedure, the cost for associated cataract surgery (CE) (CPT code 66984), and one level 4 new patient visit (CPT code 99204) and three level 3 follow up visits (CPT code 99213) were added to the total cost to represent one year of continued treatment. In any instance, if the scenario called for PPV following a previous PPV (i.e. 67112), the −78 modifier was applied so that only 70% of the total reimbursement fee was applied for that procedure. If the PPV followed a SB, or if the SB followed PR or laser for a retinal break, the −58 modifier was used so the more complex procedure was calculated at 100% of the Medicare allowable. The reimbursement schedules for procedures are based on the CMS terminology for procedures done in hospital or in an ASC, but only CE, SB, and PPV were ever modeled to be performed in an operating suite setting. PR and laser prophylaxis of RD were modeled as performed in the clinic setting regardless of practice setting permutation. The setting of CE was considered to be the same as the setting of RD repair, thus the calculations for facility-based RD repair includes CE under hospital-based billing, and the calculations for non-facility-based RD repair includes CE in an ASC.

Anesthesia professional fees (when applicable) were calculated based on the sum of base units and time units, multiplied by the conversion factor 25.52.[28] CPT code 00145, anesthesia for vitreoretinal surgery is weighed as 6 base units. One time unit is 15 minutes and an estimated one hour was applied for vitreoretinal cases. Thus, the anesthesia professional fee for vitreoretinal cases was calculated as $255. In cataract surgery, CPT code 00142 is weighed as 4 base units, and the cases were estimated to use 2 time units, for a total of $153 in anesthesia professional fees.

We assumed that an untreated retinal detachment results in 20/400, but that a successful repair preserves 20/25 for a macular sparing RD and 20/80 for a macula off RD. We also assumed that 70% of RDs are macular involving and 30% are macular sparing. We purposely chose the highest number reported for macular involving rates, and also chose what are probably better natural history assumptions, so that, if anything, our model for all procedures errs on the side of being less cost-effective. Patients undergoing reoperations were assumed to retain 20/400, thus representing a failure to yield any better vision compared to natural history. Based on this calculation, a retinal detachment repair was calculated to save 5.9 lines of vision, likely an underestimate. Furthermore, we assumed that the visual acuity (VA) results were the same regardless of the technique.[17] An average age of 62 years old was used based on previous literature.[7] Years of life expectancy were derived from actuarial tables of the Social Security Administration.[30] Quality-adjusted life year (QALY) data were adapted from previously published articles; a conversion of 0.03 QALYs per line-year of vision saved was applied.[31]

Calculations and analysis were performed using Microsoft Excel (Microsoft Corporation, Seattle, WA) software.

Results

The tabulated facility, professional fee, and anesthesia costs for each individual procedure are listed in Table 1. A summary of the adjusted results is presented in Table 2 for facility, hospital surgery and Table 3 for non-facility, ASC surgery.

Primary Retinal Detachment Repair with Pneumatic Retinopexy

The groups with primary PR treatment were evaluated at 60%, 75%, and 90% success rates for initial procedure. These rates were chosen because previously reported studies have a wide range of success. Studies have reported a range from 60–65% primary success,[3,8,16–18] 75% primary success,[15,19] and even higher rates, up to 90–95%.[14]

For a patient in a facility-based setting, when PR was assigned a 75% success rate, and subsequent surgery with PPV given a 90% success rate, the Markov analysis yielded a weighted cost of $3,691 (carrying it for the possibility of three procedures). Since 99% of patients would have successful RD repair after the three procedures, the model was never carried to a fourth intervention. If cataract surgery is factored in as described in the methods, the cost for these procedures was $4,155. When one level 4 new patient visit and three level 3 follow-up office visits were added to the cost, the total was $4,814. The dollars per line saved was $816, and the dollars per line-year saved was $41. The dollars per QALY saved calculation, as described above, was $1,360.

If a more favorable success rate for PR of 90% is assigned in the facility setting, as described for certain subgroups in the literature,[14] then the weighted cost in the Markov analysis was $2,882 after three procedures, with a 99.9% reattachment rate. When cataract development was factored in, the cost was $3,068. With clinic visits factored into the calculation, the total was $3,726. The dollars per line of vision saved was $632, and the dollars per line-year saved was $32. The cost per QALY saved was calculated as $1,053. Similarly, if a 60% PR success rate is presumed, the model yields an imputed cost of $5,901, a cost/line of $1,000, a cost/line-year of $50, and a QALY cost of $1,667.

In a non-facility setting, if a 75% success for PR is assigned, then the Markov analysis with subsequent PPV for primary failures yielded a weighted cost of $2,011. When cataract surgery is factored into this cost, then the weighted cost was $2,343. Inclusion of a level 4 new patient visit and three level 3 follow-up visits generated a weighted cost of $2,763. The cost per line was $468. The dollars per line-year saved was $23 and the dollars per QALY saved was $780.

When a 60% or 90% success for PR was assigned in a non-facility setting, the weighted cost with subsequent PPV for primary failures was $2,615 / $1,408. Factoring in cataract surgery, the cost was $3,145 / $1,540. With included office visits, the cost was $3,565 / $1,961 and the cost per line was $604 / $322. The dollars per line-year was $30 / $17, and the dollars per QALY saved was $1,007 / $554.

Primary Retinal Detachment Repair with Scleral Buckling

The modeled cost of a patient in a facility setting initially undergoing SB surgery for RD in a hospital operating room with 80% primary success rate, and subsequent PPV for failures and another PPV for additional failures was $5,740 using the Markov analysis. The overall re-attachment rate was 99.8% after the three procedures. If the cataract rate as described in the methods was used, the cost was $6,112. Factoring in a level 4 new patient visit and three level 3 follow-up visits led to a cost of $6,770. The cost per line saved was $1,147 and the dollars per line-year saved was $57. When dollars per QALY saved were calculated, the total was $1,912.

This same evaluation in a non-facility setting, ASC surgery, with SB as the initial procedure and PPV for subsequent failures, yielded a weighted cost of $4,188 carrying out for three procedures. When cataract surgery is included in this weighted total, the cost was $4,453. The addition of clinic visits as described above generated a cost of $4,873. The cost per line was $826. Cost per line-year saved was $41 and the cost per QALY was $1,377.

Primary Retinal Detachment Repair with Vitrectomy

A primary PPV without scleral buckling was assumed in this model to have a 90% success rate. For facility cases performed in a hospital operating room, the Markov analysis demonstrated a modeled cost of $5,425 in this setting, with a PPV with or without SB as the second and third procedures for failed RD repair. When cataract development was factored in, the cost was $7,282. Including one level 4 new patient visit and three level 3 follow-up visits, the cost was $7,940. Cost per line was calculated to be $1,346 and the dollars per line-year saved were $67. Dollars per QALY saved were $2,243.

Primary PPV in the non-facility setting, operated in an ASC operating room, with the same success rate as described above, demonstrated a weighted cost of $4,048. Inclusion of cataract surgery yielded a cost of $5,373, and inclusion of clinical visits yielded a cost of $5,793. The cost per line was $982, the cost per line-year was $49 and the cost per QALY was $1,637.

Laser Prophylaxis for Symptomatic Retinal Breaks

Laser prophylaxis for a retinal break was assumed to have a 95% success rate in preventing retinal detachment as detailed in prior studies.[23] For the patients that developed retinal detachment, scleral buckling was selected as the first procedure with an 80% success rate, and pars plana vitrectomy selected as a second procedure with a 90% success rate in this scenario. The modeled cost for facility patients after Markov analysis was $1,278. When cataract development for the vitrectomy patients was factored in, this cost was $1,296. Inclusion of one level 4 new patient and three level 3 follow-up visits led to a cost of $1,955. The number of lines saved in this scenario was considered to be 9 lines, as the group of patients with retinal breaks have better baseline vision than those with retinal detachment, and a higher rate of treatment success. Cost per line of vision was $217. The cost per line-year saved was $11 and the dollars per QALY saved was $362.

The same algorithm was applied for patients in a non-facility setting. The weighted cost was $822 for the laser and RD repair in failed laser cases. Inclusion of cataract surgery led to a cost of $835. The inclusion of one level 4 new patient and three level 3 follow-up visits totaled $1,255. The cost per line saved was $139, the cost per line-year saved was $7 and the cost per QALY was $232.

Discussion

The analysis presented demonstrates that when factoring in clinical visits and subsequent cataract surgery (which have not been included in other cost-consideration studies), the costs for repair of primary rhegmatogenous RD range from $2,763 to $7,940 depending on the treatment modality (PR, SBP, or PPV) practice and surgical setting. The PR cost could be even lower if a 90% success rate is modeled- a relatively high rate, but one that might be applicable in certain patient subsets.[14] Correspondingly, the dollars per QALY saved ranged from $554 to $2,243. Although these ranges are moderately broad, these costs are much lower than for other therapeutic interventions within ophthalmology and other fields of medicine, and well under what has been offered as the acceptable cost of a QALY ($50,000 to $100,000).[31] For contrast, the cost per QALY of treatment of *H. pylori* is roughly $1,830, and the cost per QALY in of treatment of systemic arterial hypertension with beta blockers is $7,389.[31] The cost / QALY of the treatment of hyperlipidemia is $77,800, much higher than that of RD treatment.[31] In comparison to other retinal treatments, a previous analysis the QALY value of these interventions compared favorably to pan retinal photocoagulation (PRP) for diabetic retinopathy ($700), and prophylaxis of retinal breaks was even more cost-effective ($232–$362).[20] Recent analyses of costs associated with one year of pharmacologic therapy macular edema from RVO yielded a range of dollars per QALY saved from $824 for intravitreal bevacizumab to $25,566 for intravitreal ranibizumab.[20–22]

Several limitations are present in this report. A number of assumptions are made in the modeling the treatment of the patients including the average age, lens status, visual results, and fees for operating room anesthesia. The data presented are based on a Miami, Florida-based practice, and costs will vary depending on a given practice setting and type, or with different treatment algorithms. The conclusions were based on a “worst case scenario” regarding costs- highest setting, highest geographic area, and associated costs. Even with this intended bias, the cost-effectiveness was favorable. When the same costs were evaluated for lowest cost geographic areas, the cost parameters were reduced by 10% or less (Tables 4 and 5, available at http://aaojournal.org). While these figures do not apply directly in other countries where the reimbursement schedules are different and healthcare is distributed differently, the high level of cost-effectiveness of RD repair relative to other medical and ophthalmologic interventions is likely to be valid regardless of surgical approach or reimbursement region.

Our model further erred on the side of undervaluing RD repair by underestimating its VA value. Our assumptions that all re-operations were visual failures and led to no lines of saved vision and our assumption that the natural history or untreated or failed treatment was for 20/400 VA are almost certainly pessimistic and would lead to higher calculated cost values. Furthermore, we assumed a 70% macular involving rate, which is higher than the 50% range reported by some,[17,19] and would result in a better value of lines saved and, hence, higher calculated cost values. If we incorporated some of these more favorable assumptions, the lines of vision saved might reasonably be doubled. Hence, the costs per lines of vision saved and QALY values halved, further distinguishing retinal reattachment treatments as extremely cost-effective. Moreover, rhegmatogenous RD may progress to a bilateral condition in 25–40% of patients,[33] further amplifying the benefit of treatment and prevention.

While this study demonstrates PR to be less costly than surgery, not all cases can be equally managed, and in some hands the success rates are not as high as assumed. While others have reported lower costs for PR (albeit without including reoperations, clinical visit costs, or actualized cataract costs), this sort of comparison was not the primary purpose of the current study design.

This study demonstrates the unequivocally high level of cost-effectiveness of retinal detachment repair regardless of technique used. That the cost-effectiveness for the different methods of RD repair (PR, SB, PPV) are reasonably comparable frees the surgeon of significant financial constraint considerations, allowing them to tailor the repair method that they feel is most appropriate for a given patient’s pathology and situation. The results of this study suggest that repair of RD may be undervalued when compared to pharmacologic treatments for other chronic retinal illnesses, and even for surgical treatment for other subacute problems. Similar Markov analyses may facilitate evaluation of costs for other retinal diseases or pathologies.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Financial Support:

The National Institute of Health Center grant P30-EY014801 and an unrestricted grant to the University of Miami from Research to Prevent Blindness, New York, New York.

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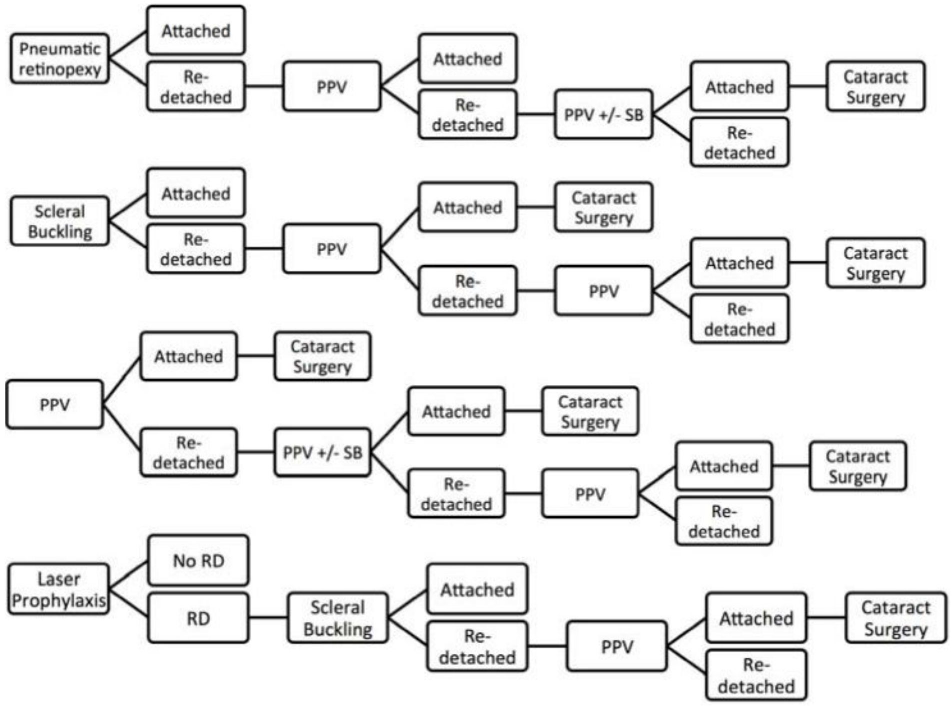

Figure 1. Decision Model Used in Markov Analysis

PPV = pars plana vitrectomy, SB = scleral buckling. RD = retinal detachment. Phakic patients (assumed to be 70% of total cohort) were expected to require cataract surgery after PPV

Table 1

Medicare Allowable Costs for Retinal Detachment Repair and Associated Treatments

	Facility, Hospital Operating Room Surgery					Non-Facility, ASC Surgery			
Procedure	**CPT Code**	**Professional**	**Non-technical**	**Anesthesia**	**Total**	**Professional**	**Nontechnical**	**Anesthesia**	**Total**
PR	67110	$901	$1,442	–	$2,343	$1,005	$0	–	$1,005
SB	67107	$1,493	$2,914	$255	$4,662	$1,493	$1,635	$255	$3,383
PPV	67108	$1,892	$2,914	$255	$5,061	$1,892	$1,635	$255	$3,782
PPV +/– SB	67112	$1,563	$2,914	$255	$4,732	$1,563	$1,635	$255	$3,453
Laser prophylaxis of RD	67145	$583	$411	–	$994	$615	$0	–	$615
Cataract surgery	66984	$769	$1,730	$153	$2,652	$769	$971	$153	$1,893
Level 4 new patient visit	99204	$145	$128	–	$273	$183	$0	–	$183
Level 3 follow up visit	99213	$55	$74	–	$128	$79	$0	–	$79

All amounts are in United States dollars. ASC = ambulatory surgery center, CPT = current procedural terminology, PR = pneumatic retinopexy, SB = scleral buckle, PPV = pars plana vitrectomy, RD = retinal detachment.

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Table 2

Weighted Costs of Retinal Detachment Repair with Dollars per Line Saved, Dollars per Line-Year Saved and Dollars per QALY for Facility, Hospital Operating Room Surgery

Initial Procedure	Weighted Cost	Weighted Cost with CE/IOL	With Clinic Visits	Lines Saved	Dollars per Line Saved	Mean Life Expectancy (Years)	Dollars per Line-Year Saved	Dollars per QALY
PR 60%	$4,500	$5,243	$5,901	5.9	$1,000	20	$50	$1,667
PR 75%	$3,691	$4,155	$4,814	5.9	$816	20	$41	$1,360
PR 90%	$2,882	$3,068	$3,726	5.9	$632	20	$32	$1,053
SB	$5,740	$6,112	$6,770	5.9	$1,147	20	$57	$1,912
PPV	$5,425	$7,282	$7,940	5.9	$1,346	20	$67	$2,243
Laser prophylaxis	$1,278	$1,296	$1,955	9	$217	20	$11	$362

All amounts are in United States dollars. QALY = quality adjusted life years, CE/IOL = phacoemulsification of cataract with intraocular lens, PR = pneumatic retinopexy, 60% = primary procedure success rate of 60%, 75% = primary procedure success rate of 75%, 90% = primary procedure success rate of 90%, SB – scleral buckling, PPV = pars plana vitrectomy

Table 3

Weighted Costs of Retinal Detachment Repair with Dollars per Line Saved, Dollars per Line-Year Saved and Dollars per QALY for Non-facility, ASC Surgery

Initial Procedure	Weighted Cost	Weighted Cost with CE/IOL	With Clinic Visits	Lines Saved	Dollars per Line Saved	Mean Life Expectancy (Years)	Dollars per Line-Year Saved	Dollars per QALY
PR 60%	$2,615	$3,145	$3,565	5.9	$604	20	$30	$1,007
PR 75%	$2,011	$2,343	$2,763	5.9	$468	20	$23	$780
PR 90%	$1,408	$1,540	$1,961	5.9	$322	20	$17	$554
SB	$4,188	$4,453	$4,873	5.9	$826	20	$41	$1,377
PPV	$4,048	$5,373	$5,793	5.9	$982	20	$49	$1,637
Laser prophylaxis	$822	$835	$1,255	9	$139	20	$7	$232

All amounts are in United States dollars. ASC = ambulatory surgical center, QALY = quality adjusted life years, CE/IOL = phacoemulsification of cataract with intraocular lens, PR = pneumatic retinopexy, 60% = primary procedure success rate of 60%, 90% = primary procedure success rate of 90%, SB – scleral buckling, PPV = pars plana vitrectomy

Retinal Surgery in Ambulatory Surgery Centers versus Hospital Outpatient Departments

After the January 2008 landmark regulations passed by the Centers for Medicare and Medicaid Services (CMS) approving ambulatory surgery center (ASC) reimbursement for essentially all ophthalmic surgical procedures, there has been a substantial movement of surgery cases from hospital outpatient department (HOPDs) to ASCs.[1] In 2015, an American Society of Retina Specialists survey showed that approximately 50% of retina specialists perform most surgical procedures in an ASC.[2] The benefits ascribed to using ASCs compared with HOPDs include a smaller environment dedicated to eye surgery and a highly trained staff that facilitates the surgeon's efficiency.[3] Criticisms of ASCs are that they cannot take on more complicated cases, such as those involving intraocular gases, silicone oils, or perfluoron; diabetic traction retinal detachments; or emergencies. There is also concern for patient safety. Reports of case selection complexity and patient safety in ASCs versus HOPDs are limited.

We performed a retrospective analysis of these issues in our large, single-specialty retinal referral practice, which performs >1500 vitrectomies a year in a major metropolitan center with a geographically and socioeconomically diverse population. The Sterling Institutional Review Board ruled that approval was not required for this study. We reviewed all of our surgeries done over a 5-year period (July 1, 2010, to June 30, 2015). Cases were routinely scheduled at the ASC, unless directed to the HOPD by the surgeon, medical preoperative review, anesthesiologist review, or insurance contracting. Access to equipment, materials, and anesthesia (general vs. local) were identical at both the ASCs and HOPDs. We categorized the cases by Current Procedural Terminology (CPT) codes and used the 10 most common CPT codes for analysis: pars plana vitrectomy (PPV) and internal limiting membrane peel (67042), PPV for retinal detachment repair (67108), PPV for complex retinal detachment (67113), PPV (67036), PPV and panretinal photocoagulation (67040), PPV and membrane peel (67041), scleral buckle for retinal detachment repair (67107), PPV and removal of intraocular lens posterior segment (67121), PPV and focal endolaser (67039), and PPV with aqueous shunt to extraocular equatorial plate reservoir (66180).

We reviewed incident reports, broadly defined as any happening not consistent with the routine operation of the ASC or HOPD as defined in the institutions' procedure manuals. This includes hospital admissions or emergency department visits within 24 hours of surgery. Cases were classified into 2 categories, elective and emergent. Emergent cases were identified as those with retinal detachment CPT codes (67107, 67108, 67113). The elective cases were those assigned the remaining CPT codes. We also reviewed the reasons that cases were scheduled at the HOPD over the ASC for the most recent 18 months (January 1, 2014, to June 30, 2015), the only period of time for which these specific data were available to us.

Categorical data for case distributions were summarized by counts and percentages. Relative frequencies of procedures were compared using the chi-square test of contingency table data or Fisher's exact test. Rates of medical incidents were calculated along with 95% confidence intervals (CIs) using the modified Wald method. Proportions of incidents were compared using Fisher's exact test for all procedures combined, as well for subgroupings, elective and emergent.

Over 5 years, there were 5737 ASC cases and 213 HOPD cases. For the 10 most common retinal surgery CPT codes, ASC cases numbered 5683; HOPD, 190. There was a significant difference ($P <$ 0.001) in the relative frequencies of procedures at ASCs versus HOPDs for all 10 of the most common retinal surgery CPT codes (Table 1).

The rate of incident reports was 7 in 5737 procedures (0.12%) (95% CI, 0.05%−0.26%) at ASCs and 0 in 213 procedures (0%) (95% CI, 0.00%−2.13%) at HOPDs. Of the 7 ASC incidents, 4 patients were transferred to emergency departments (3 for cardiac concerns, 1 for neurologic changes) and sent home from the emergency departments. The remaining 3 patient incidents did not require transfer and included 1 retrobulbar block of wrong eye, 1 unresponsive patient after retrobulbar block, and 1 macular trauma due to startle reflex during membrane peeling. There were no long-term medical or ocular sequelae for any patient. For all procedures aggregated, as well as for each subgrouping, elective and emergent, the 95% CIs of ASCs and hospitals overlapped. Examining these data with Fisher's exact test, there were no differences in incident reports, either for all procedures combined ($P = 0.21$) or for the subgroupings ($P > 0.99$ for each subgroup).

There were 43 surgeries performed at the HOPDs in the 18 months for which scheduling data were available. The reasons for scheduling at an HOPD were as follows: 30 scheduling conflicts, 6 insurance requirements, 5 pediatric cases, and 2 medical indications (severe developmental disability and pregnancy).

In this study, there was significantly more utilization of the ASCs over the HOPDs for the 10 most common categories of retinal surgery cases that were studied, with no apparent difference in the rate of medical incidents. It seems that surgery at ASCs is similar in safety compared with HOPDs. It is also performed at a lower cost. Medicare currently pays 78% more to HOPDs than to ASCs for the same procedures.[4] Applying that ratio to this study, CMS saved >$7 million dollars as a result of the surgeries being done in ASCs. Furthermore, the Office of the Inspector General determined that CMS could have saved approximately $15 billion if the HOPDs were paid at ASC rates for 2012 through 2015.[5]

This study is limited by its retrospective nature and data collection from a single retinal surgery practice with specific geographic characteristics. Also, the study did not report any eye-specific outcomes between surgeries in ASCs versus HOPDs, such as ocular complications, reoperation rates, or visual outcomes, because these measures were beyond the scope of the review. In addition, the rarity of medical incidents associated with retinal surgery makes statistical analysis of safety very difficult. However, our study suggests that shifting virtually all

Table 1. Relative Frequencies of Procedures (Ambulatory Surgery Center vs. Hospital Outpatient Department) for the 10 Most Common Retinal Surgery Current Procedural Terminology Codes

Procedure (CPT Code)	Total (no.)	Surgeries in an ASC No.	Surgeries in an ASC %	Surgeries in an HOPD No.	Surgeries in an HOPD %
PPV + internal limiting membrane peel (67042)	1918	1907	99.43	11	0.57
PPV + retinal detachment repair (67108)	1346	1266	94.06	80	5.94
PPV, complex retinal detachment (67113)	920	876	95.22	44	4.78
PPV (67036)	778	757	97.30	21	2.70
PPV + panretinal photocoagulation (67040)	519	510	98.27	9	1.73
PPV + membrane peel (67041)	157	153	97.45	4	2.55
Scleral buckle, retinal detachment repair (67107)	100	86	86.00	14	14.00
Removal intraocular lens posterior segment (67121)	68	62	91.18	6	8.82
PPV + focal endolaser (67039)	35	34	97.14	1	2.86
Aqueous shunt to extraocular equatorial plate reservoir (66180)	32	32	100	0	0
Total	5873	5683	96.76	190	3.24

ASC = ambulatory surgery center; CPT = Current Procedural Terminology; HOPD = hospital outpatient department; PPV = pars plana vitrectomy.
All $P < 0.001$.

retinal surgeries to ASCs seems to be possible and is more cost effective, although rare systemic medical conditions may require HOPD settings.

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Presented at: the 2016 Association for Research in Vision and Ophthalmology Meeting, May 4, 2016, Seattle, Washington.

Financial Disclosures: D. Miller and L. Rao are minority shareholders in an ambulatory surgery center. The other authors have no proprietary or commercial interest in any materials discussed in this article.

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Abbreviations and Acronyms:
ASC = ambulatory surgery center; **CI** = confidence interval; **CMS** = Centers for Medicare and Medicaid Services; **CPT** = Current Procedural Terminology; **HOPD** = hospital outpatient department; **PPV** = pars plana vitrectomy.

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Endoscleral Patch Graft: A Novel Closure for Complex Pars Plana Scleral Defects

External scleral patch grafts have been used in the management of scleral necrosis for conditions such as scleritis or after glaucoma or pterygium surgery.[1–4] We present a novel technique for repairing a large defect in necrotic sclera with a scleral patch graft secured internally rather than externally.

A 27-year-old man was referred to Mayo Clinic after experiencing thermal burns to both eyes approximately 2 months before. On presentation, he had complete necrosis of all 4 eyelids and large bilateral corneal perforations that were treated with corneoscleral grafts. At the time of surgery, extensive necrosis and softening of the corneal and anterior scleral tissue of the left eye were noted. A portion of the intraocular contents had been expulsed, and a retinal detachment was present. A 14-mm corneoscleral graft procedure was performed on the left eye, with plans to address the retinal detachment at a later time. One week later, the patient underwent a retina reattachment procedure via a 3-port 23-gauge pars plana vitrectomy using valved cannulas and visualized through a temporary keratoprosthesis. When the superotemporal cannula was removed, the underlying sclerotomy

Eye (2012) 26, 1418–1423

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CLINICAL STUDY

Patient-reported benefit from oculoplastic surgery

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Abstract

Purpose **It is vital that surgeons undertaking oculoplastic procedures are able to show that the surgery they perform is of benefit to their patients. Not only is this fundamental to patient-centred medicine but it is also important in demonstrating cost effectiveness. There are several ways in which benefit can be measured, including clinical scales, functional ability scales, and global quality-of-life scales. The Glasgow benefit inventory (GBI) is an example of a patient-reported, questionnaire-based, post-interventional quality-of-life scale that can be used to compare a range of different treatments for a variety of conditions.**
Methods **A cross-sectional study was undertaken using the GBI to score patient benefit from four commonly performed oculoplastic procedures. It was completed for 66 entropion repairs, 50 ptosis repairs, 41 ectropion repairs, and 41 external dacryocystorhinostomies (DCR). The GBI generates a scale from -100 (maximal detriment) through zero (no change) to $+100$ (maximal benefit).**
Results **The total GBI scores of patients undergoing surgery for entropion, ptosis, ectropion, and external DCR were: $+25.25$ (95% CI 20.00–30.50, $P<0.001$), $+24.89$ (95% CI 20.04–29.73, $P<0.001$), $+17.68$ (95% CI 9.46–25.91, $P<0.001$), and $+32.25$ (95% CI 21.47–43.03, $P<0.001$), respectively, demonstrating a statistically significant benefit from all procedures.**
Conclusion **Patients derived significant quality-of-life benefits from the four most commonly performed oculoplastic procedures.**
Eye (2012) **26,** 1418–1423; doi:10.1038/eye.2012.188; published online 14 September 2012

Keywords: Glasgow benefit inventory; entropion; ectropion; ptosis; dacryocystorhinostomy

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Received: 30 January 2012
Accepted in revised form: 25 July 2012
Published online: 14 September 2012

Parts of this work have previously been presented at academic meetings.

Introduction

Health service providers around the world are increasingly called upon to justify the allocation of finite resources to an ever expanding number of health technologies (medicines, procedures, and health-promotion interventions). This leads to rigorous examination of cost effectiveness, a role undertaken for the National Health Service (NHS) in England and Wales by the National Institute for Health and Clinical Excellence (NICE). The unit of effectiveness used by NICE is the 'quality-adjusted life year' (QALY) (http://www.nice.org.uk/media/68D/29/The_guidelines_manual_2009_-_Chapter_7_Assessing_cost _effectiveness.pdf). QALYs are an overall measure of health outcome that weigh the life expectancy of a patient against an estimate of their health-related quality-of-life (HRQL). Typically NICE considers a health technology costing below £20 000 per QALY to be 'cost-effective'. To date, the only oculoplastic procedure to have been the subject of a NICE appraisal is endoscopic dacryocystorhinostomy (DCR), which was approved (http://www.nice.org.uk/nicemedia/live/11027/30616/30616.pdf).

The majority of health-care provision by the NHS in England is, at present, the responsibility of regional commissioning bodies known as primary care trusts (PCTs) who purchase primary and secondary care on behalf of their patients. Collectively, PCTs spend around 80% of the NHS budget. In commissioning services PCTs typically follow the advice published by NICE, but outside these guidelines are free to make local judgements about funding priorities. As with NICE, these are cost-effectiveness decisions, and in the field of oculoplastic surgery it is increasingly common for PCTs to set rigid clinical criteria before agreeing to fund treatment. Examples include a demonstrable visual field defect with ptosis or dermatochalasis, or chronicity and discomfort with meibomian cysts. Many PCTs are implementing lists of 'low priority procedures' that they will not fund, and which increasingly include oculoplastic procedures.

The use of rigid criteria in the allocation of health resources is controversial. While it reflects a desire to place simple, consistent conditions on funding decisions, it can be at odds with the ethos of patient-centred medicine. As clinicians it is vital that we can demonstrate a genuine benefit to our patients, both ethically and financially, yet patient benefit can be difficult to measure. The clinician's perception of success may differ from that of the patient, and patients themselves can vary from one to another given apparently similar functional outcomes from surgery.[1] The height of the lid after ptosis surgery, for example, may be a surgeon's measure of success, but previous studies have shown a surprising mismatch between objective clinical assessment and subjective benefit.[2] Furthermore, it is the patients who report the greatest subjective preoperative functional impairment who derive the greatest quality-of-life improvements from surgery, rather than those with the greatest clinical impairment.[3]

Measuring patient benefit from medical interventions has been the subject of extensive research. The various scoring systems that have been developed tend to fall into one or more of three broad categories: clinical scales, activities of daily living/functional ability scales, and global quality-of-life scales. Clinical scales typically rely on objective, physical outcome measures, whereas the functional and quality-of-life scales typically rely on subjective patient-reported responses obtained using questionnaires. Over 800 examples of such questionnaire-based tools can now be found on the Mapi Institute 'Quality of Life Instruments Database' (http://www.mapi-institute.com). In devising this study, we examined the strengths and weaknesses of some of the most widely used quality-of-life questionnaires, including the Sickness Impact Factor[4], the Nottingham Health Profile[5], the Euroqol[6], the Medical Outcomes Short-Form 36 (SF-36)[7], and the Glasgow Benefit Inventory (GBI)[8].

Of these, we concluded that the GBI was the most suitable for our study. The GBI was initially developed for otorhinolaryngological interventions, and the original paper was used to compare patient benefit from cochlear implant, middle ear surgery (for hearing and for infection), rhinoplasty, and tonsillectomy. However, a major strength of the GBI is its ability to compare a range of different treatments for a variety of conditions, and across diverse demographic and cultural groups. It also benefits from being post-interventional quick and easy to administer by telephone or post, focused on change (rather than taking preoperative and postoperative measures and subtracting one from the other), and its use has been validated for oculoplastic procedures (DCR[9–13] and botulinum toxin for blepharospasm[14]).

In this study, we have used the GBI to assess patient benefit from four commonly performed oculoplastic operations: ptosis repair, entropion repair, ectropion repair, and DCR. Although not normally life- or vision-threatening, the symptoms associated with ptosis, entropion, ectropion, and nasolacrimal obstruction are often distressing to patients with a major adverse impact to HRQL. The visual disability associated with epiphora, for example, is often underestimated. One study comparing 14 measures of vision-dependent activities of daily living (VF-14) in patients with epiphora and those awaiting second eye cataract surgery found that those with epiphora performed worse in 12 out of 14 tasks.[15] The study recorded moderate to major difficulty in reading in 48% of patients with epiphora compared with 26% in those patients with cataract.

To date, the oculoplastic procedure most widely investigated for its quality-of-life benefits is DCR. Four studies have been published in peer-reviewed journals reporting GBI outcomes for DCR. Although these all take slightly different approaches, the results for external DCR range from $+18.5$ [9] to $+23.2$,[10] and for endonasal DCR from $+16.8$ [10] to $+52.0$.[11] Elsewhere in the literature, satisfaction with botulinum toxin is reported as $+29.2$ for blepharospasm,[14] and $+38.0$ for spasmodic dysphonia,[16] and with otorhinolaryngological surgery at $+20.0$ for rhinoplasty,[17] $+11.3$ for septoplasty,[18] and $+23.0$ for functional endoscopic sinus surgery.[19]

Materials and methods

The GBI consists of 18 questions with responses scored on a five-point Likert scale, from a large deterioration through to a large improvement in health status. The questions assess the patient's general perception of well-being, with psychological, social, and physical subscales. Post hoc analysis converts the results of the questionnaire to a score from -100 (maximal detriment) through zero (no change) to $+100$ (maximal benefit). A full list of the GBI questions is provided in Figure 1.

The questionnaire was completed during a telephone interview conducted by a member of the study team, a process that typically took 5–10 min. Subjects were identified from the theatre log at Maidstone hospital, using consecutive patients under the care of a single consultant oculoplastic surgeon (CAJ) who underwent surgery between April 2008 and April 2010. Verbal consent was obtained before proceeding with the questionnaire, and the study was conducted in accordance with the ethical standards of the Declaration of Helsinki. The study was approved by the Ethics Committee of Maidstone Hospital NHS Trust.

For each question patients are asked to score the answer on a 5 point Likert scale:

1	Much worse
2	A little or somewhat worse
3	No change
4	A little or somewhat better
5	Much better

Question	Total Score	General Subscale	Social Subscale	Physical Subscale
1. Have the results of your operation affected the things you can do?	*	*		
2. Have the results of your operation made your overall life better or worse?	*	*		
3. Since your operation have you felt more or less optimistic about the future?	*	*		
4. Since your operation do you have more or less self-confidence?	*	*		
5. Since your operation do you feel better or worse about yourself?	*	*		
6. Since your operation have you found it easier or harder to deal with company?	*	*		
7. Since your operation do you feel more or less confident about job opportunities?	*	*		
8. Since your operation do you feel more or less embarrassed when with a group of people?	*	*		
9. Since your operation do you feel more or less self-conscious?	*	*		
10. Since your operation are you more or less inconvenienced by your (specific) problem?	*	*		
11. Since your operation have you been able to participate in more or fewer social situations?	*	*		
12. Since your operation have you been more or less inclined to withdraw from social situations?	*	*		
13. Since your operation do you feel you have more or less support from your friends?	*		*	
14. Since your operation do you feel you have more or less support from your family?	*		*	
15. Since your operation are there more or fewer people who really care about you?	*		*	
16. Since your operation have you been to your doctor, or any reason, more or less often?	*			*
17. Since your operation have you had to take more or less medicine, for any reason?	*			*
18. Since your operation have you been more or less inconvenienced by your other health problems?	*			*

Figure 1 GBI Likert scale and questions.

Suitable patients were selected for four commonly performed oculoplastic procedures: entropion repair, ptosis repair, ectropion repair, and external DCR. The number of appropriate subjects was 79, 63, 50, and 50, respectively, of which the GBI questionnaire was successfully completed for 66, 50, 41, and 41, respectively (representing a completion rate of 85, 79, 82, and 82%). The mean age (with ranges) of patients undergoing surgery was 78.4 (53–94), 64.0 (20–89), 75.6 (56–100), and 67.4 (20–90) years old, respectively, and the proportion of men was 62, 52, 63, and 27%. The majority of cases where the questionnaire was not completed related to incorrect contact details and an inability to reach the patient by telephone.

Results

The total GBI scores of patients undergoing surgery for entropion, ptosis, ectropion, and external DCR were +25.25 (95% CI 20.00–30.50, $P<0.001$), +24.89 (95% CI 20.04–29.73, $P<0.001$), +17.68 (95% CI 9.46–25.91, $P<0.001$), and +32.25 (95% CI 21.47–43.03, $P<0.001$), respectively, demonstrating a statistically significant benefit from all procedures (Table 1). Confidence intervals were calculated using a Student's *t*-distribution, Instat 3 biostatistics (GraphPad, La Jolla, CA, USA).

Subscale analysis groups responses to certain questions to give further information about the nature of the benefit the patient derived. These subscales are general impact (psychological benefit to self), physical impact (overall physical health), and social impact (support from others). The mean scores for entropion, ptosis, ectropion, and external DCR using the general subscale were +31.12, +38.58, +21.85, and +37.80, respectively, using the physical subscale were +17.43, −7.67, +4.47 and +15.85, respectively, and using the social subscale were +9.09, +2.47, +14.23 and +26.42, respectively (Table 2).

Table 1 Total GBI scores

	Entropion	*Ptosis*	*Ectopion*	*External DCR*
Sample size	66	50	41	41
Mean score	25.25	24.89	17.68	32.25
Median score	30.56	25.00	5.56	38.89
Standard deviation	21.35	17.05	26.06	34.16
Minimum score	−25.00	−22.22	−16.67	−55.56
Maximum score	72.22	66.67	100.00	100.00
Lower 95% CI	20.00	20.04	9.46	21.47
Upper 95% CI	30.50	29.73	25.91	43.03

Table 2 GBI subscale scores

	Entropion	*Ptosis*	*Ectopion*	*External DCR*
General impact	31.12	38.58	21.85	37.80
Physical impact	17.43	−7.67	4.47	15.85
Social impact	9.09	2.47	14.23	26.42

Discussion

Patients report levels of satisfaction with these four common oculoplastic procedures that compare favourably with other treatments that have been studied using the GBI. Our results show slightly higher levels of patient benefit from external DCR compared with previous reports in the literature (+32.25 compared with +18.5[9] and +23.2[10]).

Within the overall GBI score, the scores achieved on the general, physical, and social subscales demonstrate some important differences between the four procedures. While the general score, reflecting overall psychological benefit, is reasonably consistent, the social and physical scores are more variable.

The social subscale records support received from family and friends, and suggests a large benefit from external DCR, more modest improvements from correction of ectropion and entropion, and relatively little benefit from ptosis repair. This may reflect the fact that chronically watering eyes are more socially stigmatising than eyelid malposition, with some patients reporting that they were thought of as being emotionally labile as they were seen to be 'crying all the time'. Similarly, patients suffering with the red, crusty lids and recurrent conjunctivitis of ectropion and entropion felt they were perceived as having poor personal hygiene. Improved watering and healthy-looking eyes may in turn have improved a patients' perception of their interaction with family and friends by making them feel less self-conscious. The social subscale of the GBI specifically reflects the patients' perception of how others respond to them, whereas the general subscale reflects the way that the patients themselves interact with others. Overall, the quality of social interaction will be a combination of these factors, and on this measure ptosis patients reported much more positive results, feeling both less self-conscious about how others saw them, and more self-confident about themselves.

One of the potential weaknesses of the GBI score is that a negative score may not indicate a genuinely adverse outcome from the surgery. On the social and general subscales, for example, much relies on the personality of individual patients, with those who did not find the condition adversely affecting them socially or psychologically before surgery tending to report less significant improvements after. But perhaps more importantly two out of three questions on the physical subscale ask about additional treatment or additional health problems for any reason since their surgery, and which could give a negative score even when completely unrelated to the lid/lacrimal surgery. Together, these factors probably account for the negative minimum scores we have demonstrated in all procedures, and for the negative mean score for physical health following ptosis surgery. It is our impression that these negative scores do not tend to reflect individually poor outcome in terms of postoperative complications of failed surgery.

Analysing the mean, median, and SD for the four procedures demonstrates some interesting patterns (Table 1, Figure 2). Benefit from ectropion surgery appears to be skewed by a small group of patients with a particularly negative experience (large positive skew), and entropion and DCR by a larger group of patients with more positive experiences (small negative skew). Outcome from ptosis surgery is quite consistent (small SD), and from DCR quite variable (large SD).

Although the GBI offers a straightforward, flexible tool for measuring patient benefit, questionnaires like these suffer from some inherent limitations. Subjective responses offer no measure of consistency and may be influenced by factors such as the style of interviewer, the time of day, or concurrent activities. There is also the suspicion that responses may owe as much to the personality of the respondent as to the effect of the procedure. It is expected, however, that such biases would be equally represented in all groups allowing a valid comparison.

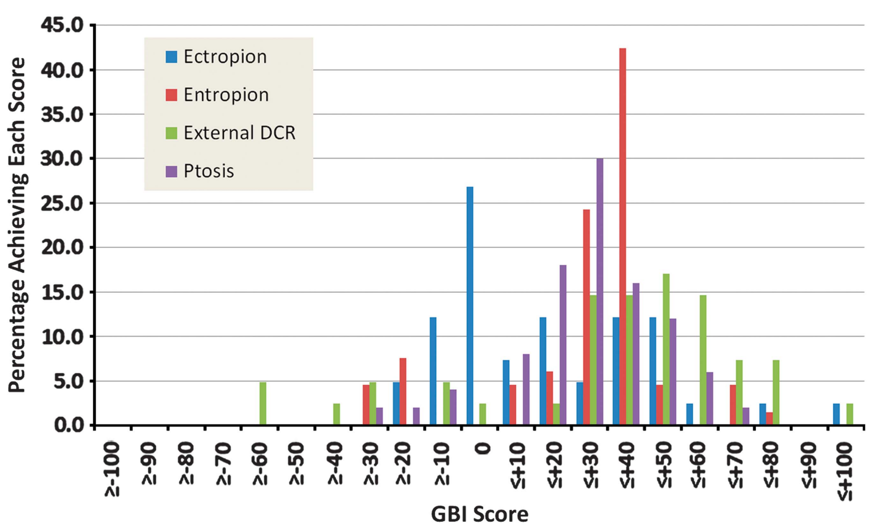

Figure 2 Graph comparing total GBI scores for different procedures.

As medical practitioners, we aim to improve the quality of our patients' lives. A significant body of evidence points to the mismatch between objective clinical impairment and subjective HRQL.[2] In patient-centred medicine, and with non-lifesaving interventions, high-quality data to demonstrate patient benefit are essential. Our study using the GBI shows significant improvements in quality-of-life from the four oculoplastic procedures we have examined, and subjective benefit to the patient should be an important consideration when appraising the value of a given intervention. We believe that greater use of patient benefit questionnaires such as GBI could contribute positively to decision making when PCTs commission services for their patients. Furthermore, patient benefit questionnaires offer a potentially useful measure of performance that could be used to compare outcomes from surgery against recognised standards in clinical audit.

In the NHS in England 2009–2010, the volume of surgery undertaken of the four procedures we have examined was as follows: entropion repair 5449, ptosis repair 5445, ectropion repair 5741, and DCR 4380 (http://www.hesonline.nhs.uk/Ease/servlet/AttachmentRetriever?site_id=1937&file_name=d:/e fmfiles/1937/Accessing/DataTables/Annual inpatient release2010/MainOp4_0910.xls&short_ name=MainOp4_0910.xls&u_id=8920). Almost all of these procedures were performed as day cases, and with the exception of DCR almost exclusively under local anaesthesia. As such, they are relatively low-cost interventions that we have shown bring genuine benefits physically, socially, and psychologically to our patients. Our results show that this group of conditions should not be considered purely within the realms of cosmetic surgery, and we hope that this study can contribute to well-informed commissioning of oculoplastic procedures in the future.

Summary

What was known before

- The Glasgow benefit inventory is a questionnaire-based, post-interventional quality-of-life scale that measures patient benefit from medical interventions. It has been validated for oculoplastic procedures, but until now has only been used in dacrocystorhinostomy and botulinum toxin for blepharospasm.

What this study adds

- We applied this tool to four commonly performed oculoplastic procedures: entropion repair, ectropion repair, ptosis repair, and external dacrocystorhinostomy. We show significant patient-reported quality-of-life improvements from these interventions. Our results confirm that these procedures are of benefit to our patients, and enable us to quantify the improvements. This gives a benchmark for future audit, and may be of value as we are increasingly called upon to justify the cost effectiveness of oculoplastic interventions.

Conflict of interest

The authors declare no conflict of interest.

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EXHIBIT #3

Green Mountain Surgery Center

PROCEDURE LIST – PLASTIC SURGERY

PROCEDURE
Abdominoplasty
Augmentation Mammoplasty
Blepharoplasty, Upper and/or Lower
Capsulotomy
Chemical Peel
Coronal Forehead Lift
Dermabrasion
Excision Lesions (cyst, etc.)
Face Lift
Hair Transplant / Flap Procedure
Liposuction
Local Anesthesia
Mandibular Fractures
Mastopexy
Mentoplasty
Nasal Fracture-open reduction
Nasal Tip reconstruction
Open Capsulotomy, Unilateral, bilateral
Otoplasty
Reconstruction breast, unilateral/bilateral
Rhinoplasty
Rhytidoplasty
Scalp Reduction
Scar Revision – ext or trunk
Scar Revision – face
Septoplasty
Subcutaneous Mastectomy & Reconstruction
Submucous Resection

Green Mountain Surgery Center

CPT CODES – PLASTIC SURGERY

11100	Biopsy skin lesion
11400	Exc tr-ext b9+marg 0.5 cm<
11401	Exc tr-ext b9+marg 0.6-1 cm
11404	Exc tr-ext b9+marg 3.1-4 cm
11406	Exc tr-ext b9+marg >4.0 cm
11420	Exc h-f-nk-sp b9+marg 0.5/<
11421	Exc h-f-nk-sp b9+marg 0.6-1
11424	Exc h-f-nk-sp b9+marg 3.1-4
11426	Exc h-f-nk-sp b9+marg >4 cm
11440	Exc face-mm b9+marg 0.5 cm/<
11441	Exc face-mm b9+marg 0.6-1 cm
11442	Exc face-mm b9+marg 1.1-2 cm
11443	Exc face-mm b9+marg 2.1-3 cm
11444	Exc face-mm b9+marg 3.1-4 cm
11446	Exc face-mm b9+marg >4 cm
11600	Exc tr-ext mal+marg 0.5 cm/<
11601	Exc tr-ext mal+marg 0.6-1 cm
11602	Exc tr-ext mal+marg 1.1-2 cm
11603	Exc tr-ext mal+marg 2.1-3 cm
11604	Exc tr-ext mal+marg 3.1-4 cm
11606	Exc tr-ext mal+marg >4 cm
11620	Exc h-f-nk-sp mal+marg 0.5/<
11621	Exc s/n/h/f/g mal+mrg 0.6-1
11622	Exc s/n/h/f/g mal+mrg 1.1-2
11623	Exc s/n/h/f/g mal+mrg 2.1-3
11624	Exc s/n/h/f/g mal+mrg 3.1-4
11626	Exc s/n/h/f/g mal+mrg >4 cm
11640	Exc f/e/e/n/l mal+mrg 0.5cm<
11641	Exc f/e/e/n/l mal+mrg 0.6-1
11642	Exc f/e/e/n/l mal+mrg 1.1-2
11643	Exc f/e/e/n/l mal+mrg 2.1-3
11644	Exc f/e/e/n/l mal+mrg 3.1-4
11646	Exc f/e/e/n/l mal+mrg >4 cm
12031	Intmd rpr s/a/t/ext 2.5 cm/<
12032	Intmd rpr s/a/t/ext 2.6-7.5
12034	Intmd rpr s/tr/ext 7.6-12.5
12035	Intmd rpr s/a/t/ext 12.6-20
12036	Intmd rpr s/a/t/ext 20.1-30
12037	Intmd rpr s/tr/ext >30.0 cm

CPT CODES – PLASTIC SURGERY

11100	Biopsy skin lesion
11400	Exc tr-ext b9+marg 0.5 cm<
11401	Exc tr-ext b9+marg 0.6-1 cm
11404	Exc tr-ext b9+marg 3.1-4 cm
11406	Exc tr-ext b9+marg >4.0 cm
11420	Exc h-f-nk-sp b9+marg 0.5/<
11421	Exc h-f-nk-sp b9+marg 0.6-1
11424	Exc h-f-nk-sp b9+marg 3.1-4
11426	Exc h-f-nk-sp b9+marg >4 cm
11440	Exc face-mm b9+marg 0.5 cm/<
11441	Exc face-mm b9+marg 0.6-1 cm
11442	Exc face-mm b9+marg 1.1-2 cm
11443	Exc face-mm b9+marg 2.1-3 cm
11444	Exc face-mm b9+marg 3.1-4 cm
11446	Exc face-mm b9+marg >4 cm
11600	Exc tr-ext mal+marg 0.5 cm/<
11601	Exc tr-ext mal+marg 0.6-1 cm
11602	Exc tr-ext mal+marg 1.1-2 cm
11603	Exc tr-ext mal+marg 2.1-3 cm
11604	Exc tr-ext mal+marg 3.1-4 cm
11606	Exc tr-ext mal+marg >4 cm
11620	Exc h-f-nk-sp mal+marg 0.5/<
11621	Exc s/n/h/f/g mal+mrg 0.6-1
11622	Exc s/n/h/f/g mal+mrg 1.1-2
11623	Exc s/n/h/f/g mal+mrg 2.1-3
11624	Exc s/n/h/f/g mal+mrg 3.1-4
11626	Exc s/n/h/f/g mal+mrg >4 cm
11640	Exc f/e/e/n/l mal+mrg 0.5cm<
11641	Exc f/e/e/n/l mal+mrg 0.6-1
11642	Exc f/e/e/n/l mal+mrg 1.1-2
11643	Exc f/e/e/n/l mal+mrg 2.1-3
11644	Exc f/e/e/n/l mal+mrg 3.1-4
11646	Exc f/e/e/n/l mal+mrg >4 cm
12031	Intmd rpr s/a/t/ext 2.5 cm/<
12032	Intmd rpr s/a/t/ext 2.6-7.5
12034	Intmd rpr s/tr/ext 7.6-12.5
12035	Intmd rpr s/a/t/ext 12.6-20
12036	Intmd rpr s/a/t/ext 20.1-30
12037	Intmd rpr s/tr/ext >30.0 cm

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12041 Intmd rpr n-hf/genit 2.5cm/<
12042 Intmd rpr n-hf/genit2.6-7.5
12044 Intmd rpr n-hf/genit7.6-12.5
12045 Intmd rpr n-hf/genit12.6-20
12046 Intmd rpr n-hf/genit20.1-30
12047 Intmd rpr n-hf/genit >30.0cm
12051 Intmd rpr face/mm 2.5 cm/<
12052 Intmd rpr face/mm 2.6-5.0 cm
12053 Intmd rpr face/mm 5.1-7.5 cm
12054 Intmd rpr face/mm 7.6-12.5cm
13100 Cmplx rpr trunk 1.1-2.5 cm
13101 Cmplx rpr trunk 2.6-7.5 cm
13120 Cmplx rpr s/a/l 1.1-2.5 cm
13121 Cmplx rpr s/a/l 2.6-7.5 cm
13131 Cmplx rpr f/c/c/m/n/ax/g/h/f
13132 Cmplx rpr f/c/c/m/n/ax/g/h/f
13151 Cmplx rpr e/n/e/l 1.1-2.5 cm
13152 Cmplx rpr e/n/e/l 2.6-7.5 cm
13160 Late closure of wound
14040 Tis trnfr f/c/c/m/n/a/g/h/f
14060 Tis trnfr e/n/e/l 10 sq cm/<
15240 Skin full grft face/genit/hf
15260 Skin full graft een & lips
15630 Delay flap eye/nos/ear/lip
15770 Fat graft
15820 Revision of lower eyelid
15821 Blepharoplasty
15822 Revision of upper eyelid
15823 Revision of upper eyelid
15825 Removal of neck wrinkles
15828 Removal of face wrinkles
15830 Exc skin abd
15836 Brachioplasty
15847 Abdominoplasty
15877 Suction lipectomy trunk
15879 Suction lipectomy lwr extrem
19300 Gynecomastia/Removal of breast tissue
19316 Mastopexy with augmentation/Suspension of breast
19318 Breast reduction
19325 Mastopexy/Breast augmentation
19350 Breast Reconstruction
19355 Inverted nipple correction

Green Mountain Surgery Center

19357	Breast reconstruction
19370	Removal of breast implants/ capsulectomy
21010	Incision of jaw joint
21011	Exc face les sc <2 cm
21012	Exc face les sbq 2 cm/>
21013	Exc face tum deep < 2 cm
21014	Exc face tum deep 2 cm/>
21015	Resect face/scalp tum < 2 cm
21016	Resect face/scalp tum 2 cm/>
21235	Ear cartilage graft
21930	Exc back les sc < 3 cm
21931	Exc back les sc 3 cm/>
21932	Exc back tum deep < 5 cm
21933	Exc back tum deep 5 cm/>
21935	Resect back tum < 5 cm
21936	Resect back tum 5 cm/>
26115	Exc hand les sc < 1.5 cm
26356	Repair finger/hand tendon
30400	RHINP PRIM LAT&ALAR CRTLGS&/ELVTN NASAL TI
30410	RHINP PRIM COMPLETE XTRNL PARTS
30420	RHINOPLASTY PRIMARY W/MAJOR SEPTAL REPAIR
30460	RHINP DFRM W/COLUM LNGTH TIP ONLY
30600	REPAIR FISTULA ORONASAL
36590	RMVL TUN CTR VAD W/SUBQ PORT/PMP CTR/PRPH INSJ
41899	UNLISTED PROCEDURE DENTOALVEOLAR STRUCTURES
42210	Reconstruct cleft palate
42235	Repair palate
49585	Umbilical or ventral hernia repair
69300	OTOPLASTY PROTRUDING EAR W/WO SIZE RDCTJ

GMSC
Colchester, VT

EXHIBIT #4

OR GI Procedure Rooms
Space Allocation

	FGI Reference	Min. Clr SF	Actual SF	Min Clr Dim	Actual Clr Dim
OR 1	3.7-3.3.1.1	250	571	15'	20'
OR 2	3.7-3.3.1.1	250	499	15'	20'
GI #1	3.9-3.2.2.2(1)	200	200		
GI #2	3.9-3.2.2.2(1)	200	200		
GI #3	3.9-3.2.2.2(1)	200	200		
GI/Exam	3.9-3.2.2.2(1)	200	200		

JOSEPH ARCHITECTS
Architecture, Planning & Sustainable Design