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On May 27, 2024, Silvia Nanjala Walekhwa Hertzberg defended her thesis “Economic assessments and quantitative modelling of alternative treatments for retinal disorders in Norway” at the Dept. of Ophthalmology, Faculty of Medicine, University of Oslo (UiO). Her PhD project was conducted at the Center for Eye Research and Innovative Diagnostics, Oslo University Hospital (OUH). Her principal supervisor was Prof. and Senior Consultant Goran Petrovski (Dept. of Ophthalmology, UiO, and Center for Eye Research and Innovative Diagnostics, OUH), and her co-supervisor was Prof. Emily A Burger (Dept. of Health Management & Health Economics, UiO).

## The price of vision:

## Economic costs and health benefits of retinal disorder treatments



Retinal diseases are a leading cause of vision loss and severe morbidity worldwide, and their incidence is rising. Contributing factors, such as diabetes mellitus, continue to rise, exacerbating the problem. As life expectancy increases, especially among patients with diabetes mellitus, who face vascular complications due to long-term illness, the economic burden of retinal disorders is expected to grow significantly.

Fortunately, advances in treatments for retinal vascular diseases offer more options for patients. While laser therapy remains the gold standard, it has limitations in improving vision. Though they require frequent follow-up, intravitreal injections (IVTs) have become more common due to their effectiveness and lower cost. Different drugs are used in IVTs based on the patient's treatment response. In more severe cases, surgical interventions may be necessary.

Given the increasing need for these treatments, this thesis aimed to estimate the economic burden and associated health benefits of different treatment strategies for retinal diseases. One aim was to evaluate the cost-effectiveness of three surgical procedures (pars plana vitrectomy, phacoemulsification, and posterior

capsulotomy) for patients with maculopathy. We compared sequential single surgeries with double and triple surgeries performed in one session to determine the most cost-effective approach from a societal perspective. Another aim was to compare the costs of different IVT drugs for treating diabetic macula edema (DME), such as dexamethasone and bevacizumab for newly diagnosed patients and aflibercept for those unresponsive to first-line treatment. Lastly, we conducted a partial economic evaluation of laser therapy, IVT, and surgeries for diabetic retinopathy over 14 years.

Our findings showed that combined surgical procedures were more cost-effective, with the triple procedure saving US\$3,582 and the double procedure saving US\$3,731 over two years, compared to sequential single surgeries. For patients with DME, using dexamethasone for non-responsive cases saved 18% in costs compared to aflibercept, while costs for newly diagnosed patients were similar between dexamethasone and bevacizumab. Over the last 14 years, IVT use increased by 85%, while the use of laser therapy and surgeries decreased. Treatment costs tripled from 2010 to 2018, driven mainly by

the frequent use of IVTs.

In conclusion, our research provides policymakers with critical insights into the cost-effectiveness of retinal treatments. Strategies like combined surgeries and using dexamethasone for patients with non-responsive DME to first-line treatment offer significant cost savings while maintaining health benefits, providing guidance for optimizing healthcare resource allocation in the future.

### Key points:

- For patients with maculopathy, the triple surgical procedure saved US\$3,582 compared to sequential single surgeries and was associated with better health outcomes, while the double procedure offered similar health benefits and saved US\$3,731.
- For patients with non-responsive DME to first-line treatment, dexamethasone treatment reduced costs by 18% during the first year compared to aflibercept.
- Over 14 years, the use of IVTs increased by 85%, while laser therapy and surgeries decreased, contributing to a nearly threefold increase in overall treatment costs.

### Future directions:

- Evaluations focused on the health benefits relative to the additional economic burdens of the existing treatment regimens.
- Cost-effectiveness studies comparing all emerging strategies, including treat and extend, a bilateral approach, and the standard monthly or bi-monthly intravitreal injections of all utilized drugs, to estimate comparative health benefits and economic costs.
- Exploration of the role of digital health tools, artificial intelligence, and telemedicine in managing retinal disorders.

### References

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