Commentary

Ophthalmic services research: towards increasing the role of economic and operations research methods in the delivery of eye care services

Given the increasing global blind and visually impaired population, a lack of effective treatments for many chronic eye diseases, as well as reduced financial resources the challenges of delivering cost effective eye care services in both developed and developing countries are not only considerable but immediate. To date, however, the delivery of eye care services has rested predominantly in the hands of highly trained ophthalmic and eye care professionals. While this 'grass roots' approach to the delivery of eye care services is vital, to be effective it must continue to foster broader multidisciplinary approaches that are both viable and sustainable. In this respect, the emerging area of ophthalmic services research may hold the key to reducing the high levels of irreversible and reversible blindness found in many parts of the world.

Broadly defined, ophthalmic services research is an integrated discipline rooted in ophthalmology, epidemiology, economic, and operations research methods and, when harnessed, its goal is the prevention and treatment of blindness on the widest possible scale. As such, ophthalmic services research attempts to use both clinical and non-clinical methods to ensure that the delivery of eye care services, be these surgical, or medical in a given region, are maximised to the fullest possible extent. Alternatively, the ophthalmic services researcher may be thought of as being a traffic controller whose duty it is to ensure that individual units of eye care resources and personnel are delivered to those who most need them and by the same token, to put those most in need in touch with the available ophthalmic resources and personnel. Thus, while the task of ophthalmic services research depends to a degree upon what is clinically feasible, it also depends to a large degree upon how existing and future eye care resources and personnel are best deployed and utilised in any given region. To better understand these aspects of ophthalmic services research, it is essential to consider both their economic and operations research elements.

Concerning the economic components of ophthalmic services research, there are three basic issues to consider. The first issue involves the sustainability of the eye care services provided. This, in turn, is governed by the productivity of the eye care service provided per unit of eye care resource and personnel spent on a given population, or region. Thus, if the returns per unit of eye care spent are zero or negative then serious concerns should be raised about the long term sustainability of that particular eye care service (for example, the cost of medical versus surgical treatment for glaucoma). Secondly, one must also be wary of differences between the marginal, or incremental, and average costs of available and possible eye care services (for example, the average cost of intracapsular cataract extraction (ICCE) with aphakic spectacle correction versus the marginal cost of ICCE with aphakic correction via anterior

chamber intraocular lens implants and the resulting postoperative gains to visual function in each case). Thirdly, there is the constant reality that the costs of eye care services are beyond the reach of those who most need them, and therefore that locally produced medical and surgical substitutes should be used whenever possible. Equally, it is recommended that effective eye care pricing policies and other innovative means be developed to ensure that existing eye care services are utilised to capacity. Lastly, even if all eye care services were delivered free of charge and ophthalmologists and others worked unpaid the problem of how best to deploy current and future ophthalmic resources and personnel would still persist. Deciding how, when and where to deploy ophthalmic resources and personnel, however, requires the use of operations research methods.

The main operations research avenues for further exploration with respect to the delivery of eye care services include: sequencing, allocation and routing algorithms, replacement analysis, queuing or waiting lists problems, and decision analysis. Sequencing involves ensuring that the delivery of eye care services occurs in as optimal a manner as possible, while deciding exactly how and when to allocate scarce ophthalmic resources and personnel relies on the use of linear and non-linear, or dynamic programming techniques which strive to ensure that an optimal flow of inputs and outputs in the delivery of eye care services is maintained. Routing algorithms, by contrast, make use of the fact that there are often multiple pathways to the same end and, as such, they attempt a priori to evaluate the effectiveness and efficiency of each of the available routes. Replacement analysis, however, attempts to determine the maximum capacity under which a given system, such as a hospital based eye department, can operate and when additions to or subtractions from a given system, be these infrastructural or personnel, are necessary in order to maintain overall operating effectiveness and efficiency. Queuing analysis is of particular importance to the delivery of eye care services in that it affords detailed investigation of ophthalmic waiting lists and surgical backlogs. Decision analysis, sometimes called game theory, may be used to simulate the effect of various eye care delivery policies before, during, and after their implementation, thereby allowing for a comprehensive range of eye care delivery scenarios to be analysed systematically and evaluated. Lastly, as an adjunct to the above mentioned operations research methods, it should also prove feasible for certain regions of developed and developing countries to be linked up to a regional, country-wide, or even globally interactive blindness prevention computer network/database. Such an interactive computer network would ideally allow for ophthalmic resources and personnel to be deployed in an up to date and hence cost effective and logistically efficient manner.

In sum, the enhanced delivery of eye care services to the world's blind and visually impaired population can only profit from a more concerted multidisciplinary approach which incorporates the fundamental economic and logistic realities that such colossal undertaking entails. Failure to adequately incorporate economic and operations research methods in the delivery of eye care services will only serve to re-enforce the widespread misconception that blindness prevention and treatment is the sole task of ophthalmic professionals. Hopefully, with any

luck, and much effort, ophthalmic services research will provide a useful bridge between existing strategic and policy gaps in the ongoing battle to preserve and restore sight.

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