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# Cataract and Cognitive Impairment: A Review of the Literature

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## **ABSTRACT**

**Acquired cataract and cognitive impairment are both common age related problems, and ophthalmologists are increasingly likely to encounter patients who have both. Dementia types which display early visuo-perceptual impairment may present first to ophthalmology services. When these patients have coexisting cataract it may be difficult to distinguish visual complaints due to cataract from those due to dementia.**

**The interaction between visual impairment due to cataract, and neurodegenerative disorders affecting the central visual pathways, is not fully understood. Visual impairment due to cataract may stress impaired attentional mechanisms, and cataract extraction may improve cognitive performance in some patients with early cognitive impairment; however the benefits of cataract surgery in established dementia are less clear. Here we review the literature on this subject and consider the implications for practice.**

## **INTRODUCTION**

There are a number of areas of overlap between ophthalmology and dementia research. It has been postulated that assessing the eyes and vision could help with the diagnosis of dementia and the monitoring of dementia treatment.[1, 2] For example, glaucoma and dementia have been proposed to have a causal relationship;[3] early age related macular degeneration and cognitive function seem to be related;[4] visual field defects are recognised as a presenting feature in some dementias[5] and eye movements can distinguish between different causes of dementia.[6-8] However, the interaction between age related cataract and neurodegenerative disorders affecting the central visual pathway is a neglected research area, despite its implications for clinical practice. Many of the issues raised here in regard to the interaction or coexistence of cataract and neurodegeneration will also be relevant to other age related eye diseases.

## **METHODS**

Published literature was obtained by cross searching MEDLINE (1950 to 2008) and EMBASE (1947 to 2008). A broad search strategy with appropriate descriptors and key words was

used. Key words included: cataract, extraction, outcomes, dementia, cognitive impairment, visuo-perceptual, visuo-spatial impairment, ageing vision or a combination of those. No language or date restrictions were entered. Reference lists of identified primary reports and review articles were searched. Abstracts were carefully reviewed and discussed among the authors, and relevant papers were then considered in detail.

## **DEFINITIONS**

### **Age related Cataract**

Age related cataract refers to acquired lens opacity with ageing. The pathophysiology and classification of acquired age related cataract have been reviewed elsewhere (e.g.[9, 10])

### **Mild cognitive impairment**

Mild cognitive impairment is characterised by a decline in cognitive ability (memory, language, attention/executive function or visual perception), without significant impairment in occupational or social functioning. Patients with mild cognitive impairment have an increased risk of developing dementia.[11, 12]

### **Dementia**

Dementia is an age related clinical syndrome which involves progressive cognitive decline for at least 6 months, sufficient to interfere with social or occupational functioning. International classifications (DSM IVR and ICD-10) currently state that dementia must involve memory impairment and at least one other impaired cognitive domain e.g. language, judgement or visual perception.[13, 14] This definition relates most closely to Alzheimer's disease (AD), but will be revised in the near future as memory impairment is often not a prominent initial feature in dementia. Dementias which show early visuo-spatial impairment with less prominent memory impairment include Dementia with Lewy Bodies, Parkinson's Disease Dementia and posterior cortical atrophy.[15-17]

## **EPIDEMIOLOGY: DO CATARACT AND DEMENTIA CO-EXIST IN ELDERLY POPULATIONS?**

### **Epidemiology of cataract:**

Age related cataract is the most common cause of reversible blindness worldwide. In the UK, a study of men aged 65 to 83 years old showed that 25% had vision 6/24 or worse attributable to cataract.[18] Over 17% of Americans over 40 years have cataract.[19] The prevalence of cataract increases with advancing age, with increased numbers of severe cataracts in elderly populations.[20-22] Cataract is a frequent cause of visual impairment and blindness in elderly, institutionalised patients.[23-25] Cataract surgery is a common procedure[26] and in the UK NHS it is the 3<sup>rd</sup> most frequent main hospital intervention or procedure after childbirth and upper GI endoscopy ([www.hesonline.nhs.uk](http://www.hesonline.nhs.uk)).

### **Epidemiology of dementia:**

There are an estimated 24.3 million patients with dementia worldwide, with 4.6 million new cases every year (one every 7 seconds).[27] 6-10% of those aged over 65 in the US suffer from dementia and if mild cognitive impairment is included, the prevalence doubles.[28] Dementia prevalence increases exponentially with advancing age, with 1% of 65 year olds affected, 15% of 85 year olds, 30% of 90 year olds and upwards of 80% of 100 year olds [29-32]. Alzheimer's Disease is the most common cause of dementia, followed by Dementia with Lewy Bodies and vascular dementia.[33-35]

### **Coexistence of cataract and dementia:**

Cataract and dementia are both age related (Figure 1), and it follows that they will frequently coexist. Ophthalmology departments in the UK have more attendances for patients aged over 70 years than any other specialty ([www.hesonline.co.uk](http://www.hesonline.co.uk)). There are over 3 million ophthalmology outpatient attendances for patients over 60 years in the UK each year ([www.hesonline.co.uk](http://www.hesonline.co.uk)) of whom approximately 5% (i.e. 150,000) would be expected to have dementia.[27, 29, 32] This assumes no causative interaction between eye disease and dementia, and equal access to ophthalmology services for patients with dementia. The latter assumption is plausible for patients living in the community; however it may not apply for nursing home residents, where prevalence of dementia and visual impairment are high and access to medical care may be restricted.[23, 25, 36]

Insert figure 1 about here

## **THE RELATIONSHIP BETWEEN COGNITIVE IMPAIRMENT AND VISUAL IMPAIRMENT**

There is a strong association between cognitive test scores and visual acuity [37] with longitudinal data showing the rate of change of vision and the rate of change of cognition to be significantly correlated.[38] There are essentially three hypotheses for this association:

1. Decreased vision impairs a subject's ability to see and interpret the test material. Cognitive tests are therefore biased against visually impaired subjects and give artificially poor scores for patients with low vision. This is known as the "cognitive resource" theory.

This first hypothesis was supported by Dickinson and Rabbitt [39] who showed that simulating visual impairment with lenses impaired healthy volunteers' recall of text passages, despite being able to accurately read text at the time of presentation. The authors concluded that the additional effort required for reading under impoverished stimulus conditions consumed processing resources needed for effective memory. Kempen and Krichevesky[40] showed that subjects with uncorrected refractive error and decreased near vision did worse than controls with corrected vision on facial recognition and visual form discrimination tasks. Both studies show that visual impairment due to uncorrected refractive errors impairs cognitive performance in cognitively intact volunteers. This emphasises the importance of testing visual acuity and correcting refractive errors before cognitive testing.

2. Cognitive test scores are low in patients with poor vision because they have a true cognitive impairment. A common factor underlies both cognitive decline and visual decline. Impaired vision is therefore a marker of cognitive impairment. This is known as the "common factor" theory.

The close relationship between cognitive and visual decline has been used in itself to argue that there must be common factors underlying both.[37, 38] In further support of this second hypothesis, Lindenberger and colleagues [41] showed that simulating “old age” vision in middle aged patients did not affect their performance on a variety of cognitive tasks. “Old age vision” did not give subjects “old age cognition” suggesting that poor vision alone did not account for decreased test scores in elderly patients. Drobny et al [42] showed that patients with visual impairment did worse on both visually presented tasks and aurally presented tasks. Patients with decreased vision performed poorly on cognitive tasks which did not require vision, suggesting that their low vision was accompanied by a real cognitive impairment. These observations have led to the suggestion that a common factor (which may be normal ageing) underlies both visual and cognitive decline.

### 3. A combined mechanism.

There is still debate as to whether impaired cognitive performance in association with visual impairment is simply due to degraded stimulus representations or whether there is a common factor underlying cognitive and visual decline. The co-existence of the two problems is not proof of a common causation (although it may be suggestive). It seems probable that both mechanisms play a role.

## **IS THERE A COMMON AETIOLOGY UNDERLYING CATARACT AND DEMENTIA?**

Cataract and dementia are degenerative processes and have been proposed to share common aetiological mechanisms.[43, 44] Risk factors for cataract include advancing age, female gender, smoking and lower socioeconomic class (and associated lower educational attainment).[45-47] These are also risk factors for dementia.[48-51] Vascular risk factors contribute to both vascular dementia and Alzheimer’s Disease. They also seem to be important for the generation of cataract. Diabetes, smoking and obesity are risk factors for age related cataract [52, 53] as well as dementia.[48] Statins may be protective for dementia[48] and cataract.[54, 55] Anti-hypertensives are protective in dementia[48] and there is some association between hypertension and cataract.[52, 56, 57] The ApoE4 allele, which is known to be a genetic risk factor for Alzheimer’s Disease, is not associated with increased cataract risk.[58, 59] Given many common risk factors, dementia patients may be expected to have a higher incidence of cataract. However, a single study of self reported

previous cataract surgery found no association between cataract and cognitive impairment.[60]

### NEURODEGENERATIVE DISORDERS WITH PROMINENT VISUAL SYMPTOMS

Patients with dementia often experience visual phenomena, including visual hallucinations, visual complaints and visuo-perceptual impairments. If these symptoms appear early in the course of the disease, they may help distinguish between different causes of dementia. Many of the visual symptoms which are seen in dementia have complex terminology attributed to them. The definitions of these terms are given in table 1.

Symptom	Explanation
Visual agnosia	An inability to recognise familiar objects by sight
Proposagnosia	A specific form of visual agnosia, an inability to recognise faces
Optic ataxia	An inability to reach for objects in the visual environment
Simultanagnosia	The patient only perceives one element of a scene at a time and is unable to absorb the whole
Palinopsia	Images persist to some extent even after their corresponding stimulus has left
Oculomotor apraxia	An inability to explore a scene and to shift gaze from one area to another
Balint's syndrome	A combination of simultanagnosia, optic ataxia and oculomotor apraxia

**Table 1:** Some visual symptoms described in neurodegenerative diseases and their definitions  
Dementia with Lewy Bodies is characterised by prominent visuo-spatial impairment and persistent, well-formed visual hallucinations.[17, 34] Compared to Alzheimer's Disease, patients with Dementia with Lewy Bodies have less memory impairment, but more visuo-spatial impairment,[61-64] which helps to separate Dementia with Lewy Bodies from other causes of dementia.[16] There is an association between visual hallucinations and visuo-perceptual impairment, in that patients with more severe perceptual impairment are more likely to experience visual hallucinations.[61, 62]



Patients with idiopathic Parkinson's disease (PD) are at increased risk of developing dementia, with the 4-year prevalence being nearly 3 times higher than in non-Parkinson's subjects.[65] Parkinson's Disease Dementia shows considerable overlap with Dementia with Lewy Bodies, both having prominent visuo-spatial impairment at the onset of the disease,[61] fluctuations in visual attention and extra-pyramidal motor features .[66, 67] Visual symptoms, such as visual hallucinations, can be an indication of the progression from Parkinson's Disease to Parkinson's Disease Dementia.[68]

Posterior Cortical Atrophy is also known as visual variant Alzheimer's Disease. It affects the occipital and parietal cortex and visual symptoms are present from the onset of the disease. Patients with Posterior Cortical Atrophy often present to eye care providers with visual complaints, before the diagnosis is established.[69] Other features include simultanagnosia (the patient only perceives one element of a picture or object at a time and is unable to absorb the whole), hemispatial neglect and hemianopia. Posterior Cortical Atrophy is one of the causes of Balint's syndrome (see table 1). Unlike typical Alzheimer's Disease, day-to-day memory, language skills and affect remain relatively intact (reviewed by [15, 70])

In typical Alzheimer's Disease, perceptual and visuo-spatial abilities tend to be relatively spared at the onset of disease, compared to DLB and PDD, and memory impairment is the most prominent feature.[61, 62, 64] Visual hallucinations and visuo-spatial impairment are less common in typical early-stage Alzheimer's Dementia, and if present suggest co-morbidity (e.g. delirium) or another diagnosis.[71] There are reports of complex visual disturbances in Alzheimer's Disease,[72-74] however most of these studies were done before the Dementia with Lewy Body consensus criteria were established in 1996,[34] and the Parkinson's Disease Dementia consensus criteria in 2005.[17] It is therefore likely that some of these early studies included other causes of dementia in their Alzheimer's Disease samples or assessed advanced disease. Visual hallucinations can occur in established Alzheimer's Disease[16, 74] and may be exacerbated by ocular pathology such as cataract or other causes of age related eye disease.[75] Visual field defects have been reported in Alzheimer's Disease,[76] most frequently inferior arcuate field defects. This creates potential diagnostic confusion with normal tension glaucoma, which has been observed to be more frequent in Alzheimer's Disease patients.[77, 78]

The rare Heidenhain variant of sporadic Creutzfeldt-Jakob disease is characterised by visual symptoms predominating at presentation. These include decreased vision, blurred vision and visual distortions.[79]

## **THE EFFECT OF CATARACT SURGERY ON COGNITIVE PERFORMANCE AND NEUROPSYCHIATRIC FEATURES**

Cognitive decline and visual decline are associated and may be related, and it therefore follows that reversal of visual impairment (as in cataract surgery) may improve cognitive function or visual hallucinations.

A number of studies have tested the hypothesis that cataract surgery can improve cognitive function with varying results: these are summarised in table 2. The evidence from Gray and colleagues[80] and similar results from Ishii et al[81] support the hypothesis. However, the modest improvement (of just 2 points or less) on the MMSE score demonstrated in both studies may not be clinically significant, and may reflect a learning effect, particularly as in the Gray study participants performed better at 6 months post-operatively than 2 months post-operatively. In a small prospective study of patients with known cognitive impairment, Tamura et al[82] showed cataract surgery improved cognitive performance, however, the design of the study has been criticised.[83] Hall et al[84] showed that patients without cataract had no change in cognitive scores at one year but that patients with cataract, whether in the surgery group or control group, had improved cognitive scores at one year follow up. These results are difficult to interpret, but may represent a preferential learning effect on cognitive tests by individuals with poor vision, and do not support the hypothesis that cataract surgery in itself improves cognition. Results from Grodstein [60] and Anstey [85] demonstrate no benefit of cataract surgery on cognitive performance.

Author	Study design	Sample and control group (if any)	Cognitive Assessments	Outcome
Gray et al[80]	Prospective, observational (without control group)	92 cognitively normal patients (mean age 78.1 +/-6.5SD) undergoing either 1 <sup>st</sup> eye, 2 <sup>nd</sup> eye or sequential cataract surgery	MMSE score 2 weeks pre-operatively, and 2 and 6 months after surgery	Improvement in MMSE scores at 6 months post-op (although not 2 months post-op)
Tamura et al[82]	Prospective, observational (with control group)	20 patients (mean age 82.1 +/- 6.0SD) with cognitive impairment having cataract surgery. 20 controls (mean age 84.3, range 70-93) with cognitive impairment not having cataract surgery	Revised Hasegawa Dementia Scale (HDS-R) pre-and post-operatively	Significant improvement in surgery group post-operatively but not in control group
Ishii et al[81]	Prospective, observational (without control group)	102 cognitively normal patients (mean age 75.3+/-8.2SD) undergoing cataract surgery	MMSE score before and 2 months post cataract surgery	Significant improvement in MMSE score following surgery
Hall et al[84]	Nonrandomized control study	92 cognitively normal patients with no cataract (mean age 66.8 +/- 5.9SD), 122 patients with cataract who elected to have surgery (mean age 70.9+/-6.8SD), 87 patients (mean age 71.1+/-5.4) with cataract who declined cataract surgery	Mattis Organic Mental Syndrome Screening Examination (MOMSSE) scores at baseline and 1 year post-op	No cataract group had no change in cognitive scores at follow up. Cataract/surgery and cataract/no surgery groups had significantly better cognitive scores at follow-up
Grodstein et al[60]	Cross-sectional epidemiological study	16, 197 women in the community aged 70-79 years. 3,597 women (mean age 75.1) self reported previous cataract surgery, 12,600 (mean age 73.9) reported no previous surgery	6 cognitive tests asked over telephone (no tests of visual memory) and questioned about previous cataract surgery	No difference in the cognitive scores between 2 groups.
Anstey et al[85]	Randomised control study	56 cognitively normal patients with bilateral cataract randomised to either cataract surgery (mean age 73.4 +/-5.9SD) or waiting list control group (mean age 76.5 +/-8.45SD)	6 cognitive tests including both visually and aurally presented tasks at baseline and follow-up	No improvement in cognitive scores for either intervention or control group

**Table 2:** Does cataract surgery improve cognitive performance? Review of the literature showing evidence both for and against improved cognition following cataract surgery

Cataract surgery may also improve visual hallucinations. A study of patients with established Alzheimer's Disease experiencing visual hallucinations showed that improving vision with refraction relieved 4/6 patients of visual hallucinations.[75] Visual hallucinations were more common in patients with cataract, and the investigators hypothesised that correcting poor vision with cataract surgery might also improve visual hallucinations.

In summary, whilst we know that visual function, mood and visual quality of life improve following cataract surgery;[80, 81] there is, at present, no conclusive evidence for improvement in cognitive function or neuropsychiatric features.

### **CONSENT FOR CATARACT SURGERY IN PATIENTS WITH DEMENTIA**

Patients with established dementia may lack the capacity to consent according to the requirements for consent laid out in the Mental Capacity Act 2005. In these patients it is up to the clinician to decide whether surgery is in the patients best interests taking into account the wishes and beliefs of the patient when competent, their current wishes and general well-being. Deciding whether cataract surgery is in an individual patients best wishes is also likely to involve discussion with people close to them. Some of the legal, ethical and moral issues surrounding informed consent for cataract surgery in dementia patients have been reviewed previously.[86]

### **HOW DOES COGNITIVE DECLINE INFLUENCE OUTCOMES FROM CATARACT SURGERY?**

Post-operative visual acuities following cataract surgery decline with advancing age, [87, 88] even when recognisable ocular pathologies are taken into account. [89] Elderly patients may also have difficulty converting improved vision to improved functioning following cataract surgery.[90, 91] Other age related pathology, such as macular degeneration and glaucoma may contribute to visual impairment in elderly patients, however, there is increasing evidence that decline in cerebral function is partly responsible for age related visual deterioration.[92]

Given that cerebral changes may be partly responsible for decreasing post-operative visual acuities following cataract surgery in elderly patients, it follows that cognitively impaired elderly patients may have worse post-operative visual acuities than non-cognitively impaired patients. Patients may also have visual symptoms which are due to cognitive

impairment but which they perceive as being due to eye pathology and so expect to improve following cataract surgery.

## **SYMPTOM COMPLEXES IN CATARACT AND DEMENTIA: DO THEY OVERLAP?**

### **Visual symptoms in cataract**

Patients with cataract may experience deterioration in visual acuity, loss of contrast sensitivity, difficulty reading, recognising faces, watching television, glare and altered colour recognition. Crabtree et al[93] explored the subjective symptoms of patients aged over 65 with cataract. They excluded patients with MMSE scores less than 25. They found that the symptoms which patients complain of can be grouped into sight related mobility, recognition and perception and hand eye co-ordination. Table 2 shows some of the subjective symptoms elicited by semi-structured interviews which led to the development of the Cataract Symptom Scale.[93]

### **Visual symptoms in Dementia**

Visual symptoms may be the presenting symptom in idiopathic, dementing disease.[94-98] Visual symptoms complained of by patients with dementia include difficulty reading, visuo-spatial difficulties, blurred vision and visual hallucinations.[69, 72, 73, 97] Glare has also been reported as an early symptom in a patient presenting with Alzheimer's Disease.[69] Visual symptoms which may be present in dementia are shown in table 3, divided into the same groups as the cataract groups for ease of comparison.

<b>Visual Symptoms in Cataract</b>	<b>Visual Symptoms in Dementia</b>
<p><b>Sight related mobility</b> Getting off the pavement Going downstairs Crossing the road</p> <p><b>Recognition and perception</b> Blurred vision Reading small print and newspapers Seeing television subtitles/teletext Seeing numbers on a bus Needing a bright to read</p>	<p><b>Sight related mobility</b> Finding way in familiar surroundings Bumping into objects</p> <p><b>Recognition and perception</b> Blurred vision Recognition of objects Recognising faces Reading</p>
<p><b>Hand eye co-ordination</b> Pouring hot drinks Seeing to write</p>	<p><b>Hand eye co-ordination</b> Reaching for objects Playing golf Playing tennis</p>
<p><b>Other</b> Glare whilst driving</p>	<p><b>Other</b> Glare whilst driving Visual Field Defects Visual Hallucinations</p>

**Table 3:** Visual symptoms in cataract (from [93]) and visual symptoms reported in dementia disease (from [69, 72, 73, 97])

Symptoms reported in dementia in the elderly show a large degree of overlap with those described in children with cerebral visual impairment. [99] As in children, a structured history taken from a close friend or relative, for evidence of cognitive and visual perceptual visual dysfunction, may reveal visual difficulties which the patient is unable to describe.[100] This is particularly important in dementia patients because anosognosia (unawareness of symptoms) is not uncommon.[101]

Visual symptoms seen in cataract and dementia have a large degree of overlap (see table 3). This creates diagnostic difficulties in distinguishing which symptoms are due to cataract and which due to cognitive impairment, particularly in the elderly where most patients will have some degree of lens opacity on examination (see figure 1).

### **CAN VISUAL SYMPTOMS ASSOCIATED WITH COGNITIVE IMPAIRMENT BE CONFUSED WITH SYMPTOMS DUE TO CATARACT?**

A retrospective review of 22 patients with the Heidenhain variant of sporadic Creutzfeldt-Jakob Disease (sCJD), in which visual symptoms predominate at presentation, showed that 17 (77%) of these patients initially presented to ophthalmology services. Two patients had

their symptoms attributed to cataract and underwent cataract extraction before a diagnosis of sCJD was made.[79] sCJD is a devastatingly rapid, progressive form of dementia with decline to death typically within 6 months. Removing a cataract for symptoms due to sCJD would become rapidly apparent as an error; however, removing a cataract, or a lens with a normal degree of age related opacity, for symptoms due to a more gradual, progressive dementia would be more difficult to detect. It is likely, on statistical grounds and given the absence of routine cognitive testing prior to cataract surgery that some patients have cataract surgery for symptoms due to early forms of dementia, but the extent to which this occurs is not yet clear.

### **IMPLICATIONS FOR PRACTICE**

The symptoms of cataract and dementia overlap, and there is therefore a risk that without thorough pre-operative clinical assessment, inappropriate cataract surgery could be performed on patients with cognitive impairment. In patients with visual symptoms due to both cataract and cognitive impairment, a lack of awareness of the cognitive component of the symptomatology will lead to unrealistic expectations of the improvement in symptoms which would follow cataract surgery. Furthermore, persistent visual symptoms following cataract surgery may be incorrectly attributed to other pathology, such as cystoid macula oedema or age related macular degeneration, leading to inappropriate management. Given the large numbers of elderly patients presenting to ophthalmology services, many patients are likely to be encountered with visual symptoms and dementia. Eye care services may be more accessible to elderly patients with perceptual disturbances than old-age psychiatry services, and ophthalmic assessment may be more acceptable than cognitive assessments. This highlights the need for awareness by ophthalmologists of the potential for cognitive impairment to cause visual symptoms, and a multi-disciplinary approach in managing such patients with good lines of communication between ophthalmology, neurology and old-age psychiatry services. Figure 2 gives a model of how such a multi-disciplinary team may be accessed and what it may involve.

Insert Figure 2 about here

## SUMMARY/KEY POINTS

- Large numbers of elderly patients are seen in ophthalmology departments and ophthalmologists will encounter patients with cognitive impairment and dementia, some of whom have yet to be diagnosed.
- Visual symptoms in cataract and dementia may show considerable overlap and this may lead to diagnostic difficulty.
- Major causes of dementia with prominent visual symptoms at the outset include Dementia with Lewy Bodies, Parkinson's Disease Dementia, Posterior Cortical Atrophy and sporadic Creutzfeldt-Jakob Disease.
- Cataract surgery has been hypothesised to improve cognitive function in patients with established dementia but further evidence is needed to support this view.
- Patients with dementia and cognitive impairment may achieve poorer post-operative outcomes and need to be counselled about this prior to surgery.
- There is a need for a multidisciplinary approach for patients with visual symptoms, ophthalmic pathology and dementia

## FIGURE LEGENDS

**Figure 1:** Above, the prevalence rates of dementia from a Delphi consensus study for 3 developed areas of the world with reliable prevalence data.[26] Below, the prevalence rates of cataract in the Blue Mountain's eye study, 1<sup>st</sup> and 2<sup>nd</sup> cohorts which included 3654 and 3509 patients respectively in Australia.[19] For each cohort prevalence rates of any type of cataract (nuclear, cortical and PSC) including patients who had had previous cataract surgery are shown. Cataract was assessed from lens photographs and without regard to patient symptoms.

**Figure 2:** A proposed model for elderly patients presenting for cataract surgery. This gives advice on which patients would require further assessment by a multi-disciplinary team (MDT) including ophthalmologists, neurologists and old age psychiatrists.



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## **COMPETING INTERESTS**

None to declare

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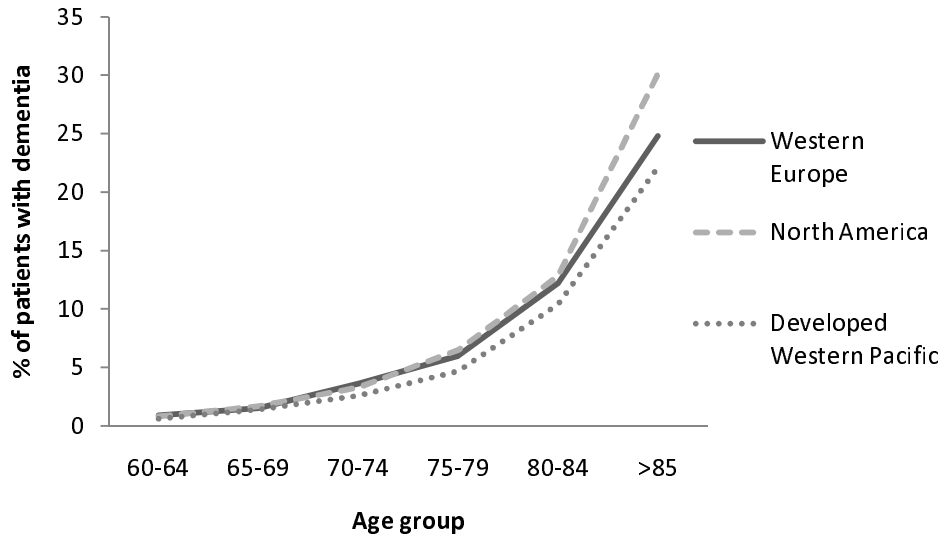
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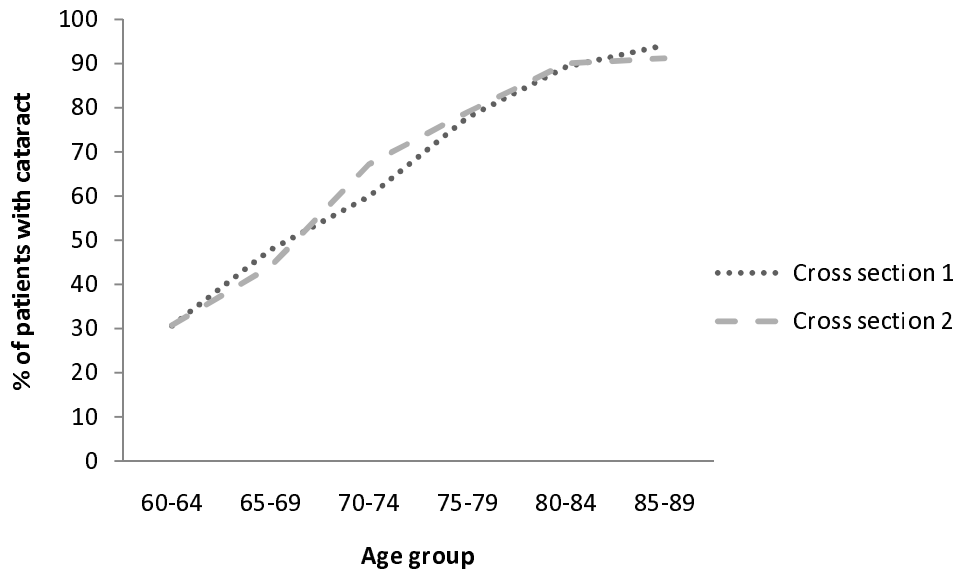
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## Dementia prevalence



## Cataract prevalence



Patient referred for cataract surgery



**Directed history taking to include features of cognitive impairment:**

- Do your eyes ever play tricks on you?
- Do you have difficulty finding your way around your home?
- Do you have difficulty reaching for objects?
- Do you have difficulty recognising faces or objects?

**Ophthalmic Examination**

No features of cataract on examination; history positive for symptoms of cognitive impairment

Clear features of cataract on examination; history negative for symptoms of cognitive impairment

Features of cataract on examination AND history positive for symptoms of cognitive impairment

Cognitive assessment with MMSE. Refer to MDT team

Proceed with cataract work-up as per usual

Cognitive assessment with MMSE. Refer to MDT team

Explain guarded prognosis of cataract surgery allowing patient to make informed choice.

**MDT assessment to include:**

- Detailed history from patient and informant
- Neurological assessment and examination
- Further ophthalmic examination including visual fields and extra-ocular movements
- Formal Cognitive examination
- Dementia clinic referral if indicated

