

# The accuracy of DRGs patient classification system to identify cases of visual impairment in hospital admissions: volume, mix and costs

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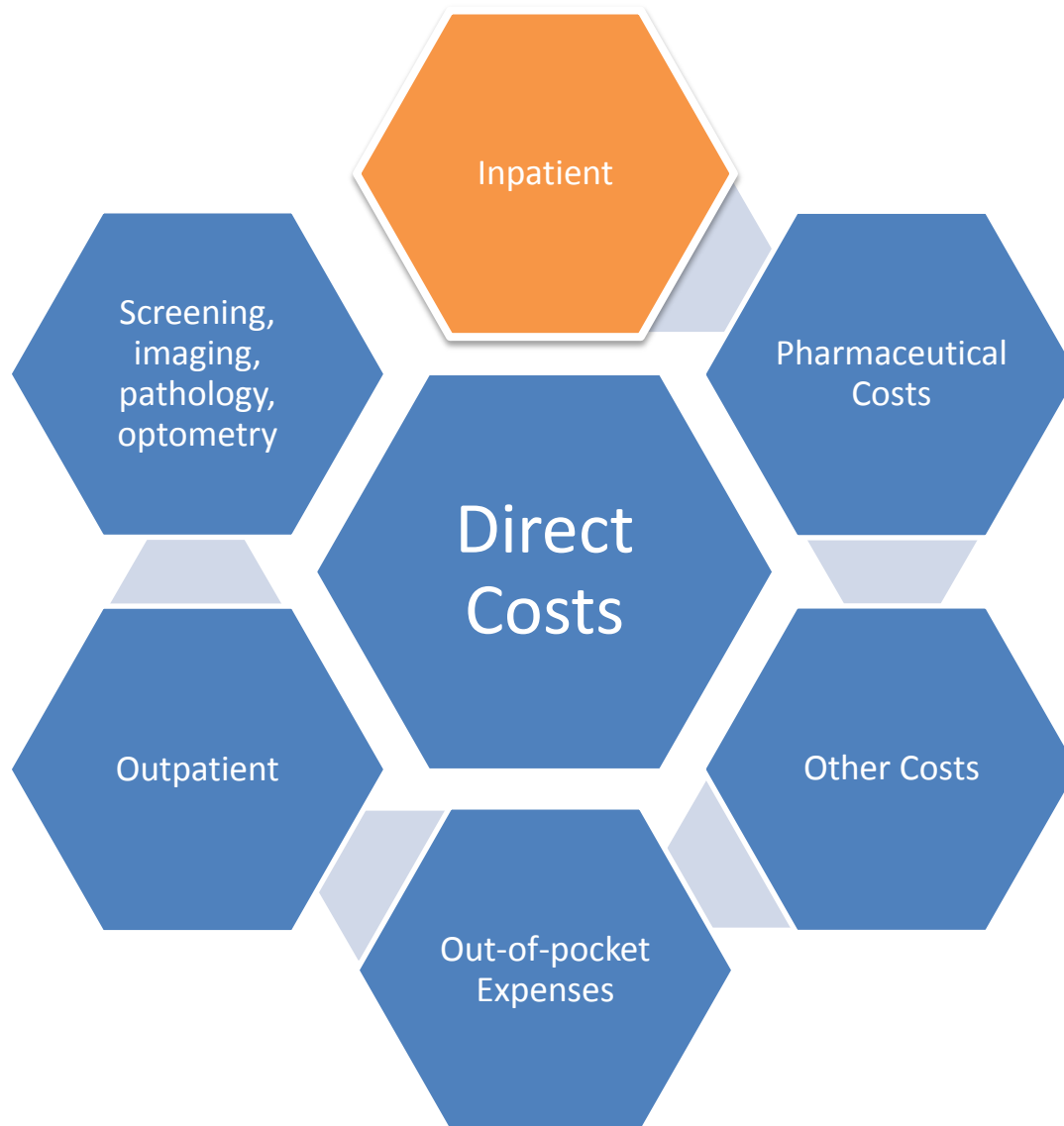
# Introduction

This study is included in a larger study financed by FCT - Fundação para a Ciência e Tecnologia which aims to estimate the number of people with vision impairment (VI) and costs of vision impairment in Portugal.

We will be conducting a multisite hospital-based study. First of all, the prevalence visual impairment in a base period of one calendar year will be estimated. Secondly, costs associated with medical expenses, as well as other financial and nonfinancial costs (i.e. productivity losses, loss of well-being, etc) due to the condition will be calculated.

In this stage we calculated the volume, mix and cost of hospitalization attributable to people with or at risk of VI in Portugal.

# Introduction



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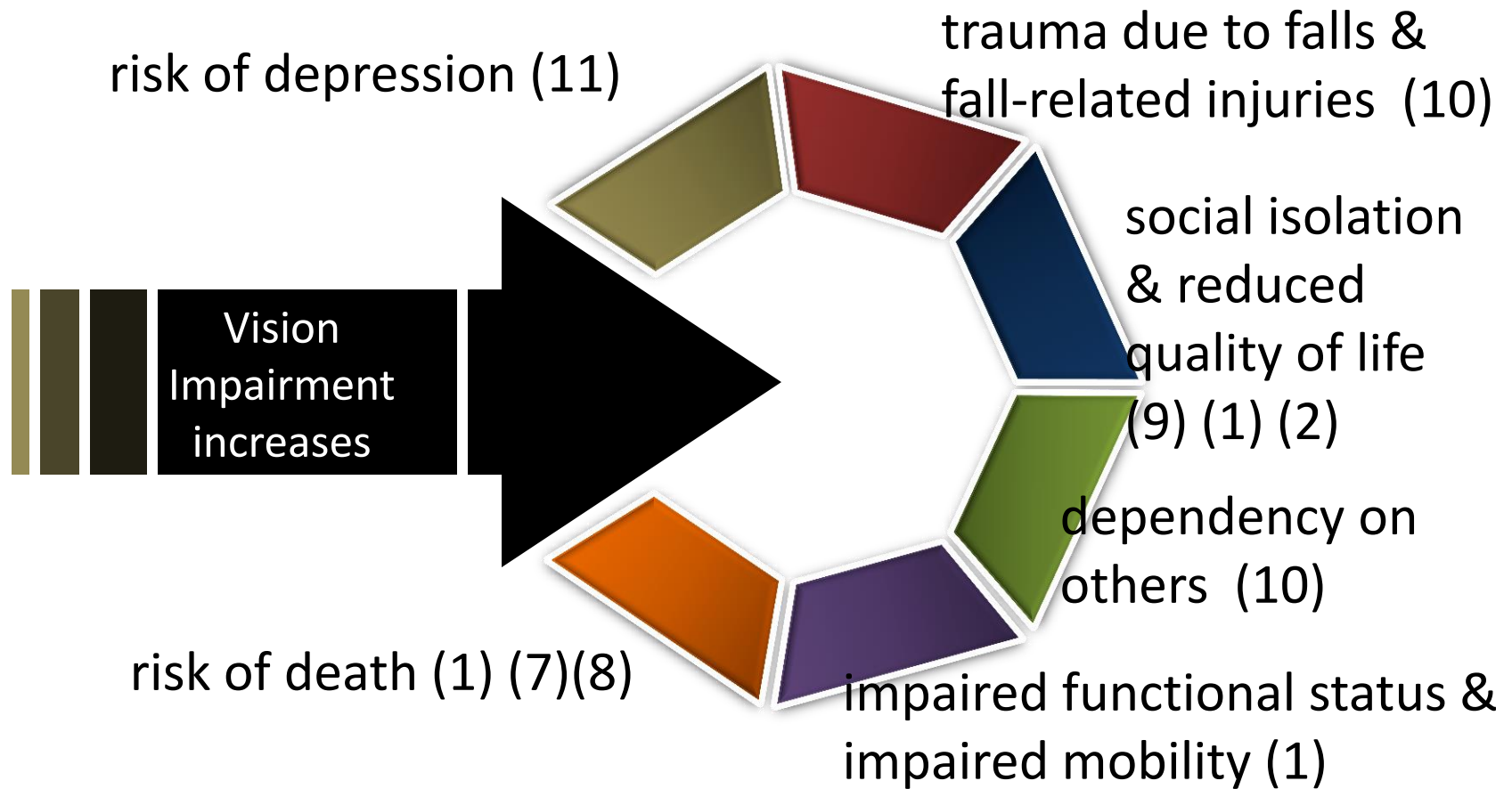


# Introduction

Vision impairment is a major public health problem causing a substantial human and economic toll on individuals and society including significant suffering, disability, loss of productivity, and diminished quality of life for millions of people (1)(2)(3)(4)(5);

Lopez et al (6) calculated that vision-related disability-adjusted life-years (DALYs) rank sixth just below HIV/AIDS.

# Introduction



# Introduction

The International statistical classification of diseases, injuries and causes of death, 10th revision (ICD-10) defines visual impairment as:

- i) visual acuity of less than 6/18, but equal to or better than 3/60, or a corresponding visual field loss to less than 20 degrees in the better eye with best possible correction (ICD-10 visual impairment categories 1 and 2);
  
- ii) blindness is defined as visual acuity of less than 3/60, or a corresponding visual field loss to less than 10 degrees in the better eye with best possible correction;



# Introduction

Visual impairment refers to a functional limitation of the eye (e.g., limited visual acuity or visual field).

- Visual Impairment as 3 severity levels:
  - Mild
  - Moderate
  - Severe
- Can also be categorized as:
  - Monocular
  - Binocular
- The major causes of VI are:
  - AMD – Age-related Macular Disease
  - Cataracts
  - Diabetic Retinopathy
  - Glaucoma
  - Uncorrected Refractive Errors

# Introduction



As the number of people with vision impairment is expected to increase with the aging population, accurate information on visual health and eye care utilization and cost is needed to plan optimal public health care policies for this growing segment of the population.

Knowledge about the size of the problem will also help to reduce costs for individuals and governments.

## Objective

- The aim of this study was to identify the volume of hospitalizations and their costs attributable to people with or at risk of visual impairment in Portugal.

## Data/Methods

1. We identified hospital admissions and quantified the volume, mix and costs of visual impaired patients in national health system (NHS) hospitals.
2. We used data from the Portuguese NHS hospitals discharge database during the year 2011
3. Visually impairment related cases were selected according with ICD-9-CM codes included in Bunce (12)

# Data/Methods

ICD 9 Codes		Designation
360	360.2	21 Degenerative disorders of globe*
	360.4	41 e 42 Degenerated conditions of globe **
361	361.0	00 a 07 Retinal detachment with retinal defect
	361.1	10 a 19 Retinoschisis and retinal cysts
	361.2	Serous retinal detachment
	361.3	30 a 33 Retinal defects without detachment
	361.8	81 a 89 Other forms of retinal detachment
	361.9	Unspecified retinal detachment
362	362.0	02 e 06 Diabetic retinopathy ***
	362.1	15 Other backgrd. retinopathy / retinal vascular changes****
	362.2	20 a 27 Other proliferative retinopathy
	362.5	50 a 53 Degeneration of macula and posterior pole
	362.7	70 a 77 Hereditary retinal dystrophies
	362.8	83 e 84 Other retinal disorders
363	363.3	32 e 55 Chorioretinal scars
365	365.1	14 Open-angle glaucoma*****
366	366.3	34 Cataract secondary to ocular disorders*****
368	368.4	41 e 45 Visual field defects*****
	368.6	60 a 62 Night blindness
369	369.0	00 a 08 369.0 Profound impairment, both eyes
	369.1	10 a 18 369.1 Moderate or severe impairment, better eye, profound impairment lesser eye
	369.2	20 a 25 369.2 Moderate or severe impairment, both eyes
	369.3	369.3 Unqualified visual loss, both eyes
	369.4	369.4 Legal blindness, as defined in U.S.A.
	369.6	60 a 69 369.6 Profound impairment, one eye
	369.7	70 a 76 369.7 Moderate or severe impairment, one eye
	369.8	369.8 Unqualified visual loss, one eye
	369.9	369.9 Unspecified visual loss
377	377.1	10 a 16 377.1 Optic atrophy
	377.5	377.5 Disorders of optic chiasm

1.993.979 Hospital Admissions Year 2011

18.844 Hospital Admissions related to Visual impairment (0,9% of total cases)

11.706 as Principal  
Diagnosis  
(62% VI cases)

7.138 as Secondary  
Diagnosis  
(38% VI cases)

6.280 individuals

5.414 individuals

46,7 % Men  
82,7% (> 60 years old)

45,4% Men  
50,8% (> 60 years old)

## Data/Methods

4. To determine the cost of visual impaired hospitalized we separate the episodes in which the principal diagnosis were coded with selected ICD9 codes from those with secondary diagnosis. With this methodology we identified all the DRG products.
5. To estimate costs we use the price tables (cost weights) that are currently in use in the NHS hospitals as a proxy of mean costs for each DRG.
6. We have also calculated the mean cost of principal diagnosis by weighting the number of cases in each DRG and each principal diagnosis.
7. In order to determine the accuracy of cost estimation using prices per DRG we also compared average cost per diagnosis with prices per DRG.

# Results

## Major cause of hospitalization - Top ICD9CM

ICD 9 Codes	Description	Principal Diagnosis (PD)	Secondary Diagnosis (SD)	(PD) + (SD)	%	% Cum.
36252	Exudative senile macular degeneration	6.992	226	7.218	38%	38%
36202	Proliferative diabetic retinopathy	7	2.003	2.010	11%	49%
36900	Impairment level not further specified	2	1.533	1.535	8%	57%
36283	Retinal edema	614	359	973	5%	62%
36101	Recent detachment, partial, w/ single defect	801	47	848	5%	67%
36253	Cystoid macular degeneration	389	358	747	4%	71%
36250	Macular degeneration (senile), unspec.	656	70	726	4%	75%
36100	Retinal detachment w/ retinal defect, unspecified	448	83	531	3%	77%
36021	Progressive high (degenerative) myopia	255	265	520	3%	80%
36105	Recent detachment, total or subtotal	455	31	486	3%	83%
36960	Impairment level not further specified		472	472	3%	85%
36102	Recent detachment, partial, with multiple defects	322	15	337	2%	87%
36961	1 eye: total impairm. other eye: not spe	0	334	344	2%	89%
<b>Others</b>		765	1342	2.107	11%	100%

The accuracy of DRGs to identify cases of visual impairment in hospital admissions

# Results

## Major cause of hospitalization - Top DRG

DRG	Description	Principal Diagnosis (PD)	Secondary Diagnosis (SD)	(PD) + (SD)	%	% Cum.
42	Intraocular proc. excp. Retina, Iris & Lens	8.678	1884	10.562	57%	57%
36	Retinal Procedures	2.385	650	3.035	16%	74%
39	Lens Procedures W/ OR W/O Vitrectomy	343	569	912	5%	79%
14	Stroke with infarction	0	214	214	1%	80%
541	Simple pneumonia & oth respiratory disord exc bronchitis, asthma w major cc	0	148	148	1%	81%
89	Simp . pneumonia & pleurisy age >17 w CC	0	145	145	1%	82%
127	Heart failure & shock	0	106	106	1%	82%
47	Other disorders of the eye age>17 W/O CC	85	18	103	1%	83%
320	Kidney & urinary tract infections age >17 w CC	0	82	82	0%	83%
533	Other nervous system disord except TIA, seizure & headache w major CC	0	71	71	0%	83%
569	Kidney & urinary tract disorders except renal failure w major CC	0	69	69	0%	84%
46	Other disorders of the eye age>17 W CC	0	49	49	0%	84%
316	Renal failure	0	49	49	0%	84%
<b>Others</b>		213	2661	2.874	16%	100%



# Results

## Major cause of hospitalization – Cost per DRG

DRG	Description	Volume	Estimated Cost	%	% Cum.
42	Intraocular proc. excp. Retina, Iris & Lens	10.562	16.261.156,18	37%	37%
36	Retinal Procedures	3.035	10.019.486,85	23%	60%
39	Lens Procedures W/ OR W/O Vitrectomy	912	1.621.114,88	4%	64%
14	Stroke with infarction	214	401.110,20	1%	65%
541	Simple pneumonia & oth respiratory disord exc bronchitis, asthma w major cc	148	452.988,06	1%	66%
89	Simp . pneumonia & pleurisy age >17 w CC	145	258.333,72	1%	66%
127	Heart failure & shock	106	332.387,67	1%	67%
47	Other disorders of the eye age>17 W/O CC	103	83.324,32	0%	67%
320	Kidney & urinary tract infections age >17 w CC	82	123.318,69	0%	68%
533	Other nervous system disord except TIA, seizure & headache w major CC	71	222.058,57	1%	68%
569	Kidney & urinary tract disorders except renal failure w major CC	69	149.055,14	0%	68%
46	Other disorders of the eye age>17 W CC	49	64.461,52	0%	69%
316	Renal failure	49	105.545,47	0%	69%
<b>Others</b>		2.874	13.638.539,75	31%	100%

The accuracy of DRGs to identify cases of visual impairment in hospital admissions

# Results

## Major cause of hospitalization – Cost per Diagnosis

ICD 9 Codes*	Description	Volume	Estimated Cost	%	% Cum.
36252	Exudative senile macular degeneration	7.218	11.257.442,32	50%	50%
36202	Proliferative diabetic retinopathy	2.010	14.300,58	0%	51%
36900	Impairment level not further specified	1.535	3.968,19	0%	51%
36283	Retinal edema	973	1.167.920,99	5%	56%
36101	Recent detachment, partial, w/ single defect	848	2.242.368,34	10%	66%
36253	Cystoid macular degeneration	747	613.004,12	3%	69%
36250	Macular degeneration (senile), unspec.	726	1.277.046,21	6%	74%
36100	Retinal detachment w/ retinal defect, unspecified	531	1.177.224,19	5%	80%
36021	Progressive high (degenerative) myopia	520	432.950,62	2%	82%
36105	Recent detachment, total or subtotal	486	1.336.311,23	6%	87%
36102	Recent detachment, partial, with multiple defects	337	966.821,70	4%	92%
<b>Others</b>		15.931	22.313.597,84	100%	
<b>*Principal Diagnosis</b>					

The accuracy of DRGs to identify cases of visual impairment in hospital admissions

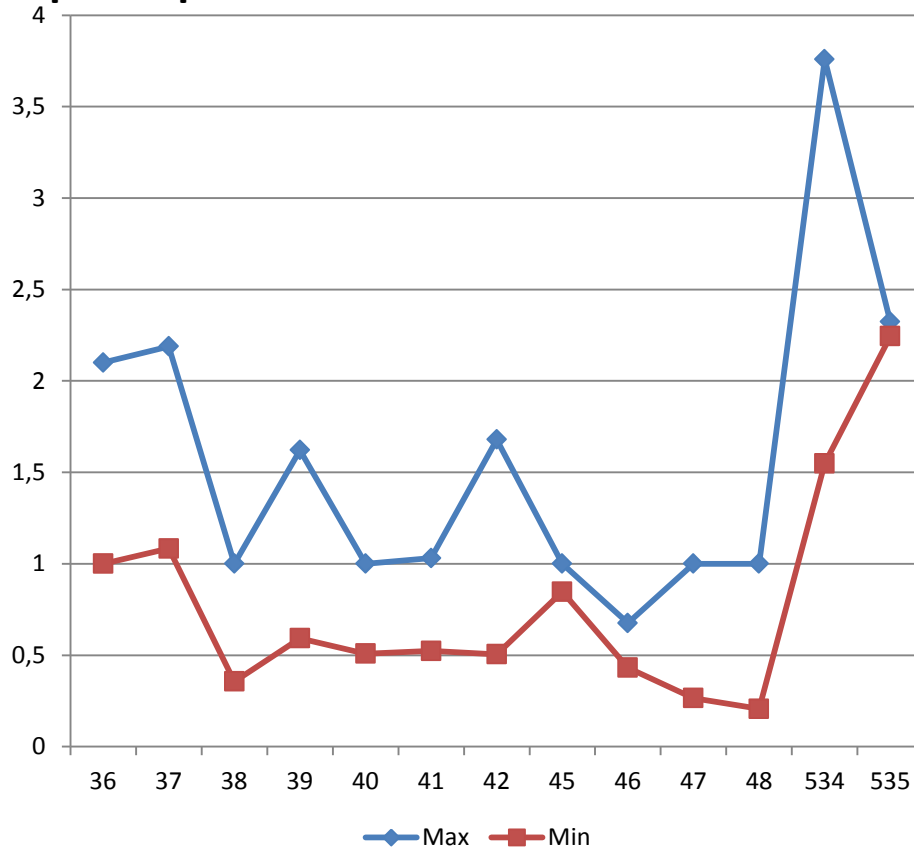
# Results

## Comparing average cost per diagnosis with prices per DRG

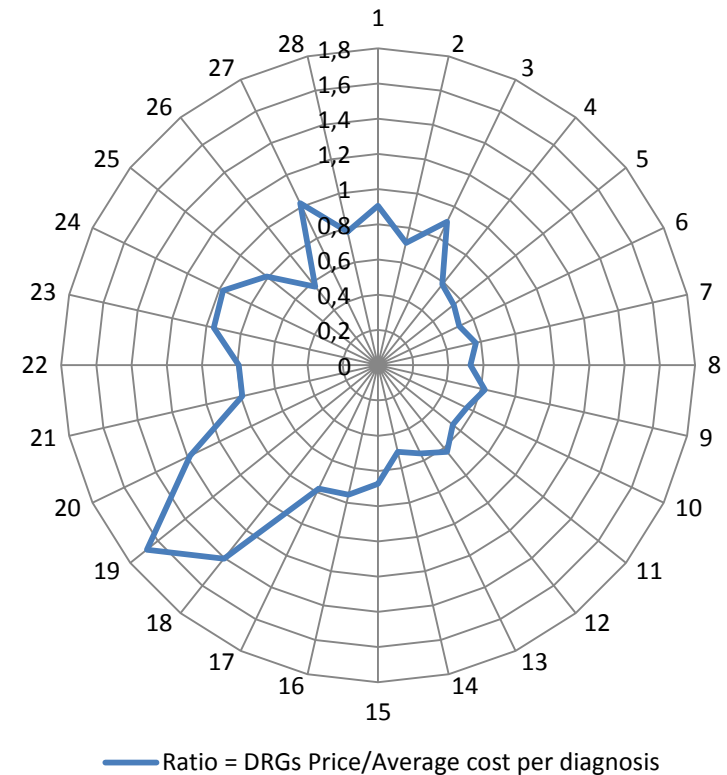
DRG	№ ICD 9 codes*	Volume (%)	Ratio = DRGs Price/Average cost per diagnosis			
			Max	Min	Average	CV
36	28	20,38%	2,100	1,000	1,441	23,92%
37	9	0,72%	2,189	1,083	1,623	22,70%
38	4	0,16%	1,000	0,357	0,632	36,95%
39	21	2,93%	1,621	0,592	0,866	30,89%
40	13	0,26%	1,000	0,508	0,760	23,12%
41	6	0,12%	1,031	0,523	0,796	23,79%
42	28	74,15%	1,679	0,505	0,780	35,38%
45	2	0,03%	1,000	0,847	0,924	8,28%
46	8	0,10%	0,676	0,432	0,528	16,24%
47	21	0,73%	1,000	0,265	0,384	41,39%
48	12	0,26%	1,000	0,206	0,557	50,85%
534	8	0,14%	3,759	1,549	2,138	35,12%
535	2	0,03%	2,323	2,244	2,284	1,73%
623	1	0,01%	1,634	1,634	1,634	0,00%
<b>*Principal Diagnosis</b>						

# Results

## Comparing average cost per diagnosis with prices per DRG



## Variability within DRG 42



The accuracy of DRGs to identify cases of visual impairment in hospital admissions

# Results

- Major findings of this study:
  - Visual impairment is directly responsible for 11.704 episodes (selected icd 9 codes as principal diagnosis);
  - For these episodes case mix index (CMI) was 0.796;
  - Episodes were divided by:
    - ambulatory care (82.7%)
    - elective admission (93.5%) and surgical (98.9%).
    - from the total, 82.7% of the subjects were 60 years old or older
    - 53.3% were female.
  - An estimate of 22.3 million euro was spent by the NHS in this type of care during the year 2011.

# Results

- Major findings of this study:
  - When we analyse visual impairment as co-morbidity we identified 6.715 episodes, mainly as elective admission (53.5%).
  - In this case CMI was 1.331. Here 69.8% of the subjects were 60 years old or older and were from these 51.3% were male.
  - Inpatient care represents 64.8% of the total costs with 60.5% of these costs attributable to surgical procedures/interventions.
  - An estimate of 21.4 million euro was spent in this type of care during the year 2011

# Discussion

- Visual impairment is a topic of growing interest worldwide.
- The aging of the general population and increasing prevalence of conditions such as diabetes, age-related macular degeneration, stroke and glaucoma, is expected to raise the number of people with visual impairment (13)
- If current age-specific VI prevalence rates were to persist, the increased longevity would lead to a rapid increase in the global number of cases of VI with huge and broad impact on our society including serious economic consequences for health care systems (14).
- Preventing visual impairment and improving quality of life amongst persons with impairment should be health priorities in order avoid additional financial costs for individuals and governments

# Discussion

- The projected prevalence together with the cost and impact of VI documented in several studies around the world confirm the need to develop and utilize treatments and technologies to safeguard the eyesight of the increasing number of people who should otherwise lose vision;
- Much can be done so much VI can be prevented or treated with cost effective interventions (15);
- Half of visual impairment cases is correctable and one quarter is preventable (2) (15);



# Conclusion

- This study shows that visual impairment is responsible for 18.419 hospital episodes (year of 2011).
- An estimate of 43.7 million euro was spent in this type of care due to this clinical condition.
- Given the variability between average cost per diagnosis and prices per DRG, we consider that to estimate hospitalization costs attributable to visual impairment would be better to rely on diagnosis rather than DRGs.

## Next Steps:

### To estimate:

- Direct Costs:
  - Outpatient Costs;
  - Other Costs:  
Pharmaceuticals,  
screening, imaging and  
other medical costs;
  - Out-of-Pocket: consists  
in all direct payments  
made by patients
- Indirect Costs including  
economic and social  
costs:
  - Productivity costs;
  - Absenteeism;
  - Other care costs: such as  
cost with informal  
caregivers
  - Dead weight losses:  
include the lost of  
taxation revenue and  
social security payments.

Thank you !

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