

Medical technology transfer for sustainable development: A case study of intraocular lens replacement to correct cataracts

Logan D.A. Williams^{a,b,*}

^a*Mechanical Engineering, University of Colorado, UCB 427, Boulder, CO 80309 0427, USA*

^b*Center for Science and Technology Policy Research, University of Colorado 1333 Grandview Ave,
Campus Box 488, Boulder, CO 80309 0488, USA*

Abstract

Cataracts account for almost 50% of blindness in the world (17 million people). The magnitude of this problem is stunning, and affects the sustainable economic progress of developing nations where 90% of the blind are located (and likewise 90% of the \$19 billion dollars in lost global productivity each year). The Vision 2020 program has called for eliminating cataract as a cause of avoidable blindness through intraocular lens replacement surgery (IOL surgery), a relatively cheap solution with good outcomes. This paper will: (1) give background on the scope and problems surrounding international technology transfer of IOL surgery; (2) develop the international medical technology transfer framework adapted from work by Lall and Wei; (3) compare programs in the countries of Nepal and Nigeria; (4) evaluate the success of their technology transfer of intraocular lens replacement; and (5) provide recommendations for sustainable international transfer of IOL surgery.

© 2007 Elsevier Ltd. All rights reserved.

1. Introduction

1.1. Outline

Many developing nations struggle to find sustainable solutions to their medical needs including infrastructure, human capital and technology innovation, in order to provide basic medical services. Technology transfer, or the process of moving both knowledge and goods from one institution to a second, is one potential solution. Who are the important players in this process? What makes such medical technology transfer successful?

This paper will first summarize the magnitude of cataract disease and the cultural barriers to international medical technology transfer of the identified solution, intraocular lens replacement surgery (IOL surgery). It will continue with a short discussion of the important role of non-governmental organizations, and, development of the international medical technology transfer framework. Finally, it will compare the

*Corresponding author: Present address (starting August 1, 2007): Science and Technology Studies, Rensselaer Polytechnic Institute, 110 8th St., Sage Building 5th Floor, Troy, NY 12180 3590, USA. Tel.: +1 518 276 6574; fax: +1 518 276 2659.

E-mail addresses: Logan.Williams@colorado.edu, willil8@rpi.edu (L.D.A. Williams).

countries of Nepal and Nigeria, evaluate the success of their technology transfer of IOL surgery and provide recommendations for sustainable international transfer of IOL surgery.

1.2. *Cataract disease*

1.2.1. *Cataracts, or occlusion of the lens(es), are the leading cause of blindness in the world*

Bi-lateral cataracts alone account for 47.8% (17.7 million people) out of the 37 million blind in 2002 [1,2]. With an aging population, the number of blind men and women is expected to increase annually, resulting in 76 million blind by the year 2020 [3]. This is especially a cause for concern in developing nations where 90% of the world's blind are located [4].

1.2.2. *The causes of cataract are not well known*

Clinicians have seen a high correlation to exposure to ultraviolet light, and vitamin A deficiency, and a very high association with smoking. A recent study performed in the United States shows a very high correlation to lead accumulation in older men [5]. Low weight before 1 year of age, a common condition in developing nations, may also be correlated to children having a higher risk for cataract development later in life [6]. There is no consistent correlation between size at birth and later age-related cataract [7]. This may indicate that the above-mentioned environmental conditions which impact personal eye health after birth are more important in cataract development than pre-birth conditions. However, the genetic effect of heritability has been reported as having significant correlation to nuclear and cortical cataract [8].

1.2.3. *Cataracts are one of the most easily corrected causes of blindness*

Several techniques are available including: lens removal and aphasic corrective glasses, lens removal and replacement, lens capsule draining and refill with a polymer substitute for the crystalline lens [9–15]. Extracapsular cataract extraction and posterior chamber intraocular lens implantation (ECCE & PC-IOL, referred to in this paper as IOL surgery) is fast, and relatively cheap with good long-term outcomes for visual acuity [15].

1.2.4. *The blindness epidemic negatively impacts the ability of developing nations to sustain development*

Unfortunately, without the infrastructure and support systems common in industrialized nations, the blind are unable to live fully productive lives. In fact, the care they may require from a sighted family member contributes to a reduction in the economic livelihood of their families [16]. Visually impaired people are less well socially integrated, and at higher risk for suicidal behavior [17–19]. The relatively simple outpatient surgeries described can dramatically improve the quality of life of the visually impaired [8,20].

1.3. *Vision 2020*

In 1997, the World Health Organization (WHO) Program for the Prevention of Blindness and Deafness published a document called “The Global Initiative to Eliminate Avoidable Blindness” in which they outlined the global priorities to fight blindness by targeting: cataract, trachoma, onchocerciasis, childhood blindness, refraction, and low-vision services [4]. In 1999, the WHO joined together with the International Agency for the Prevention of Blindness (IAPD) (Hyderabad, India), to create the “Vision 2020—the right to sight” program with the goal of eliminating avoidable blindness by the year 2020. Operating on approximately \$200 million USD each year, the objectives of Vision 2020 are to: (1) create awareness of the magnitude of global blindness and visual impairment, and, the fact that 75% can be cured or prevented with existing technologies and knowledge; (2) organize for more efficient mobilization and use of resources in developing eye care services; (3) implement sustainable and equitable eye care services at the regional level; and (4) prioritize locally and nationally available resources to control avoidable causes of blindness and visual impairment [1].

Vision 2020 organizes annual workshops for each country to develop individual Vision 2020 plans and national eye care service programs. The IAPB keeps track of Vision 2020 affiliated training programs under the following categories: ophthalmology, low vision/rehabilitation, community eye health, mid level ophthalmic personnel, eye care management personnel.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات