EXTENDED REPORT

The rising cost of glaucoma drugs in Ireland 1996–2003

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Background: Glaucoma affects approximately 2% of the population in developed countries and is estimated to affect 67 million people worldwide. The authors investigated the effect of the introduction of new medications on the volume and cost of drugs for glaucoma in two countries, Northern Ireland (NI, population approximately 1.7 million) and the Republic of Ireland (ROI, population approximately 3.9 million) in the 8 years from 1996 to 2003. They also looked at the surgical rates for glaucoma within the same time period for the two countries.

Methods: A retrospective analysis was performed of drug costs, prescribing data, and operation rates for glaucoma in Ireland from January 1996 to December 2003. Information regarding costs and volume were obtained for each type of glaucoma drug and these were then grouped into the glaucoma treatment subsections as found in the *British National Formulary*. The drug information was obtained from the Central Services Agency in NI and IMS Health in the ROI and included both public and private prescriptions. The information on surgical rates for glaucoma was obtained from the Department of Health and Social Services in NI and the Hospital In-patient Enquiry (HIPE) data national files in the ROI.

Results: There was a 30% increase in prescription items for glaucoma in NI and a 59% increase in the ROI from 1996 to 2003. The costs increased more rapidly than the number of items: 227% in the ROI and 78% in NI from January 1996 to December 2003. In the ROI, there was an average 19% year on year increase in costs. In NI, new drugs accounted for 40% of the quantity of prescription items for glaucoma and 63% of the market cost in 2003. In the ROI new drugs accounted for 57% of the quantity and 77% of the market cost for glaucoma in 2003; prostaglandin analogue drugs alone accounted for 53% of the cost. The number of trabeculectomies performed decreased by more than 60% in both countries.

Conclusion: Volume and cost of glaucoma drugs increased dramatically in both NI and the ROI from 1996 to 2003, probably the result of a combination of changing demographics and a changing approach towards the management of patients with glaucoma and ocular hypertension. In 2003 in the ROI, prostaglandin analogues were the most commonly prescribed class of drug for patients with glaucoma and/or ocular hypertension causing a profound rise in drug expenditure.

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Glaucoma is estimated to affect approximately 67 million people worldwide.¹ Primary open angle glaucoma (POAG), the most common form of glaucoma in the developed world, has an estimated prevalence of between 1% and 2% of the adult population in developed countries, with increasing prevalence in the elderly.^{2–4} POAG requires lifelong treatment and follow up, placing an increasing financial strain on the health service as the elderly population increases. Ocular hypertension (OHT) is estimated to affect 7–13% of the general population.⁵ The Ocular Hypertension Treatment Study (OHTS) showed that the cumulative probability of developing POAG from OHT was 4.4% in those treated with glaucoma medication compared to 9.5% in the observation group.⁷

Recent large scale, prospective, randomised, multicentre trials have provided evidence that lowering the intraocular pressure in glaucoma can arrest the progression of blindness.^{8,9} Glaucoma is most commonly treated with topical medication and surgery is usually performed if the medication fails to lower the intraocular pressure adequately. Glaucoma drugs are commonly divided into six main groups: prostaglandin analogues, β blockers, miotics, sympathomimetics, carbonic anhydrase inhibitors (CAI), and combination drugs. For more than 20 years topical β blockers have dominated the market, overtaking the older miotics and sympathomimetics in volume of sales. However, in the past decade a number of new drugs have been introduced, which have had a profound effect on the management of the disease.

Bateman *et al* reported the impact of new medication on the prescribing rates for glaucoma in Scotland from 1994 to 1999.¹⁰ They reported a large increase in the use of new glaucoma products (dorzolamide, latanoprost, and brimonidine) with a 61.5% increase in cost during the study period. In 1999 they found that new drugs accounted for more than half of the total glaucoma drug expenditure.¹⁰

Further significant changes have occurred since 1999 with the introduction of two new prostaglandin analogues (travoprost and bimatoprost), a combination drug (xalacom), consisting of a prostaglandin and a β blocker, and a new topical CAI (brinzolamide). In addition, latanoprost, the first prostaglandin analogue introduced, and travoprost have been licensed for first line use in glaucoma.

Walland found dramatic increases in the total number of prescriptions and costs for glaucoma medication in Australia from 1994 to 2003, with a corresponding decrease in the number of surgical procedures performed for glaucoma.¹¹ He found that in 2003 prostaglandins accounted for 49% of the total prescribing for glaucoma in Australia.

According to the 2005 edition of the *British National Formulary*, prostaglandin analogues are approximately three times the net price of β blockers and therefore any change in prescribing to these newer drugs will have a significant effect

Abbreviations: CAI, carbonic anhydrase inhibitors; HIPE, Hospital In-patient Enquiry; NI, Northern Ireland; OHT, ocular hypertension; OHTS, Ocular Hypertension Treatment Study; POAG, primary open angle glaucoma; ROI, Republic of Ireland

on overall costs. Future screening to increase detection of patients with glaucoma will further escalate drug costs. We examined the volume and cost of drugs for glaucoma in two countries, Northern Ireland (NI) and the Republic of Ireland (ROI) in the 8 years from 1996 to 2003. We also looked at the surgical rates for glaucoma within the same time period for the two countries.

METHODS

Northern Ireland's healthcare system is the National Health Service, which is the same as the rest of the United Kingdom. The public healthcare system in the Republic of Ireland is the General Medical Service, while approximately 40% of the population have private health insurance. The population of NI is approximately 1.7 million and in the ROI approximately 3.9 million.

The Central Services Agency collects data on prescriptions written by general practitioners and dispensed by pharmacists in NI. IMS Health, a global source for pharmaceutical market intelligence, collects data from the wholesalers who sell the medications to the pharmacists in the ROI. Neither system has information on drugs dispensed by hospital pharmacies but both systems provide information on public and private prescriptions. The NI drug costs recorded during the study period are net ingredient costs, which are approximately 8% cheaper than the pharmacy costs, which are the drug costs recorded for the ROI. Information regarding costs and volume were obtained for each type of glaucoma drug and these were then grouped into the glaucoma treatment subsections as found in the *British National Formulary*. Since 1996 a number of drugs have been introduced and these were analysed collectively as new drugs as well as individually: three prostaglandin analogues (latanoprost, travoprost, and bimatoprost), two combination drugs (cosopt and xalacom), a α_2 agonist (brimonidine), and a topical CAI (brinzolamide).

The Department of Health and Social Services for NI routinely collect information on hospital episodes within hospitals in NI. Using the OPCS4 codes for hospital discharges, all episodes where a trabeculectomy was performed (code C60.1, which includes phacotrabeculectomy and non-penetrating trabeculectomy) were identified for the period 1996 to 2003. Similar data were collected for the ROI from the Hospital In-patient Enquiry (HIPE) data returned to the Economic and Social Research Institute.

RESULTS

There was a 30% increase in prescription items for glaucoma in NI and a 59% increase in the ROI from 1996 to 2003 (table 1).

During the 8 year period vast changes occurred in prescribing in the various glaucoma drug groups in both

Figure 1 Number of items for each group of glaucoma drugs in Northern Ireland, 1996–2003.

countries (figs 1 and 2). In NI, miotics showed a steady decline by 50% and β blockers decreased by 9%. Sympathomimetics, after an increase in prescribing in 1998 and 1999 because of the introduction of brimonidine, decreased by 45% during the study period. CAI prescribing increased by 51% as a result of the introduction of the new topical CAI, brinzolamide, and increased prescribing of dorzolamide. The prostaglandins, first introduced in 1997,

Figure 2 Number of items for each group of glaucoma drugs in Republic of Ireland, 1996–2003.

Table 1 Items and costs for glaucoma drugs prescribed in Northern Ireland and Republic of Ireland

Year	Northern Ireland		Republic of Ireland	
	Total no of items for glaucoma (000s)	Total costs for glaucoma drugs (£000s)	Total no of items for glaucoma (000s)	Total costs for glaucoma drugs (€000s)
1996	134.2	713.6	271.5	1879
1997	142.0	807.0	291.6	2273
1998	149.6	967.4	315.5	2636
1999	156.6	1084.8	325.0	3178
2000	155.6	1033.5	343.5	3853
2001	157.6	1119.1	376.4	4635
2002	166.9	1209.6	412.5	5504
2003	174.4	1271.0	431.1	6140
Percentage increase 1996–2003	30%	78%	59%	227%

£1 = €1.43.

Figure 3 Costs for each group of glaucoma drugs in Republic of Ireland, 1996–2003.

accounted for 30% of the glaucoma drugs prescribed in 2003 and the combination drugs, relatively new to the market, accounted for 3%.

In the ROI, a similar trend existed but with a more profound reduction in miotics, sympathomimetics and β blockers by 59%, 42%, and 18%, respectively. In 2003, prostaglandins occupied 37% of the glaucoma market and combination drugs 9% in the ROI.

In both countries costs increased much more rapidly than volume of drugs. The total costs of glaucoma drugs increased by 78% in NI and 227% in the ROI from 1996 to 2003 (table 1). The expenditure on all drugs increased by 69% in NI and 157% in the ROI in the same period (information from the Central Services Agency and IMS Health). In the ROI alone, there has been an average year on year increase in costs of glaucoma drugs by 19% from 1996 to 2003 (fig 3). In 2003, prostaglandin drugs accounted for 49% of the costs of glaucoma drugs in NI and 52.6% in the ROI.

In NI in 2003, the new drugs accounted for 63% of the market cost and 40% of the quantity. In the same year in the ROI, new drugs accounted for 77% of the market costs and 57% of the quantity.

Trabeculectomy procedures decreased by 61% in NI from 1996 to 2003, whereas cataract operations increased by 43%. In the ROI, trabeculectomy procedures decreased by 64% and cataract operations increased by more than 40% from 1996 to 2003.¹²

DISCUSSION

Substantial increases in prescription items and drug costs for glaucoma occurred in both countries during the study period with the more recently introduced drugs playing the greatest part in these changes. These findings are similar to those of Bateman *et al*¹⁰ in Scotland but the increases here are more pronounced, probably in part because of the longer study period and the introduction of more new drugs within the study period.

As Bateman *et al*¹⁰ discussed, increased prescribing may be the result of more patients being treated or the prescribing of additional drugs to those already receiving glaucoma medication or a combination of both. General population increase alone would not account for the increase in drug costs. From 1991 to 2001 the population of NI increased by 6% and the over 65 year old age group increased by 12% (NI statistics website www.nisra.gov.uk). In the ROI, from 1996 to 2002 the population increased by 8% and the over 65 year old age group increased by 5.3% (Central Statistics Office website www.cso.ie/census).

The publication of the results of the Ocular Hypertension Treatment Study⁷ and the Early Manifest Glaucoma Trial

Group⁸ may have led to the commencement of drug treatment in some previously untreated patients with ocular hypertension or existing patients with glaucoma being prescribed more drugs. However, these results were published in 2002 and the volume and costs of glaucoma drugs had already shown a substantial rise by this time.

De Natale *et al*¹³ looked at the change in prescribing among 2228 patients with glaucoma or ocular hypertension in Italy from 1997 to 2002. The study found a sharp drop in the prescribing of β blockers and a marked increase in the use of prostaglandin derivatives and CAI during the study period. From 1997 to 2002 the number of patients treated increased dramatically by 98% and there was a trend towards drug addition rather than substitution. The authors suggest that this increase in volume of prescribing may indicate that the ophthalmologists' approach towards glaucoma has changed and a more aggressive attitude towards medically lowering intraocular pressure is being adopted.

In our study costs increased more rapidly than the volume of prescribing during the study period because of more expensive, new drugs being prescribed. Prostaglandin analogue prescribing soared after the introduction of latanoprost in 1997 and in the ROI this group overtook β blocker sales in 2003. The fact that the prostaglandin analogues have a safer side effect profile than β blockers and that latanoprost and travoprost have been licensed for first line use could account for these findings.

More dramatic increases in prescribing and costs occurred in the ROI than in NI. In the ROI, a larger percentage of the drugs prescribed were prostaglandin analogues and combination drugs, which represent the most expensive drugs on the glaucoma market. In the ROI, β blocker prescribing decreased twice as much as NI during the study period. This may be the result of more switching from β blocker drugs to prostaglandin or combination drugs. Unlike NI, community ophthalmologists serve a significant area of the ROI, which may result in a higher prescribing of drugs rather than surgery for glaucoma. The two countries do have different healthcare systems but within both systems medication is free to the elderly (65 years and over in NI and 70 years and over in the ROI), although this was only introduced in the ROI in July 2002. There is no evidence to suggest that there is any difference in the prevalence of glaucoma between the two countries. Prosser *et al*¹⁴ performed a study observing factors that influence GPs' decision making in prescribing new drugs. They concluded that prescribing of new drugs is not only influenced by critical appraisal but, more importantly, by the mode of exposure to pharmacological information and social influences on decision making. If these factors are also applicable to ophthalmologists, then variations in the distribution of pharmaceutical information and marketing influence may account for some of the difference in drug prescribing between the two countries.

Trabeculectomy rates have decreased despite an increase in cataract surgery. This trend of falling rates of trabeculectomy surgery has been previously reported in other countries.^{10 11 15} The costs of glaucoma surgery involve not only the costs on the day of surgery but also those caused by the increase in clinic visits, which inevitably results after surgery. Calissendorff¹⁶ found that the cost of surgery combined with the cost of treatment during the 3 years after surgery was twice that of the treatment costs for the 3 years before surgery. The fact that a third of the patients required glaucoma medication postoperatively was a large factor in the costs. Previous studies have shown that approximately 20% of patients who have undergone trabeculectomy will require glaucoma medication within 5 years of their surgery and the figure rises at 10 years and 15 years.¹⁷ This is an important factor to take into account when costing for

glaucoma surgery, particularly as the life expectancy of the population rises.

Watson *et al.*¹⁸ examined the long term efficacy of monotherapy with topical β blockers. Analysis showed that half of the eyes in patients initially treated with topical β blockers might be expected to have remained on the original medication after 5 years. The rest required either additional medication or trabeculectomy. This could help to explain an increase in the volume of prescription items noted in our study as drug addition is used to counteract decreased efficacy of β blockers. It also raises concern regarding the long term efficacy of the new drugs for glaucoma and whether these new drugs are simply delaying the need for trabeculectomy. The long term intraocular pressure lowering effect of the new drugs is still not fully determined. Continued monitoring of their efficacy and the rates of trabeculectomy surgery are required in the future to look for any such trends.

In conclusion, the volume and cost of glaucoma drugs have increased in both NI and the ROI from 1996 to 2003, probably the result of a combination of changing demographics and a changing approach towards the management of patients with glaucoma and ocular hypertension. In the ROI, a larger percentage of the drugs prescribed were prostaglandin analogues and combination drugs compared to NI, indicating the differences in glaucoma prescribing that can exist between countries.

Studies have shown that OHT is present in 7–13% of the general population and in a quarter of those over the age of 65.^{5,6} In this increasingly litigious and consumer based society ophthalmologists may feel pressurised to treat despite the fact that 90% of untreated patients in the OHTS did not progress during the 5 year follow up.⁷ As Tuulonen comments in an editorial on the rise of glaucoma drug costs, is our society able to tolerate such increases in costs for one disease?¹⁹

One of the inevitable shortcomings of this type of study is the lack of any corresponding data on clinical outcomes. One hopes that increased prescribing ultimately correlates with improved glaucoma care and that the increased cost of glaucoma prescribing is offset to some extent by the saving to the health system of the lower surgical rates for glaucoma. Better glaucoma care could also potentially reduce visual disability and blind registration secondary to glaucoma resulting in further financial savings.

At a time when justification is being sought for government expenditure in the health service, it is important to gain some measure of the cost of prescribing in glaucoma and the expenditure that is likely to occur in the future.

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