#NT100IS5: PEEK

Celebrating 5 years of NT100

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THE PORTABLE EYE EXAMINATION APP

By PeekVision

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To celebrate five years of NT100 we've revisited Peek to understand what's helped the initiative grow, since it featured in our 2014 NT100.

Growing up with Egyptian parents in the UK, Andrew Bastawrous was the only non-white pupil at his school, and struggled to keep up with his class. Aged 12, he was diagnosed with myopia and prescribed glasses. "The whole world came into focus," Bastawrous, now 37, recalled when speaking to People magazine last year. "I quickly went from the bottom of my class to doing very well," he added.

His joy turned to anger and guilt when he first visited Egypt with his parents. "I became very aware that if I had been somewhere else, something as simple as a pair of glasses wouldn't have been available to me," he says. "I had it clear in my mind that this was an injustice that I wanted to do something about," he elaborated later, speaking to Optometry Today.

Even at his young age, Bastawrous identified a global problem. The World Health Organization estimates that of the 285 million visually impaired people in the world, 90% live in low-income settings, while 80% of visual impairment cases could be cured or prevented.

It's not just a health issue. Restricted eyesight bears social and economic repercussions. A report from AMD (Age-related Macular Degeneration) Alliance in 2010 estimated that the worldwide direct cost of preventable vision loss was $2.3 trillion, not including indirect costs like loss of productivity and caregiving.

51% of blindness is caused by cataracts, which can be treated with an operation that takes just minutes. We have the tools to prevent and treat the majority of blindness around the world, but access to them is limited by an ineffective distribution of resources.

Bastawrous trained as an ophthalmologist, and after gaining a PhD moved to

Kenya, developing a network of 100 eye clinics in rural areas where access to ophthalmological care was sparse. As he worked day in day out with queues of patients outside, he still wasn't satisfied that he was reaching enough people. "I realised that I could spend the rest of my life doing these clinics and I would still not make a difference," he explains to Optometry Today.

One problem Bastawrous faced was the lack of infrastructure. Eye examinations required heavy electrical equipment, which is difficult to transport on Kenya's existing road network, while it was tough for patients to come to clinics using those same roads. Power outages were common, which meant frequent use of expensive, heavy and polluting petrol generators.

At the same time, Bastawrous was noticing the widespread use of mobile phones around him. A 2016 report by Afrobarometer, a pan-African, non-partisan research network that explores access to basic services and infrastructure, revealed that more people in Africa have access to mobile phone services (93%) than piped water (63%).

Seeing that more people can be reached with mobile phone technology than brick-and-mortar clinics, Bastawrous shifted his attention to portable eye diagnostics delivered with smartphones. Working with technicians on the ground and academics at the London School of Hygiene and Tropical Medicine, he went on to develop one software and one hardware solution: Peek Acuity and Peek Retina.

Peek Acuity is a simple eye test delivered through a free smartphone app. A tester holds the phone two metres in front of a patient, who sees a letter 'E' pointed in one of four directions, which is gradually reduced in size. The patient simply points which way he sees the letter pointing, and the tester swipes left if a patient has given an answer, or right if he or she is not sure. Neither the tester nor the patient knows if the answer is correct – the app's algorithm takes care of that, displaying the next image accordingly.

Peek Acuity can be used by anyone with a few minutes' training, and can store and communicate results via SMS to a local clinic, school and parents, with recommendations for further care. No heavy equipment or generators are necessary. The tester is equipped with a solar-powered rucksack, which keep the lightweight smartphone charged and backed up.

Bastawrous and a team of other academics tested the app's accuracy following an initial trial with 20,000 schoolchildren in Kenya, and found that Peek Acuity "produced results to a clinical level equivalent to the much larger and more expensive standard electricity dependent chart." A Peek Acuity test is also faster, at an average of 77 seconds compared to 82 seconds for a traditional test, and has a feature called SightSim, which provides a simulation of the tested patient's vision, so others in the community can understand how he or she is able to see the world.

Peek Retina is a compact retinal scanner that clips onto a smartphone camera, converting it into a portable ophthalmoscope in under 30 seconds. While traditional ophthalmoscopy equipment can cost tens of thousands of pounds and take a van to transport, Peek Retina fits in a pocket and costs just £180. It

requires minimum training, and has been proven to be as reliable as standard equipment.

The two smartphone solutions have huge potential to remove barriers to eye diagnostics and treatment. They also provide jobs to more people without extensive training, while freeing up expert ophthalmologists to focus on more specialised work. “When we first moved to Kenya, we went with $150,000 of equipment, a team of 15 people, and that was what was needed to deliver health care. Now, all that's needed is a single person on a bike with a smartphone. And it costs just 500 dollars,” said Bastawrous in his TED Talk.

While Peek Acuity and Peek Retina are themselves impressive, what’s truly revolutionary is the ecosystem through which they are delivered to ensure impact. In 2016, Bastawrous established Peek Vision, a limited company owned by a single shareholder – the non-profit Peek Vision Foundation – to work with governments and NGOs on delivering vision diagnostic services using Peek Acuity and Peek Retina through a five-step process.

First, Peek Vision carries out a health system check to understand population needs and the capacity of local service providers. If enough capacity exists, the team moves on to phase two, where a programme and budget are worked out, in close collaboration with stakeholders on the ground.

Phase three involves training local teams, and running a small test case, before moving onto phase four: a pilot programme involving between 20,000 and 50,000 people. During phase five, the team assesses the impact and lessons from the pilot, carrying out an economic analysis and creating a business case for scale, which can be integrated into local government programmes.

Bastawrous is clear that the role of technology is to amplify rather than lead Peek Vision’s work. “An app is not going to restore someone’s sight, as much as it’s a nice media story. A human being, who is trained for many years and works really hard and is dedicated is going to do that,” he explains.

Often, the challenges that Peek Vision’s programmes tackled have little to do with technology. In Kenya, initial research showed that consistent barriers to receiving treatment were lack of funds, and the amount of travel. Peek Vision therefore rolled out a programme that offered free surgery and transport, yet 50% of those who qualified still didn’t come. The problem turned out to be linguistic. Healthcare workers were using the Swahili word ‘paswaji’ to refer to a free operation, little realising that it can mean ‘butchery’. Just by changing the word used, twice the number of people came to treatment.

Over 200,000 people have been screened using Peek technologies to date, in Kenya, Botswana and India. And while the company doesn’t release the number of Peek Retinas sold, the product has been bought in 72 different countries. Peek Acuity has been downloaded between 10,000 and 50,000 times – mainly by trained personnel working on Peek Vision’s programmes.

Bastawrous says that even though about 50% of requests for Peek Vision’s services come from the US, he is focusing on integrating Peek Acuity and Peek Retina within end-to-end health solutions in low- and middle-income countries

where the greatest impact can be felt.

And while investment offers have also been coming from the US, Bastawrous wants Peek Vision to continue to report to its sole shareholder, the Peek Vision Foundation: “The foundation’s mandate is to serve the world’s visually impaired and the blind, and therefore they are our shareholders. So every decision we make is for their benefit, as opposed to a profit motivation.”

As well as receiving grants, the company generates revenue partly through product sales, and largely through NGO and government partnerships, where non-profit clients pay for Peek Vision’s services in order to increase efficiencies in existing programmes and access data to both prove impact, and identify where improvements are needed.

In the long run, the Peek Vision model could be adapted to deliver other community services. The company has already partnered with hearScreen in South Africa to deliver hearing testing. If vision for everyone is a tall order, health for everyone sounds positively gigantic, yet Peek Vision’s track record together with its collaborative and holistic approach makes it sound plausible.

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