

Editorial

Project vision: a new and sustainable model for eliminating cataract blindness in China

INTRODUCTION

Cataract is by far the most common cause of major vision loss, accounting for approximately half of all global blindness. According to the World Health Organization (WHO), roughly 18 million people worldwide are bilaterally blind from cataract.¹ These sobering statistics have a profound societal economic impact through the combined loss of productivity of both the blind and those who must care for them. This, and the significant reduction of life expectancy for the blind, makes sight restoring cataract surgery one of society's most cost-effective medical interventions. It is estimated that increased economic productivity during the first postoperative year alone exceeds the cost of the surgery by a factor of 15.¹

The costly societal burden of cataract blindness is not for lack of an effective treatment, as residents of all developed countries enjoy the hi-tech miracle of modern cataract surgery. Instead, cataract blindness results from the sizable gap in health-care delivery between affluent and poor societies. Cataract remains the leading cause of blindness in developing countries where the significant shortage of ophthalmologists and eye surgical services is the chief, but not sole cause. Yorston highlighted four additional major obstacles that deter people from receiving cataract surgery in developing countries.² These barriers are (i) a lack of awareness about cataract and its treatment, (ii) a negative perception of the quality of locally available health services, (iii) problems with transportation to health-care facilities, and (iv) the inability to afford the direct and indirect costs arising from surgery.

During the past three decades, China's explosive economic growth and development have been apparent and impressive to all. However, the benefits of this extraordinary economic transformation have been largely reaped in China's urban centres, and have not been shared by the rural population. Perhaps in no area is this gap in living standard more apparent than in health care. An important public health statistic is the so-called, cataract surgical rate (CSR), which represents the number of cataract operations annually performed per one million of population. As would be expected, the highest rates are seen in those countries with the highest gross domestic product (GDP) (Table 1).^{3,4} Astonishingly, however, China's CSR is among the lowest in the world, and on a par with African countries with extremely low GDPs.^{3,4} This glaring discrepancy is all the more disappointing considering that economic reforms have resulted in a 10-fold rise in China's GDP since 1978.³

Table 1. The cataract surgical rate (CSR) and gross domestic product (GDP) in China as compared with other countries (data from Vision 2020 Global Declaration in December 2006⁴)

Countries	CSR (cataract operations/million population/year)	GDP per capita (US dollar) ³
China	380	\$6 000
Ethiopia	360	\$800
India	4067	\$2 800
USA	6500	\$47 000

An epidemiological survey in the late 1980s estimated that at least 5 million people suffered from bilateral blindness in China, and that cataract was responsible for 50% of these cases.⁵ According to the WHO, in developing countries a CSR of 1000 is necessary simply to treat the new cases of cataract blindness arising every year.¹ For China, the current population of 1.3 billion, translates into 1.3 million new cases of cataract blindness per year. With such a deficient CSR, China's burden of cataract blindness will continue to grow at an epidemic rate until access to surgery can be increased. To underscore the severity of the problem, even a tripling of China's current CSR would barely make a dent in the country's huge backlog of cataract blindness.

CHINA'S URBAN–RURAL GAP IN HEALTH-CARE SERVICES

Why is the CSR so low in a country otherwise blessed with such remarkable economic progress? Of many contributing factors, the main reason is the immense gap in health-care quality, availability and affordability between China's rural and urban populations. It is estimated that out of China's 1.3 billion citizens, approximately 800 million are farmers residing in rural villages, towns and counties located well outside the urban metropolitan areas. Although more than 60% of China's population lives in these rural regions,³ more than 80% of the country's health resources are concentrated in its large cities.⁶ Most of China's rural population is served by county-level hospitals. Unfortunately, the quality of cataract surgery performed at most of these county-level hospitals historically has been poor. In some published surveys, as many as 50% of the cataract surgeries performed in rural China resulted in blindness in the operated eye.^{7,8} In a two-site population-based study, Nathan and co-authors

demonstrated that lack of confidence in the quality of local medical care is a major barrier to having cataract surgery in rural China.⁹ Lacking proper resources, equipment and properly trained medical personnel, these rural county hospitals foster a vicious cycle of (i) poor surgical outcomes destroying patient confidence and (ii) an inability to improve quality and training because of declining patient demand and revenue.

If good cataract surgeons are not available locally, rural residents would need to travel to cities to have their cataracts removed. Unfortunately, the cost of this option is usually prohibitive. Depending on the surgical method, typical fees for cataract extraction in major cities range from 3500 to 7000 RMB (US\$512–1025, at an exchange rate of 1 : 0.147); however, the average annual income of most rural patients, in 2007, was only 4140 RMB per capita (US\$606 at an exchange rate of 1 : 0.147).¹⁰ Raising the financial barrier even higher are the additional costs for transportation, local accommodation and meals, and time lost from work by accompanying family members.

In summary, good quality cataract surgery is not generally available in China's rural villages and is not affordable for rural residents willing to travel to the cities. This conundrum is just a part of a major national health-care crisis in China. The lack of adequate public health insurance means that much of the rural population cannot afford basic health care and a 2003 national survey estimated that 30% of all poverty in China was caused by catastrophic medical problems. Without affordable solutions, cataract surgery in China will remain the privilege of the more affluent urban middle and upper classes. Considering the rapidly ageing demographics of the world's most populated country (the population over age 80 years will increase sixfold by 2040), China's future burden of cataract blindness will be staggering if a solution is not found.

AN INNOVATIVE SOLUTION

Project Vision, a Hong Kong-based non-governmental organization, was created by one of us (DSL) as a new and innovative model for surmounting blindness in rural China. Project Vision's first priority has been to establish financially sustainable, rural charity eye care centres within which local doctors are trained to provide high-quality and affordable cataract surgery.

The proposed model was first tested with a pilot programme launched in the Chaoshan region of southern China in late 2004. The Li Ka Shing Foundation in Hong Kong funded this programme, which was called 'Caring is Hip'. Initially, several county-level hospitals were selected to receive ophthalmic equipment and to become regional Charity Eye Centers. Consultant ophthalmologists from urban centres provided on-site surgical training and supervision in sutureless large incision manual cataract extraction (SLIMCE). SLIMCE is a modified extracapsular cataract extraction technique, specifically designed by one of the authors (DSL) to safely remove cataracts in developing countries in a cost-effective manner. This modified technique utilizes a large scleral tunnel incision (8 mm in cord length) for safe delivery of the large, dense nuclei

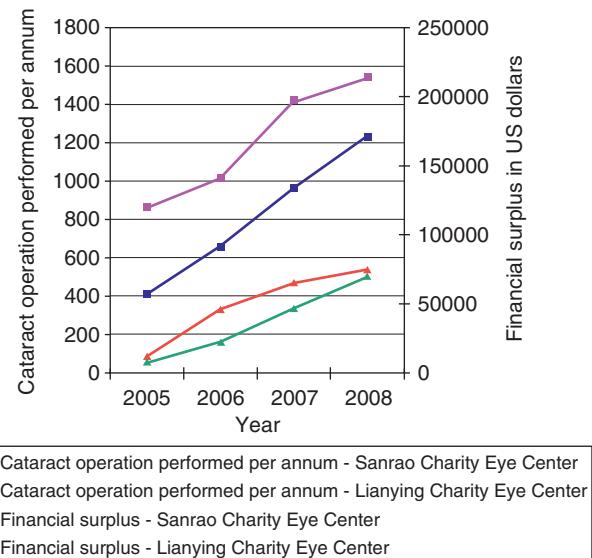


Figure 1. Annual number of cataract operations and financial surplus generated during the first 4 years (2005–2008) of Project Vision's first two charity eye centres.

typically encountered in poor populations. The frown configuration, and the 4 mm radial length and posterior location (2 mm behind the limbus) of the sclerocorneal tunnel combine to achieve an astigmatically neutral, and self-sealing incision without sutures.^{11–13} An anterior chamber (AC) maintainer is used to facilitate delivery of the nucleus.¹⁴ Additional surgical details can be found in an upcoming publication.¹⁵ The key potential advantages include lower capital and procedural costs and possibly, a shorter learning curve compared with phaco.

After 2–3 months of hands-on training, these local surgeons were able to perform cataract surgery independently with encouraging outcomes. In our first report on this project, 95% of patients achieved a best-corrected postoperative visual acuity of 6/18 or better following SLIMCE by newly trained surgeons at Sanrao, the first centre in our model programme.¹⁶ The rates of operative complications and postoperative blindness were significantly lower for patients treated by surgeons trained in these Charity Eye Centers, compared with those operated on by other local eye surgeons.¹⁷ As this favourable difference in outcomes became recognized by residents in the catchment area, the number of patients receiving cataract surgery in our charity centres steadily increased. In their fourth year of operation, the two pioneering centres at Sanrao and Lianying performed 1539 and 1231 cataract operations, respectively. In 2008, they had each generated a financial surplus amounting to US\$74 647 and US\$70 237, respectively (Fig. 1).

The 'Caring is Hip' pilot programme achieved its ambitious goals of surgical skills transfer to local eye surgeons, quality assurance and financial sustainability. Encouraged by the success of this pilot project, DSL established the Project Vision Foundation in Hong Kong in 2006. The initial goal was to raise US\$13 million to establish 100

Charity Eye Centers in rural China by 2015. This initiative has the full support of the Central Government of China. Professor Han Qide, Vice Chairman of National People's Congress, and Mr Gao Qiang, Minister of Health (2003–2008), serve as the Honorable President and Honorable Advisor of the Project Vision Foundation, respectively. To date, including the six centres launched under 'Caring is Hip', a total of 14 Charity Eye Centers have been established in four Chinese provinces – Inner Mongolia, Shaanxi, Guangdong and Hainan. More than 15 000 sight-restoring cataract operations have been performed under this system.

To overcome the barriers of availability and affordability, Project Vision collaborates with local government and selected county hospitals that have been unable to provide quality cataract surgery. In return for a significant, one-time capital contribution for equipment, the county-level hospitals agree to provide basic facilities and staff support for a regional Charity Eye Center. Carefully selected local doctors are then trained to perform SLIMCE using a structured teaching programme. Recognizing the charitable mission of Project Vision, the county hospitals also commit to making cataract surgery affordable by considerably discounting the fee. He *et al.* determined that 80% of rural Chinese residents are willing to pay something for sight restoring surgery,¹⁸ whereas Xu *et al.* concluded that reducing the cost of cataract surgery should lead to a significant increase in CSR in rural China.¹⁹

Project Vision provides cataract surgery at a charge of only 700 RMB (approximately US\$100), which is one-tenth to one-fifth of the fee typically charged at urban hospitals. One study of patients in southern (Yangjiang) and northern (Handan) China suggests that a significant number of patients were willing to spend the equivalent of 1–2 months' salary to have cataract surgery.⁹ Based on an average per capita annual income of reportedly 4 140 RMB (approximately US\$607) in China's rural population, Project Vision's cataract surgery pricing is well within the affordable range.

SUSTAINABILITY AS THE KEY TO SUCCESS

A critical long-term goal of Project Vision's charity eye centres is to provide needed high volume services within a health-care delivery system that is financially sustainable. International volunteer surgeons and philanthropy can generate one-time results in terms of reducing regional cataract blindness. Long-term sustainable eye care, however, requires the creation of financially self-supporting, regional eye centres that are staffed by local physicians and are easily accessible to the rural population.

Project Vision's Charity Eye Centers have achieved excellent clinical outcomes by standardizing protocols for performing cataract surgery and for training surgeons. The satisfaction and pride arising from impressive clinical outcomes has empowered and motivated Project Vision physicians to stay with these Charity Eye Centers following their training. Well over half of all Project Vision patients gave their surgeons the ultimate compliment by electing surgery on their second eye.¹⁷ Despite providing cataract

surgery at heavily discounted fees, each of Project Vision's Charity Eye Centers has been profitable thanks to a number of factors. These include reducing the disposable per case costs through bulk purchasing, reducing administrative overhead through centralized management and standardization, and favourable tax treatment for charity services. Financial surpluses are re-invested into each Charity Eye Center to provide additional equipment and physician training for expanding and improving comprehensive eye care.

CONCLUSION

As the Nobel Peace Prize Laureate Muhammad Yunus has rightfully stated, 'It's time to put affordable health care for the poor within reach.' Project Vision has successfully demonstrated a practical and sustainable model for reducing the growing backlog of cataract blindness in China through high-quality, affordable surgery. A robust management system provides a solid foundation for success, whereas health-care teams that share this noble goal comprise the building blocks that will hopefully multiply over time.

The guiding philosophy of Project Vision is to mandate high-quality care by empowering local physicians with proper training and equipment. Cost-effective cataract surgery is achieved by using SLIMCE, following efficient, standardized protocols, and reducing overhead and supply costs through large economies of scale. Affordable surgery with quality outcomes ensures sufficient patient volume for the eye centres to be financially self-sufficient. With continuing growth in patient volume, the financial surplus from cataract surgery can be re-invested into expanding and improving comprehensive eye care at these centres. This offers the future promise of improving treatment for other sight-threatening conditions prevalent in China's rural population, such as glaucoma and diabetic retinopathy.

Because China has the world's largest population, the ageing demography of the next several decades will create enormous health-care challenges. A failure to substantially increase China's meagre CSR will result in a burden of cataract blindness of tragic proportions. Based on the initial success and feasibility of its pilot programmes, Project Vision has proposed that the Central Government of China provide an 800 million RMB (approximately US\$118 million) fund to create 800 county eye centres throughout the nation using the Project Vision model. By spending 'a dollar per person', the goal would be for these eye centres to provide affordable, high-quality cataract surgery to the 800 million rural residents in China. The Ministry of Health would be a logical choice to coordinate the management and training operations in these centres. Based on our experience, each of these eye centres, costing approximately one million RMB (US\$147 000) each to establish, should be able to perform more than 1500 sight-restoring cataract operations per year. These estimates project to an annual volume of 1.2 million total cataract surgeries delivered collectively by all 800 centres. To coin a famous Chinese slogan, this would constitute a great leap forward towards the

humanitarian and necessary goal of eliminating China's rising backlog of cataract blindness.

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