THE ECONOMIC VALUE AND LEARNING CURVES ASSOCIATED WITH LASER VISION CORRECTION

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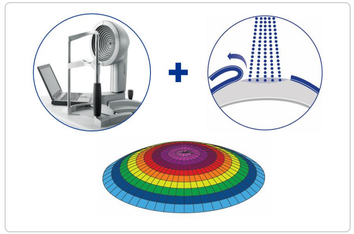
Background

- Refractive surgeries are used to correct refractive errors by reshaping the cornea.
- Surgical technologies include laser-assisted in situ keratomileusis (LASIK) (Figure 1) and small incision lenticule extraction (SMILE).
- Personalized CONTOURA VISION uses Topography-guided measurements of the cornea combined with refraction data to customize a laser ablation pattern for myopia and myopic astigmatism.

Figure 1. Topography-guided LASIK with CONTOURA VISION



Objective

- A targeted literature review was conducted to examine the costs, time, and/or healthcare resource utilization (HCRU) and learning curves associated with the LASIK and SMILE technologies.

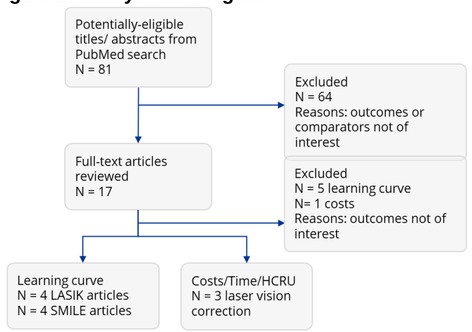
Methods

- Searches were performed in MEDLINE with terms including “LASIK”, “small lenticule extraction”, “costs”, and “learning curve”.
- English-language studies published between 1/1/2002 and 9/1/2022 were included if they reported either the costs, time, and/or healthcare resource utilization associated with laser vision correction, or the learning curve associated with LASIK and/or SMILE.

Results

- A total of 11 studies were found in this review, including 8 publications on the learning curve (SMILE [n=4] and LASIK [n=4]) and 3 on the costs, time, and/or HCRU associated with laser vision correction (Figure 2).

Figure 2. Study Flow Diagram



Results

LEARNING CURVE

SMILE is associated with a steep learning curve for inexperienced ophthalmic surgeons[1-4]

Tityal (2017)	**Trainees experience higher rates of incision and lenticule dissection related intraoperative complications** in up to 16% of eyes (8/50) in their early learning curve compared with 2% of eyes (1/50) in the later phase of the learning curve[1]
Chan (2017)	**Significantly worse UDVA and efficacy index were observed at 1 week post op in a surgeon’s first 100 patients** compared with the second 100 patients (P ≤ 0.043), with no differences by 6 months (P≥0.181); in the first 100 patients there was also **lower safety index at 1 week and 6 months** (P ≤ 0.045); **significantly longer duration of docking/suction engagement** (P = 0.034) and **duration of lenticule extraction** (P < 0.001)[2]
Ivarsen (2014)	**A loss of 2 or more lines for 3 month CVDA** was reported in 24 eyes (1.5%), **8 of which were within the first 100 eyes treated** (P<0.001)[3]
Li (2014)	1 large prospective case series (n=100 eyes) indicated **good visual quality could be achieved in the early learning curve phase for SMILE**, with **mild decentration and induced vertical coma**[4]

LASIK may be performed safely and with good visual outcomes even in the training phase for ophthalmic surgeons[5-8]

Shtein (2012)	In this retrospective case series, significantly worse UDVA was observed at 1 day post op (*P*=0.0203) after LASIK, but **UDVA was similar in attending and resident groups at 1 week up to 12 months** post op[5]
Kwon (2009)	In this survey of US ophthalmic surgeons (n=72), 90% of respondents believed **resident outcomes were excellent and similar to those of attending surgeons**[6]
Le Boyer (2005)	Postop outcomes of UCVA, refractive error, retreatment rate, and loss of BCVA for **LASIK performed by residents were consistent with published results of nonresident surgeons**, and **exceeded FDA requirements** for LASIK[7]
Bowers (2004)	**Low rate of flap-related complications** were reported (0.9%, 7/775 eyes) after LASIK was performed in a corneal and external disease and refractive fellowship program[8]

HEALTHCARE RESOURCE UTILIZATION AND COSTS

Reduced healthcare resource use and time savings for patients with LASIK compared with eyeglasses and contact lenses[9]

TIME SAVINGS TYPE	DESCRIPTION
OPTICAL CENTER VISITS	Patients with LASIK saved 18 to 50 visits to the optical center compared to those with eyeglasses and 41 to 117 visits compared to those with contact lenses
OPTOMETRIST VISITS	A mean of 4.7 to 12.2 visits to optometrists to correct visual acuity were saved with LASIK over a time-horizon of 30 years
VISUAL ACUITY CARE TIME	Over 30 years, LASIK saved 45 days (1,090 hours) compared to contact lenses in caring for visual acuity, with >90% of the total time in the contact lenses group attributable to cleaning and fitting

Results

Patients benefit from cost savings with LASIK compared with eyeglasses and contact lenses[9,10]

COST TYPE	DESCRIPTION
TRANSPORTATION	LASIK saved up to 278 km compared to eyeglasses and up to 1,436 km compared to contact lenses in travel to optical and ophthalmologist centers over a 30-year time horizon
EYE CARE CLEANING PRODUCTS	LASIK saved between 28 and 84 eyeglass cleaning packs and up to €1,934 in contact lens cleaning units
KERATITIS INCIDENCE	LASIK avoided 95 to 295 per 10,000 CL-related keratitis over 10 and 30 years, respectively

- Overall, the cost of LASIK is equivalent to 8 to 10 years of purchasing spectacles, contact lenses, solutions, and eyecare visits[9,10]

Non-personalized LASIK and SMILE refractive surgeries are cost-effective strategies for myopia correction[11]

- Over a 30-year time horizon, the reported incremental cost-effectiveness ratios (ICERs) were €15.02 per quality adjusted life year (QALY) for FS-LASIK and €13.98 per QALY for SMILE[11*]

Conclusions

- While laser vision correction provides patients with long-term time and cost savings, there is a significant learning curve associated with the SMILE technology.
- LASIK provides economic benefits for eye care practitioners and patients.

References

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*2020 euros. Costs included consult, screening, bilateral surgery, postoperative medications, medical treatment for dry eye, retreatment, complication management. Average weighted costs were €335.45 and €346.96 for SMILE and FS-LASIK, respectively. Utility values were 0.8 for SMILE and 0.77 for FS-LASIK, and QALYs for 30 years were 24 and 23.1, respectively.