

## Impact case study (REF3)

<b>Institution:</b> Queen's University Belfast		
<b>Unit of Assessment:</b> UoA 2		
<b>Title of case study:</b> BOOST app improves early assessment of visual acuity after cataract surgery where resources are scarce		
<b>Period when the underpinning research was undertaken:</b> 2013 to 2019		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b> Nathan Congdon	<b>Role(s) (e.g. job title):</b> Professor; Centre for Public Health; School of Medicine, Dentistry and Biomedical Sciences	<b>Period(s) employed by submitting HEI:</b> 2015 onwards
<b>Period when the claimed impact occurred:</b> 2017-2020		
<b>Is this case study continued from a case study submitted in 2014?</b> No		
<b>1. Summary of the impact</b> Poor surgical outcomes have long been a major impediment to reducing cataract blindness in low- and middle-income countries where few patients return for post-operative assessment, hampering measurement and quality improvement. The free, multi-lingual BOOST app, underpinned by Professor Congdon's research, is changing this. The app improves efficiency and patient outcomes by allowing surgeons to assess post-operative vision immediately and accurately predict surgical quality. Its use is encouraged by national ophthalmic societies, WHO and surgical facilities. It has been downloaded more than 1,800 times, more than 500 institutions are using it across the world and almost all users are uploading their data to a central repository which now contains data on more than 9,000 operations.		
<b>2. Underpinning research</b> Un-operated cataract is the world's leading cause of blindness and cataract blindness can only be treated with surgery. The World Bank has identified cataract operations as among the most cost-effective surgical interventions. However, there is a need to improve the likelihood of high-quality surgical results, which can have life-changing outcomes but are frequently not achieved in low-resource settings. Good patient outcomes depend on access to appropriate equipment, well-trained surgeons, and strong quality assurance. Shortcomings in these areas are a major impediment to reducing cataract blindness. One particular problem is that patients in low-resource areas do not return to hospital in the weeks after surgery, when outcomes are traditionally assessed, thereby hampering outcome measurements and quality improvement.  The BOOST (Better Operative Outcomes Software Tool) app ( <a href="http://boostcataract.org">http://boostcataract.org</a> ) is overcoming these problems by helping surgeons to reliably assess patient outcomes sooner [R1, R2]. It is a key output of Professor Congdon's broad programme of vision research, which is providing the evidence base to deliver high-quality vision care in low-resource settings.  Professor Congdon's research that underpins the BOOST app was done in collaboration with stakeholders including leading global eye health NGOs, international eye centres, national ophthalmic groups, the WHO and the International Council of Ophthalmology. The development of BOOST drew on engagement with potential users in 100 hospitals in a dozen low- and middle-income countries in Asia, Africa, Latin America and the Pacific Region. The feedback gathered in this research informed major aspects of the app's current format. More than 90% of users expressed their strong need for such a tool, and their willingness to share their data online for benchmarking if anonymity could be guaranteed. A similar proportion agreed that benchmarking their results against those of other BOOST users was crucial to provide context for interpreting vision results immediately after surgery. This is essentially impossible without the use of BOOST in many settings, as there are no generally agreed, data-driven standards for cataract surgical		

outcomes so soon after surgery. Virtually all respondents wished to receive help from an app like BOOST to further improve outcomes.

The research-based development of the BOOST app means that it leads the surgeon through validated data collection protocols to benchmark their current performance and improve their future results through tailored suggestions to them, based on their specific reasons for poor outcomes. BOOST takes the surgeon through two rounds of data collection and enhances what they would usually do. First, uncorrected (without glasses) visual acuity is measured before the patient leaves hospital on the day after their cataract surgery and entered for 60 consecutive patients. This allows outcome quality to be benchmarked anonymously against an original data set from 4,000 patients at 40 urban and rural hospitals of various sizes collected during Professor Congdon's Prospective Review of Early Cataract Outcomes and Grading (PRECOG) study [R3], and new data uploaded by other users of BOOST into the secure cloud-based repository. This surpassed the original 4,000 patients in July 2019 and reached 9,000 by December 2020. Second, users record data for 20 consecutive patients with poor final vision (< 6/60 at four weeks), choosing from among three reasons for this (refractive problems, surgical complications, presence of ocular co-morbidity). The app then suggests changes in pre- and post-operative care, designed specifically to remediate the most common cause of poor vision identified for each surgeon.

### 3. References to the research

R1. **Congdon N**, Suburaman G, Ravilla T, Varga B, Resnikoff S, McLeod J, Taylor H, Limburg H, Lansingh V, Schmidt E, LeMesurier R. Transforming research results into useful tools for global health: BOOST. *Lancet Global Health* 2016;4:e96 doi: 10.1016/S2214-109X(15)00267-3

R2. **Congdon N**, Dodson S, Chan VF, Mathenge W, Moo E. Improving the practice of cataract surgical outcome measurement. *Community Eye Health* 2019;31(104):91-2 doi: not assigned

R3. Meltzer ME, **Congdon N**, Kymes SM, Yan X, Lansingh VC, Sisay A, Müller A, Chan VF, Jin L, Karumanchi SM, Guan C, Vuong Q, Rivera N, McLeod-Omawale J, He M. Cost and Expected Visual Impact of Interventions to Improve Follow-up after Cataract Surgery: PRECOG Multi-center Observational Study. *JAMA Ophthalmology* 2017;138:85-94 doi: 10.1001/jamaophthalmol.2016.4735

### 4. Details of the impact

The development of BOOST, as outlined in section 2, has ensured that the app contains the features and functions needed by its potential users. All data collected and stored for BOOST are anonymous, and users can opt out of sharing their data at any time. However, with exchange of passwords, data can be shared with administrators at Ministries of Health, residency programs or elsewhere, who receive simple graphic reports on all users whom they supervise. Unlike other available software, BOOST has simple default settings, is completely self-explanatory and easy to use. It is quick to download from Google Play Store, and can be used offline, on computers and smartphones using Windows and Android platforms **in 7 languages**: English, French, Spanish, Russian, Chinese, Vietnamese and Bahasa Indonesia.

The positive feedback and demand for BOOST during its development phase has translated into usage and impact. This was recognised by Dr Elena Schmidt, Director of research at Sightsavers who said: "BOOST is a good example of collaboration between leading eye health organisations who work together to ensure that patients with cataracts who live in low and middle income countries have access to high quality surgery, which meets their individual needs and expectations. This tool is critical for global efforts to reduce avoidable visual impairment, strengthen national eye health systems and improve patient experience and health outcomes" [S1].

As of December 2020, the app had been **downloaded more than 1,800 times** across all platforms and **516 institutions in 74 countries** had formally registered as users of the app, with 64 facilities

in India, 48 in Pakistan, 39 in Nigeria and 34 in Bangladesh. By July 2020, the proportion of **registered users uploading data had reached 98%** (484 of 492) and by December 2020, information on **more than 9000 patients** had been uploaded to the secure cloud-based repository.

Furthermore, examples of the satisfaction of individual surgeons with BOOST have been gathered by the Fred Hollows Foundation [S2], including:

- *"I like this about BOOST, it's easily accessible in our phones and after using BOOST, I got a chance to monitor my surgical outcomes and got a chance to improve the quality of the surgeries and assess my surgical outcomes."* [Nepal]
- *"I will continue using it (BOOST), I like it. For me it was so simple, I had no issues with it. I gave an orientation to the ophthalmic personnel, the mid-level ophthalmic personnel or frontliners, to share with them about the BOOST and how to enter the data. I think we may continue using it for all districts in my province."* [Zambia]
- *"We can continue to use BOOST for our junior residents and registrars, if they want to know their cataract outcome for some period of time and quickly. To use BOOST is very quick."* [Cambodia]
- *"The reasons for poor outcomes, we say it was an optical error or it was a surgical error. It is good to drill it down, was it a PC tear, was it an iris tear? We need to go into details and know exactly what it was that caused surgical complication."* [Kenya]

The BOOST app has received much positive attention and commitments for use, but these have been delayed by the COVID-19 pandemic and its associated measures, including the impact of these on eye surgery. Examples include:

- Discussion of the benefits of BOOST for patients and healthcare systems at the WHO/IAPB Meeting on Cataract Surgery Outcomes Monitoring Systems in Kuala Lumpur, Malaysia in September 2018 [S3]. Representatives from Ministries of Health in China, Lao, Malaysia, Mongolia and Papua New Guinea made commitments to use or consider use of BOOST nationally.
- Recommendations and access to BOOST on websites of major eye health umbrella organizations (e.g. International Association for the Prevention of Blindness [S4]) and eye health NGOs (e.g. Fred Hollows Foundation [S5], Orbis International [S6] and Sightsavers international [S7]). For example, when launching BOOST, Orbis noted "We are excited to announce the launch of a brand new app designed to help measure, analyse and improve success rates in cataract surgery" [S6] and Ian Wishart, CEO of The Fred Hollows Foundation, said "There is great potential for BOOST to be integrated into routine care and guidance, particularly for trainees and new surgeons. By equipping surgeons and hospitals with the right tools, we can establish and support a practice of continuous quality improvement across the eye care sector" [S1].
- Agreement at an expert meeting on improving cataract surgical outcomes in Geneva in June 2017 on the use of BOOST to improve cataract surgical outcomes, and its citing in WHO's first World Report on Vision in 2019 (page 75) [S8], which is the global vision community's leading blueprint for action against eye disease.
- Recommendation of BOOST in the report of the Lancet Global Eye Health Commission (page 48), a high-profile document which outlines the way forward for the world to reduce the burden of un-necessary blinding disease. This report was finalised in 2020 but publication was delayed until February 2021 because of COVID-19 [S9].
- Welcome for the launch of BOOST by key organisations in vision health, such as the International Council of Ophthalmology [S10].
- Major eye health NGOs currently using BOOST in their programs include Orbis International, Fred Hollows Foundation and Sightsavers International. For example,

Sightsavers is requiring that all their funded partner hospitals use BOOST or other, more complex software to record their surgical outcomes and the Fred Hollows Foundation highlights BOOST as one of four examples of the organisation's innovative approach to raising awareness about avoidable blindness and providing high quality eye care to some of the most disadvantaged communities in the world [S5]. BOOST was a key tool in the measurement of the quality of surgery in a study in the Bangladesh Rohingya displaced population in 2018-19 [S11]. Ongoing research involving the Ministry of Health in China, Orbis, Fred Hollows and QUB is assessing the option of incorporating BOOST into national cataract surgical monitoring system in China to add the capacity to assess the quality of cataract surgeries and improve outcomes, but this was delayed by funding issues related to the COVID-19 pandemic.

#### 5. Sources to corroborate the impact (indicative maximum of 10 references)

S1. News release from the International Association for the Prevention of Blindness (IAPB). Available at [www.iapb.org/news/new-smartphone-app-aims-to-improve-cataract-surgical-outcomes/](http://www.iapb.org/news/new-smartphone-app-aims-to-improve-cataract-surgical-outcomes/) (Accessed on 11 March 2021)

S2. The Fred Hollows Foundation. Innovation Fund Project, Final Report: BOOST (Better Operative Outcomes Software Tool). The Fred Hollows Foundation 2020.

S3. World Health Organization, Regional Office for the Western Pacific. WHO/IAPB Meeting on Cataract Surgery Outcomes Monitoring Systems, Kuala Lumpur, Malaysia, 19–20 September 2018: meeting report. Manila: WHO Regional Office for the Western Pacific 2018. Available at [iris.wpro.who.int/bitstream/handle/10665.1/14364/RS-2018-GE-70-MYS-eng.pdf](http://iris.wpro.who.int/bitstream/handle/10665.1/14364/RS-2018-GE-70-MYS-eng.pdf) (Accessed on 27 January 2021).

S4. News release from the International Association for the Prevention of Blindness (IAPB). Available at [www.iapb.org/sib-news/seeing-is-believing-the-cataract-boost-study](http://www.iapb.org/sib-news/seeing-is-believing-the-cataract-boost-study) (Accessed on 27 January 2021).

S5. Website of the Fred Hollows Foundation highlighting their involvement in BOOST. Available at [www.hollows.org/us/what-we-do/innovation-and-research](http://www.hollows.org/us/what-we-do/innovation-and-research) (Accessed on 27 January 2021).

S6. News release from Orbis International. Available at [gbr.orbis.org/en/news/2018/orbis-partners-launch-boost-app](http://gbr.orbis.org/en/news/2018/orbis-partners-launch-boost-app) (Accessed on 27 January 2021).

S7. News release from Sightsavers International. Available at [www.sightsavers.org/news/2018/06/cataract-app/](http://www.sightsavers.org/news/2018/06/cataract-app/) (Accessed on 27 January 2021).

S8. World Health Organisation. World report on vision. Geneva: World Health Organization; 2019. Available at [apps.who.int/iris/bitstream/handle/10665/328717/9789241516570-eng.pdf](http://apps.who.int/iris/bitstream/handle/10665/328717/9789241516570-eng.pdf) (Accessed on 27 January 2021).

S9. Burton MJ, Ramke J, Marques AP, Bourne RPA, Congdon N, Jones I, et al. The Lancet Global Health Commission on Global Eye Health: vision beyond 2020. Lancet Global Health published online 16 February 2021 doi: 10.1016/S2214-109X(20)30488-5.

S10. News release from the International Council of Ophthalmology. Available at [www.icoph.org/news/letter\\_for\\_ophthalmic\\_educators/letter\\_for\\_ophthalmic\\_educators\\_detail/125/ICO-Ophthalmic-Educators-Letter-ICO-Educator-Curriculum-Content-Outline-Now-Available.html](http://www.icoph.org/news/letter_for_ophthalmic_educators/letter_for_ophthalmic_educators_detail/125/ICO-Ophthalmic-Educators-Letter-ICO-Educator-Curriculum-Content-Outline-Now-Available.html) (Accessed on 27 January 2021).

S11. Ahmed M, Whitestone N, Patnaik JL, Hossain MA, Husain L, Alauddin M, Rahaman M, Cherwek DH, Congdon N, Haddad D. Burden of eye disease and demand for care in the

Bangladesh Rohingya displaced population and host community: A cohort study. PLoS Medicine 2020;17(3):e1003096 doi: 10.1371/journal.pmed.1003096.