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The economics of femtosecond laser-assisted cataract surgery

John D. Bartlett and Kevin M. Miller

Purpose of review

Femtosecond lasers for use during cataract surgery carry significant purchase and use costs. The aim of this article is to help surgeons and surgery centers anticipate financial issues related to implementing femtosecond laser-assisted cataract surgery (FLACS). Such scenarios hopefully can help to inform decision making around the purchase and use of these lasers.

Recent findings

FLACS has several potential advantages over traditional phacoemulsification. However, although studies have demonstrated noninferiority of FLACS, there continues to be few data to support significantly improved visual outcomes. The literature does show a significantly higher cost for FLACS. As this cost can be passed on to patients under Medicare rules, there is the potential for increased physician revenue, which can be a motivator for adoption of this new technology. The magnitude of this increase is heavily influenced by the financial details of the implementation, like the cost of the laser, the volume of surgery performed, and the incremental increase in revenue.

Summary

A financial analysis should be performed prior to purchasing a femtosecond laser. This analysis can help predict if FLACS is going to be a financial windfall or a money loser.

Keywords

cataract, cost, economics, femtosecond, practice management

INTRODUCTION

Cataract continues to be the most common surgery in the USA for patients of Medicare age with an estimated 3 million procedures per year [1]. Given the projected increase in the cataract segment of the population to 50 million people in the USA over the next couple of decades, and the concomitant increase number of cataract surgeries, demographic factors present an unprecedented economic opportunity for ophthalmologists but also presents significant economic challenges and risks. The Centers for Medicare and Medicaid Services (CMS) have been looking to control and contain the costs of cataract surgery for decades and this has caused significant downward pressure on cataract surgeon reimbursement for the procedure [2].

Although increased volume could provide increased revenue, physician reimbursement per surgery has steadily decreased over decades. Comparing the 1985 surgeon reimbursement of US \$2000 per case to the 2012 US \$761 reimbursement, surgeons have seen a decline in surgical fees of 62% in real dollars, but when adjusted for inflation the

decrease is calculated at an astounding 89% [3]. Understandably, many cataract surgeons have become concerned that they may be put out of business because of declining reimbursement.

In 2005 and 2007, CMS Rulings provided an avenue for generating additional revenue during cataract surgery by allowing providers to provide 'premium' refractive services, the correction of astigmatism, or the placement of astigmatism or presbyopia correcting intraocular lenses, at additional out-of-pocket cost to the patient [4,5].

Since these Medicare rulings, many cataract surgeons have seen a significant increase in revenue fueled by refractive fees, but there are limits. Many

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KEY POINTS

- Femtosecond lasers are available for cataract surgery but because of their high cost represent a financial risk to ophthalmic practices.
- The actual clinical benefits of femtosecond laser-assisted cataract surgery have yet to be proven.
- A careful analysis of femtosecond laser-associated costs and revenue should be done prior to obtaining a laser system.

patients are not candidates for multifocal lenses or are unwilling to accept the limitations of these types of lenses in terms of glare and halo. Many patients have lower levels of astigmatism and do not require toric astigmatism-correcting lenses. As a result, only about 11–15% of patients nationwide receive premium lenses [6,7]. This leaves a significant number of cases reimbursing at the much lower regular surgery rate. From a financial standpoint this creates a strong incentive to find a way for these remaining patients to qualify, and pay for, refractive surgery fees. Femtosecond laser-assisted cataract surgery (FLACS) offers one potential way to command these additional refractive fees in a significantly greater percentage of patients with cataract.

FEMTOSECOND LASER-ASSISTED CATARACT SURGERY

FLACS is an exciting new technology. Surgeons are always looking for ways to improve treatment delivery. Ophthalmologists have seen disruptive changes in cataracts surgery since the 1970s with the institution of phacoemulsification as the dominant mode of surgery and the development of modern intraocular lenses. These have radically changed the surgery from one of last resort for blind patients to a high-tech refractive procedure with which patients expect not only improved vision, but also a decreased need for glasses if not outright spectacle independence.

With the success of femtosecond technology in LASIK, it was logical for industry to seek FDA approval for the use of femtosecond lasers in cataract surgery. What is less clear is whether or not FLACS will become the dominant mode of cataract surgery in the future. The debate can be framed from a technical standpoint; does FLACS result in a measurably better surgery, with better results [8,9]? Current studies show some theoretical advantages in terms of the circularity of the capsulorrhexis, predictability of the effective lens position calculation,

decreased total ultrasound energy with resultant decreased endothelial cell injury, and reproducibility of corneal incisions including peripheral corneal relaxing incisions [10,11]. Although there is a large multicenter French trial underway currently [12], there is a dearth of published studies showing actual improved outcomes. At the very least, FLACS does not seem to have inferior outcomes to traditional cataract surgery once the initial learning curve is mastered [13].

Aside from arguing the added clinical benefit, a significant portion of the debate will be centered around finances. FLACS is much more expensive. If FLACS becomes the standard for cataract surgery, the societal cost for cataract care will rise significantly and the individual cost to patients will be higher. Already, we have some inkling that from a cost-effectiveness stand point FLACS may not make sense.

Currently, cataract surgery is one of the most cost-effective interventions in the world at about US \$4378 per quality adjusted life year (QALY). By comparison, even with generous estimates of additional benefits and a low US \$300 additional patient cost for FLACS yielded US \$57 000 per QALY, a drastic reduction in cost-effectiveness, although not outside the range of other commonly delivered interventions like the treatment of hypertension (~US \$40 000/QALY) [14].

FINANCIAL SCENARIOS

Femtosecond lasers are expensive. As such, it makes sense to evaluate the expected cost versus the expected additional revenue generated before purchasing a new laser and planning to perform FLACS. The cost includes the purchase price of the laser itself, of course, but should also include the cost of financing, a service agreement, the 'per click' or per procedure disposables cost, the cost of future software and hardware upgrades, and other costs, like the cost of building out a procedure room and increased technician time.

We have considered two hypothetical laser purchase scenarios (Figs. 1 and 2). These two scenarios, for simplicity sake, include the purchase price of the laser estimated at US \$450 000, a service contract costing US \$40 000 per year after the first year, and an interface device or per procedure fee estimated at US \$400 per patient. One scenario assumes no financing fee and one with 7% financing. The costs are then calculated as a breakeven cost per patient for various numbers of cases per year and over a range of 5–8 years of service of the laser.

We feel that these ranges show the financial limits of the use of FLACS. At the high expense

FIGURE 1. Hypothetical breakeven financial scenario, part 1.

end, with just 5 years of laser lifespan, financing, and with a low volume of 250 cases per year, the cost per patient is estimated at US \$956 per patient. Owning a laser at this level is probably not reasonable as it may be difficult to command premiums at a commensurate level. At the other end of the

spectrum, with a laser lifespan of 8 years, without financing, and with a high volume of 1500 cases per year, the cost falls to US \$461 per patient. At this cost level, patient charges could almost certainly support additional clinical revenue above costs. However, 1500 cases per year over an average 240 work days

FIGURE 2. Hypothetical breakeven financial scenario, part 2.

per year means that a femtosecond laser would need to be used for an average of 6.25 cases per day every day, a level of utilization that might be difficult for many practices or surgery centers.

It is worth mentioning that with increased competition among femtosecond laser producers, some manufacturers are willing to provide machines on a lease basis, with higher per use charges and mandatory minimum cases volumes instead of traditional purchase arrangements. These arrangements could allow ophthalmologists to utilize FLACS technology at lower upfront financial risk, but would blunt the potential economic returns.

According to a 2013 survey of FLACS users [15], practices were able to charge an additional \$1058 for the use of the femtosecond laser in conventional IOL cases. This would seem to support the use of FLACS even in the most stringent conditions of our scenarios. However, in the same survey FLACS users reported smaller increases in revenue when using the laser in toric or multifocal lens cases of US \$664 and US \$673, respectively. Hence, the average expected additional revenue for FLACS depends upon the rate of usage of premium lenses prior to instituting FLACS, as seen in Fig. 3, and if or how premium IOL use is bundled with femtosecond laser. Some reports from early adopters of FLACS report that up to 70% of their patients opt for the femtosecond laser whereas others report a 30% conversion rate [15,16]. As an out-of-pocket procedure,

the use rate will be dependent upon a host of factors like the financial situation of the target patient population and patients' perceptions of the added value of FLACS. Given our experience with premium lenses, the 30% rate is probably more reasonable as a generalization. The scenarios in Fig. 3 illustrate the estimated increased revenue for practices with a variety of pre-FLACS premium lens usage rates, in which all those premium lens patients are among the either 30 or 70% of cases converted to FLACS. The higher the usage of premium lenses prior to FLACS, the lower the relative revenue gain achieved with FLACS. Here we can see that a practice that has positioned itself to provide lower volume but higher premium lens usage may find that the economics of FLACS are less advantageous, and may merely serve to cannibalize their preexisting premium services.

One last area of cost that must be considered is efficiency. FLACS takes longer to perform than routine phacoemulsification. The patient must be positioned at the laser, the laser adjusted, and treatment applied. Then the patient must be moved to another room for surgery or repositioned in the same room for the remainder of the cataract procedure. This extra time translates into a decreased number of procedures per day, with some FLACS users reporting a decrease in number of cases per day of as much as 30–50% [17,18].

We have put all the numbers together for a theoretical surgeon (Fig. 4). We will assume that

FIGURE 3. Additional charges per FLACS case.

Additional practice revenue per year		
	350 FLACS cases (70% conversion rate, no efficiency loss)	245 FLACS cases (70% conversion rate, 30% efficiency reduction)
Sole surgeon	\$79,100	\$18,865
1000 case/year surgery center	\$158,550	\$110,985
	150 FLACS cases (30% conversion rate, no efficiency loss)	105 FLACS cases (30% conversion rate, 30% efficiency reduction)
Sole surgeon	-\$35,700	-\$61,635
1000 case/year surgery center	\$67,950	\$47,565
Assumptions: Surgeon averages 500 cases/year with 15% as premium cases prior to FLACS		

FIGURE 4. Additional practice revenue per year.

he or she is currently performing an average of 500 surgeries per year. Currently, 15% of these cases include refractive services.

Under the least advantageous scenario our surgeon has decided to purchase the laser himself or herself, convinces 30% of his or her patients to pay for the laser, and experiences a 30% decline in productivity because of the laser. This results in 105 cases generating an additional US \$102 375 of revenue, but with additional costs of US \$164 010, a net loss of US \$61 635. Clearly, this is not a sustainable situation and suggests that lone practitioners may not find FLACS a viable procedure. Certainly, the situation improves if our surgeon uses a shared laser with a total volume of 1000 cases per year. The total cost for 105 cases falls to US \$54 810, netting the surgeon US \$47 565. We think this is probably the most like general scenario, larger groups of average volume surgeons banding together to purchase a laser.

CONCLUSION

All medical practices require, as a necessity, that they run as efficient businesses. They must generate sufficient revenue to cover expenses. As the health care environment becomes more and more cost conscious, we can expect continued downward pressure on reimbursements, especially for more expensive and common items like cataract surgery. We can also expect more shifting of financial risk

from patients and insurers to physicians. Naturally as this occurs physicians will look for ways to supplement revenue. Premium refractive surgery in conjunction with cataract surgery has proven to be profitable but we cannot assume that other new technologies, such as FLACS, will automatically have the same level of success.

Our scenarios have tried to present some information regarding the financial viability of FLACS for average ophthalmology practice conditions but any practice considering such a large investment of capital and other resources should conduct their own analysis based on assumptions that they feel are most predictive for their unique practice circumstances. The numbers that are the basis of our scenarios are speculative as the literature reports widely varying utilization rates, costs, and laser charges. Still the scenarios should be illustrative.

Looking at our numbers, it seems that practices with higher volumes and efficiency, that have average or lower than average current premium lens usage rates, and that can share a laser with multiple surgeons to lower overhead, stand the best chance of integrating FLACS over the long term. These practices, especially if they are located in more affluent areas, may very well find that FLACS can supplement revenue. Other practices, however, may find that they are better off waiting for more evidence of utility or lower costs before proceeding to purchase a femtosecond laser.

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Conflicts of interest

J.D.B. has consulted for Bausch & Lomb. K.M.M. has consulted for Alcon and Bausch & Lomb.

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