The costs of screening for diabetic retinopathy at a diabetic clinic

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Journal of the Ceylon College of Physicians, 1994, **27**, 49-52

Summary

Objective: To audit the costs of a retinopathy screening programme.

Design and setting: An economic analysis of a retinopathy screening programme.

Patients: Two groups of consecutive patients, 150 patients who had been referred for laser therapy from a diabetic clinic with a formal retinopathy screening programme (Group S) and 117 consecutive referred from other hospitals and clinics at SJGH other than the diabetic clinic (Group O).

Methods: Visual acuity and retinal status determined in both groups. Cost utilty analysis was performed on outcomes of both groups and incremental cost utiity ratio calculated.

Results: The provision of a screening service added 1.16 Quality adjusted life years per patient. The incremental cost was Rs 23.78 per patient.

Conclusions: The costs of screening are justifiable as the cost utility ratio indicates that screening is an economically and financially efficient intervention.

Introduction

Diabetic retinopathy is a common cause of blindness in the United States[1] where the annual costs of retinopathy amount to US $ 75,000,000[2,3]. Early treatment with laser photocoagulation in those with good visual acuity at the time of detection of treatable retinal disease can reduce visual loss and blindness from diabetic retinopathy[4,5].

However screening for retinopathy is a neglected aspect of health care even in the developed world[6]. Diabetic retinopathy is an asymptomatic disorder. If patients are examined without dilating the pupil proliferative retinopathy is missed in 50% of examinations[7,8]. Ideally a retinal examination should be performed on all diabetic patients at least once a year[9].

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In November 1990 a diabetes retinopathy screening programme was implemented at Sri Jayawardenepura General Hospital (SJGH) diabetic clinic. The aim of the screening programme was to detect diabetic eye disease early in order to obtain maximum benefit from laser treatment.

Ideally, economic evaluation should be undertaken alongside clinical studies. Unfortunately because setting up and conducting appropriate studies is time consuming and expensive existing medical publications usually provide the main source of data on effectiveness and outcomes for economic analyses[10]. We conducted an economic evaluation of the value of a retinopathy screening programme by assessing the costs of the screening programe and utilised data on outcome from a previously reported clinical study[11].

Materials and methods

The methods of the clinical component of the audit has been previously documented[11]. We studied all patients who had received laser treatment at SJGH from November 1990 to March 1991. Patients in whom impairment of visual acuity was attributed to causes other than diabetic retinopathy (cataract, age related macular disorders etc) were not considered in the analysis. 267 patients were studied. 150 referred from a diabetic clinic with a formal retinopathy screening programme (group S) and 117 reffered from other sources (group O).

All patients attending the SJGH diabetic clinic were screened for diabetic eye disease at the first clinic visit and at 6 month intervals. Details of the diabetic clinic and screening programme have been previously described[12].

Age and duration of diabetes was recorded.

The definition of legal blindness was taken as visual acuity 6/60 or worse.

Economic analysis

Illness leads to three types of cost. Direct costs, indirect costs and intangible costs. Direct costs involve health service costs of detecting and treating disease and non health services costs such as that incurred by travel to hospitals and time spent by relatives looking after patients. Indirect costs are those costs arising as a loss of a persons labour that could be used productively. Intangible costs include the costs of diminished well being and quality of life. We assessed the direct and indirect costs associated with diabetic retinopathy.

Medical clinics (group O patients) were held for 4 hours for 150 patients. The diabetes clinic (Group S patients) was held for 2 hours for 20 patients. Both diabetes and medical clinic had the services of 2 orderlies, 1 clerk, 2 senior house officers [SHO] and 1 specialist physician. In addition the medical clinic had the services of 2 house officers [HO]. The diabetes clinic being nurse centred had 2 nurses working in it compared to the medical clinic which has only one.

Both groups of patients were given a self administered questionnaire which comprised questions on time, distance and money spent on travel to the clinic, loss of wages or leave for the patient and the accompanying person and expenses for food. Lost wages and/or leave were calculated according to the monthly income.

Health service costs include staff services and drugs[13]. Capital equipment which were unique to the medical clinic has little or no alternative use value [opportunity cost]. If oppurtunity costs have no alternate use it is not considered in costing and is referred to as sunk cost[14]. Costs borne by patients and their families were assessed by means of a questionnaire. A study of cost effectiveness of laser therapy in the UK showed a 73% reduction in blindness due to diabetic retinopathy by early delivery of laser therapy[15].

In measuring the value of a modality of treatment when compared to its costs and comparing an intervention to non intervention (or another form of treatment) it is useful to derive a ratio of extra costs required to achieve one extra unit of outcome. The commonly used units are utility and effectiveness. Cost utility analysis requires that a weight be attached to each health state and the product of life expectancy and utility is called a Quality adjusted life year (QUALY)[16,17]. As no studies are avaiable for the effect of laser treatment on mortality of diabetic patients in Sri Lanka we assigned equal life expectancy to each group.

Corrected visual acuity using a Snellen's chart was converted to a decimal scale where the extremes were perception of light / hand movements = 0, Visual acuity 6/60 = 0.1 and visual acuity 6/6 = 1.

Incremental [marginal] cost utility ratio was defined as the cost of screening / utility — cost of non screening / utility.[17]

Statistical analysis was by chi squared test.

Components of the questionnaire was analysed into arithmetic mean and standard deviation [SD]. 95% confidence interval [CI] was calculated using the t distribution.

Results

All patients in Group O denied having had a previous routine biannual retinal examination 'after having drops in their eyes' as part of their diabetes care by physicians. 37 had been examined at eye clinics 'after instillation of eye drops' when they developed impaired vision. 106 patients in Group O had been referred for laser treatment after they complained of impaired vision. 31 patients in group S had noticed impaired vision at the time of referral to the eye clinic but 26 did not volunteer symptoms to the doctor.

The results of the clinical component of the audit have been previously documented[11] and are summarised in Table 1.

Table 1. Characteristics of the two patient groups

	Screening (Group S)	*Other refferals (Group O)*
Age (years)	51 SD 8.1	60 SD 5.3
Duration of diabetes (years)	7.5 SD 3.2	11.3 SD 4.1
Visual acuity (decimal scale)	0.58 SD 0.15*	0.35 SD 1.13
Visual acuity better than 6/36 number (%)	81 (54%)*	37 (31.6)
Visual acuity worse than 6/60 number (%)	30 (20)*	40 (43.5)

Results expressed as mean and SD unless otherwise stated
* $p < 0.01$

The economic indices for calculating health service costs borne by the hospital and costs borne by patients is shown in tables 2,3 and 4.

Table 2. Economic indices in screened and non screened groups

	Screening (Group S)	*Other refferals (Group O)*
Time spent on travelling(Minutes)	64.5 SD 49.02 [50.56-78.46]	64.5 SD 49.02 [50.56-78.46]
Distance from home to clinic (Km)	10.1 SD 9.16 [6.79-13.42]	10.1 SD 9.16 [6.79-13.42]
Travel expenses (Rs)	41.9 SD 23.12 [21.12-62.78]	41.9 SD 23.12 [21.12-62.78]
Other expenses (Rs)	33.42 [16.28-50.56]	33.42 [16.28-50.56]

Results are expresed as mean and standard deviation (SD) with 95% confidence intervals in parentheses.

Table 3. Health service costs

	Screening (Group S)	*Other refferals (Group O)*
Staff wages	Rs 10.33	Rs 5.32
Cost of mydriatic	Rs 2.67	Rs 0.00
Capital equipment costs [sunk costs]	Rs 0.00	Rs 0.00
Health service costs [direct costs]	Rs 13.00	Rs 5.32

Costing of the staff time was based on the overtime payment and cosolidated salary.

They were successively valued as;

Orderly	Rs 10.40/hour
Clerk	Rs 12.25/hour
Nurse	Rs 17.00/hour
HO	Rs 30.00/hour
SHO	Rs 40.00/hour
Specialist	Rs 60.00/hour

Table 4. Patients costs

	(Group S)	*(Group O)*
Travelling time	Rs 16.10	Rs 16.10
Travelling expense	Rs 41.90	Rs 41.90
Other expenses	Rs 33.42	Rs 33.42
Costs borne by patients [direct and indirect costs]	91.42	91.42
* Total Costs	Rs 120.52	Rs 96.74

Total Costs = Health services costs + patients costs

The incremental cost utility ratio for the screening vs non screening was Rs 6.46 per QUALY. (Table 5) The additional cost of screening one patient was Rs 23.78. For a clinic serving 2000 diabetic patients the additional cost of setting up a retinopathy screening programme would be Rs 47,600 per year and would result in an additional 2320 QUALY'S gained.

Table 5. Cost utility analysis

	Direct Costs	*Effectiveness (life expectancy)*	*Utilty**	*QUALY*
Group S	120.52	5 year	0.58	2.9
Group O	96.74	5 year	0.35	1.75

Incremental Quality adjusted life years / patient = 2.9 - 1.75 = 1.16 QUALYS / patient

Incremental cost per patient = 120.52 - 96.74 = Rs 23.78

Incremental cost utility ratio = $\frac{120.52 - 96.74}{2.9 - 1.74}$

= 6.46 Rs per QUALY gained

Total incremental costs per year (For 2000 patients) = 2000 × 23.8 = Rs 47,600 / year

Total incremental Quality adjusted life years gained over one year for 2000 patients = 2000 × 1.16 = 2320 QUALY

* Utilty = Mean visual acuity on the decimal scale

Discussion

Diabetic retinopathy is the major cause of blindness in adult life[19]. Early detection by screening for retinopathy and appropriate intervention may prevent or minimise visual handicap[4,5,12]. Optimal results may be obtained with photocoagulation where the vision was good at time of laser therapy and not significant if visual acuity was 6/36 or worse[19,5]. A cost effective evaluation of photocoagulation services using different populations has shown that it is cheaper to detect and treat retinopathy than to care for a blind or visually handicapped person for one year[20]. Our study shows similar results. Although the patients in group O were older and had a longer duration of diabetes their visual handicap was due to retinal disease and not age related disorders. The screening programme detected diabetic retinopathy at an earlier stage while most of the referrals from other centres were refered too late when they were legally blind and less likely to benefit significantly from laser treatment[11]. The aim of screening is to detect asymptomatic disesase. The patients in group O were examined in most instances when they had symptoms and too late in the course of the disease.

In the USA the National Diabetes Advisory Board has recommendeed that all patients with diabetes should be screened by an ophthalmologist. However in Sri Lanka

ophthalmic services are not freely available. Hence other strategies to make optimal use of available resources will have to be adopted. These include emphasis on training in ophthalmoscopy in postgraduate medical training of physicians. With such training higher detection rates have been achieved by non ophthalmologists[21,22,23].

It is well known that screening for diabetic retinopathy is a cost effective exercise[15] which can prevent 10% of all new cases of blindness in the UK[15] and may prevent blindness in 2-4% of diabetic patients per year in Sri Lanka[23]. We have previously shown that non ophthalmologists can conduct successful screening programmes of proven validity[11,12]. We have shown in this study that screening by non ophthalmologists can lead to improved quality of life in diabetic patients and that the additional expenditure incurred is money well spent.

However several limitations exist in the study method and these must be taken into account. The life expectancy of Sri Lankan patients with retinopathy is unknown. We have calculated the value for an arbitrary period and many patients do survive longer.

We have also made an assumption that PGIM trainees in medicine are adequately trained in opthalmoscopy and are qualified 'screeners'. Hence the cost of training a physician has not been considered because a general physician is expected to perform retinal screening.

The cost utility ratio is useful in comparing the value of different health care interventions in countries with a limited health care budget like Sri Lanka. The total cost of Rs 47,000 per year to improve qualty of life among 2000 diabetic patients may fall within the reach of an impoverished health care system. Prevention of blindness alone should qualify a retnopathy screening programme to obtain a place in priority lists for funding. The results of this study show that there are sound economic reasons to support its inclusion as a feasible low cost high output programme. We recommend therefore that routine retinal screening programmes for diabetic patients be implemented at all medical and diabetic clinics in Sri Lanka.

Acknowledgements

We are grateful to the accountant and internal auditor of the Sri Jayawardenepura General Hospital for supplying the data on staff and capital costs.

The financial audit has been presented as a dissertation for the special degree in public administration by HGM Chandrika and was published as an abstract at the Sri Lanka Medical Association annual sessions 1994.

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