

# Cataract Services in the COVID-19 era: Risk, Consent and Prioritisation

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## Research Article

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# Abstract

## Background:

The COVID-19 pandemic halted non-emergency surgery across Scotland. Measures to mitigating the risks of transmitting COVID-19 are creating significant challenges to recommencement of all surgical services safely. We describe the development of a risk stratification tool to prioritise patients for cataract surgery and report the demographics and comorbidities of patients on the NHS Fife waiting list.

## Methods:

A prospective case review of electronic records was performed. A risk stratification tool was developed based on review of available literature on risk factors for poor outcome from COVID-19 infection. Scores derived from the tool were used to generate 6 risk profile groups to call in time order for surgery.

## Results:

There were 744 patients awaiting cataract surgery of which 66 (8.9%) patients were 'shielding'. One hundred and thirty-two (19.5%) patients had no systemic comorbidities, 218 (32.1%) patients had 1 relevant systemic comorbidity and 316 (46.5%) patients had 2 or more comorbidities. Five hundred and ninety patients (88.7%) did not have any ocular comorbidities.

## Conclusions:

COVID-19 has presented every department an urgent challenge to deal with the mounting cataract surgery waiting list. We present a pragmatic method of risk stratifying patients on waiting lists, blending an evidence-based objective assessment of risk and patient need combined with an element of shared decision-making. This has facilitated recommencement of our cataract service taking into account biohazard measures of the COVID-19 era.

## Introduction

Cataract is the most common cause of treatable visual impairment in elderly patients in the UK accounting for over a third of visual impairment in those over 75 years (1). Due to its recognised cost and clinical effectiveness, it is one of the most common surgical interventions performed in wealthy nations (2–5). Visual impairment and age-related cataract is known to be associated with increased mortality (6–9). In addition, visual impairment is also associated with increased risk of depression after adjusting for confounding factors (10). Improved vision reduces the risk of falls and hip fractures as well as of developing dementia (11). Improved quality of life with improved independence with less need for hospital and community care makes cataract surgery service restart a priority for NHS Scotland in the COVID-19 era (12–15)

Several studies show that COVID-19 disproportionately affects the elderly, those with multiple comorbidities (16) and people from Black, Asian and Minority Ethnic (BAME) groups. As cataract prevalence increases with age and may be accelerated by comorbidities, the demographic benefiting from cataract surgery is at high risk of poor outcome from COVID-19 infection. This poses significant practical challenges of safely restarting services and alters the balance of risk and benefit of surgery to also include the adverse outcomes of COVID-19 infection.

The Royal College of Ophthalmologists (RCO) and United Kingdom and Ireland Society of Cataract and Refractive Surgery (UKISCRS) have recently provided guidelines on recommencing cataract surgery services post-lockdown (17). Taking these into consideration, we developed and implemented a risk stratification tool and prioritisation system relevant to the new COVID-19 era. The tool takes into account individual risk of morbidity and mortality associated with COVID-19 infection and the need for surgery. This paper describes the development of this tool and practical application, reporting the demographics and comorbidities of all patients waiting for cataract surgery in NHS Fife.

## Methods

We performed a prospective review of all patients on the cataract surgery waiting list in collaboration with the NHS Fife Quality Improvement Register. Using the NHS Clinical Portal age, gender, ethnicity and systemic comorbidities (Table 1), visual acuity, degree of anisometropia and presence of other ocular disease were recorded. Patients were assigned a 'risk' score based on their likelihood of poor outcome from COVID-19 infection and a 'need' score based on level of visual acuity, degree of anisometropia, presence of only one good eye and co-existent ocular disease that might limit outcome from surgery (Table 1).

**Table 1:** 'Risk' and 'Need' Score For Cataract Surgery Prioritisation.

Characteristic	Score
<b>Risk Score (Based on systemic risk to poor COVID-19 outcome)</b>	
<b>Age</b>	
<70 years	0
70 to 79 years	5
> 80 years	10
<b>Gender (Male)</b>	1
<b>Ethnicity (BAME)</b>	1
<b>Systemic Comorbidities</b>	
Chronic respiratory disease (excluding mild asthma)	1
Chronic heart disease (excluding hypertension)	1
Chronic Kidney Disease	1
Malignancy	1
Diabetes	1
Other	1
<b>Maximum Risk score</b>	<b>18</b>
<b>Need Score (Based on need and prognosis of cataract surgery)</b>	
Vision 6/12 or worse OR anisometropia >3D	1
Lack of any of the following ocular comorbidities significantly affecting prognosis of surgery	1
Moderate to Advanced AMD	
Amblyopia	
Cornea opacification	
Retinal artery/vein occlusion	
Chronic retinal degeneration	
Central visual impairment	
Optic neuropathy	
Active uveitis	
Other maculopathy (excluding AMD)	
Only one good eye	1
<b>Maximum Need Score</b>	<b>3</b>

### Cataract Surgery Prioritisation Stages

We stratified patients on the waiting list based on a balance between their 'risk' and 'need' prioritising those with the greatest 'need' and lowest 'risk'. This led to the creation of 6 different phased stages (Figure 1). In each stage, patients with the greatest need score and lowest risk score are prioritised.

The patients were then sent a letter to explain the likely timing of their surgery. If patients wished to raise any concerns regarding their vision and need for surgery unrecognised from our review of their notes which may have developed since listing they were asked to telephone the department. A phone consultation with the operating consultant was then offered to clarify their wish to have surgery after further discussion of their individual potential risk of contracting COVID-19 during their hospital visit in accordance with the RCO's guidance.

## Statistical analysis

Median and interquartile range (IQR) were used to summarise continuous results after inspection of results using histograms. Student T-test was used to measure any differences in number of comorbidities between patients aged below and above 70. Linear regression was used to measure the relationship between age and number of systemic comorbidities. P-values of <0.05 were considered statistically significant. Data was analysed using R software (3.5.1, R Foundation for Statistical Computing, AUT, Vienna, Austria).

## Results

### Demographics

Table 2 describes the demographics of patients awaiting cataract surgery. Five hundred and ninety patients (88.7%) did not have any ocular comorbidities. Moderate to advanced age-related macular degeneration was the most common ocular comorbidity affecting 31 patients (4.7%) followed by amblyopia affecting 11 patients (1.7%) and macular pathology of any cause (excluding AMD) affecting 10 patients (1.5%).

### Comorbidities and risk score

The frequency of comorbidities recorded are listed in Table 2. One hundred and thirty-two (19.5%) patients had no comorbidities, 218 (32.1%) patients had only 1 comorbidity and 316 (46.5%) patients were identified to have 2 or more comorbidities. Figure 2A illustrates the range of risk scores in this cohort of patients. The risk score has a median of 7 (IQR 5 to 11). Of the 508 patients aged 70 and above, only 70 (11.4%) patients did not have any systemic comorbidities. With every year increase in age, the number of comorbidities increases by 0.037 ( $R^2= 0.093$ ,  $P<0.001$ ) as seen in Figure 2B. There was a significant difference in the number of systemic comorbidities between patients aged below (1.08) and above 70 (1.74) ( $P <0.001$ , CI = -0.85 to -0.48).

**Table 2:** Demographics and frequencies of ocular and systemic comorbidities. Data presented in Median (IQR) unless specified otherwise

<b>Demographics</b>	<b>Results</b>
Sex (% Females)	393 (55.4)
Ethnicity (% Whites)	628 (98.4)
Age	76 (69 to 82)
Waiting List Duration in weeks	6.8 (3.9 to 9.6)
<b>Ocular Comorbidities</b>	<b>n (%)</b>
Moderate to severe AMD	31 (4.7)
Amblyopia	11 (1.7)
Cornea opacification	6 (0.9)
Retinal artery/vein occlusion	6 (0.9)
Chronic retinal degeneration	4 (0.6)
Central visual impairment	4 (0.6)
Optic neuropathy	2 (0.3)
Active uveitis	1 (0.2)
Other maculopathy (excluding AMD)	10 (1.5)
<b>Systemic Comorbidities</b>	
Chronic heart disease	194 (28.9)
Diabetes	148 (22.1)
Chronic kidney disease	139 (20.7)
Chronic respiratory disease	66 (9.9)
Malignancy	39 (5.8)
Others	458 (68.3)

### Cataract Surgery Prioritisation stages

Table 3 illustrates the number of patients allocated to each stage of resumption outlined in Figure 1.

**Table 3:** Number of patients in each cataract surgery prioritisation stage.

<b>Stages</b>	<b>Number of patients (%)</b>
1	28 (3.8)
2	37 (5.0)
3	106 (14.2)
4	278 (37.4)
5	229 (30.8)
6	66 (8.9)

## Patient-led Recall

744 patient letters, containing basic information on prioritisation stage, surgery-related COVID-19 risk and surgical prognosis were sent. To date (5 weeks since patient letters were sent), 53 (7.1%) patients have telephoned the department requesting a discussion with their consultant regarding their allocated priority stage.

## Discussion

The coronavirus pandemic has led to significant disruption of routine cataract surgery in the UK and will continue to impact capacity in unpredictable ways for the foreseeable future. This situation requires all ophthalmic departments to develop a plan for safe surgical prioritisation. A combination of increased waiting lists due to disruption of services and reduced capacity going forward pose challenges that must be addressed to deliver services safely.

The RCO guidance on resumption of cataract surgery highlighted the need to balance quality of life, surgical risk and the risk to patients of COVID-19 infection (17). The risk stratification and patient prioritisation protocol we describe was designed with several aims; (1) quantify the risk factors that were known at the time to be predictors of poor outcomes in patients with COVID-19 infection in our patients waiting for cataract surgery, (2) categorise patients by need and from this, (3) derive an approach to cataract surgery resumption that is efficient and pragmatic (18). Available peri-operative risk prediction tools such as the Acute Physiology and Chronic Health Evaluation (APACHE II) and Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity (POSSUM) scores are dependent on physiological variables, such as heart rate, blood pressure and laboratory values, which are unavailable and not relevant in our current circumstance. In particular these scoring systems do not take into account risk factors specific to COVID-19, such as ethnicity and sex (19,20).

Many studies have shown that age is the single biggest predictor of poor outcome in COVID-19 patients with a large increase in risk in patients aged 70 and above. Docherty et al. reported that after adjusting for major comorbidities, age between 70-79 was associated with a hazard ratio of 8.51 while patients aged 80 and above were associated with a hazard ratio of 11.09, compared to patients less than 50 years, in terms of mortality (16). We felt that given age is the single biggest predictor of mortality in COVID-19, age should be given more weighting in any prioritisation score and guide discussion with patients during the consent process. Therefore, a score of 5 points for ages 70 to 80 and 10 for ages more than 80 reflects the importance of age in our risk stratification model. Studies also reported an increase in morbidity in males and in individuals of BAME background and therefore ethnicity and gender were also accounted for in our scoring system (16,21).

Identification of the most important comorbidities that are predictors of mortality in COVID-19 formed the basis of selection of comorbidities for risk stratification. At the time of development of our risk scoring system, there were several reports from China and only 2 from the UK (16,21–24). Of the comorbidities studied, chronic heart, respiratory and kidney disease, malignancy and diabetes stood out as important

risk factors and therefore were specifically recorded. The additional score of 1 per known associated risk factor was felt to be practical and importantly, recording which comorbidity was scored allows for retrospective weighting to be carried out if future evidence on COVID-19 risk highlights particularly high-risk comorbidities or demographic characteristics.

We recognise that our assessment of quality of life and visual symptoms is limited as only visual acuity, degree of anisometropia, presence of ocular comorbidities and the presence of only 1 good eye is taken into account. Although visual acuity is strongly associated with cataract severity, visual acuity measurement does not take into account glare and contrast sensitivity affecting quality of life. In addition, glare disability with cataracts does not correlate with visual acuity (25,26). However, given the volume of information needed for even a simplified prioritisation model alongside the large number of patients on the waiting list, a detailed discussion regarding specific visual symptoms and quality of life factors would significantly increase the workload associated with patient prioritisation. In our model, the patient-led recall was deemed an acceptable way for a patient to express their wish for surgery taking into account the patient's own risk of poor outcome from COVID-19 infection. The cataract surgery risk grading was not taken into consideration in the model but would be expected to aid in the planning of specific theatre lists, especially once surgical training of ophthalmic trainees also restarts.

The prioritisation plan was designed with the aim of balancing risk of mortality secondary to COVID-19 infection and potential benefits of cataract surgery. Patients with the lowest risk and most potential gain from cataract surgery were invited first. The presence of ocular comorbidities does not preclude the potential of improvement in visual acuity post-surgery. However, it is difficult to anticipate the level of expected improvement, especially without further face to face patient review. The Blue Mountains Eye five-year follow-up study reported that early age-related maculopathy at baseline adversely affected the postoperative visual acuity following cataract surgery (5). Armbrecht et al. reported that patients with no ocular comorbidities had more pronounced improvements in quality of life measures and visual function post-operatively (27). Given that age is the most important predictor of mortality in COVID-19, these patients are only invited in the later stages of the plan. It is hoped that this will provide more time for the pandemic to settle, hospital procedures to be optimised to reduce risk, and thus be safer for these patients to attend for their surgery.

We note several limitations to our stratification system and prioritisation model. As we learn more about risk factors affecting mortality associated with COVID-19, the selected comorbidities for scoring may need to be expanded and given a wider range of weightings. In our study, a significant proportion of patients were noted to have hypertension which was recorded under 'Other' but in retrospect, this could be recorded as a separate condition in future models (28). The electronic health data available for patients may be outdated by several months given the reduction in contact with the health service during the COVID-19 pandemic. The reported visual acuity in the initial referral and assessment may have deteriorated significantly while awaiting cataract surgery. The patient-led recall model is a pragmatic approach to take this into account and also allows patients to highlight the negative impact upon their activities of daily living which they would also like to be taken into consideration. Our cohort is not

diverse with only 1.6% being of BAME ethnicity. Therefore, extrapolation to more ethnically diverse populations may be limited.

In conclusion, we believe that our model provides a pragmatic approach to prioritising patients awaiting cataract surgery according to their risks and needs in an efficient manner as a result of the COVID-19 pandemic. This model we believe successfully balances the risk of mortality secondary to COVID-19, potential of visual improvement and need for improved visual outcomes. The demographic and comorbidity data shows, as we expected, that a significant proportion of patients are at an increased risk of mortality related to COVID-19 which drives the need for a change in our assessment of risks and benefits of a previously regarded low-risk intervention.

## **Abbreviations**

AMD – Age-related Macular Degeneration

APACHE II – Acute Physiology and Chronic Health Evaluation

BAME – Black, Asian and Minority Ethnic

NHS – National Health Service

POSSUM – Physiological and Operative Severity Score for the enumeration of Mortality and Morbidity

RCO – Royal College of Ophthalmologists

UKISCRS – United Kingdom and Ireland Society of Cataract and Refractive Surgery

## **Declarations**

### **Ethics Approval and Consent to Participate**

This prospective clinical audit was conducted in concordance with the NHS Fife Quality Improvement Team (Datix Registration no. 25067).

### **Consent for Publication**

Not applicable.

### **Availability of data and materials**

The datasets used during the current study are available from the corresponding author on reasonable request.

### **Competing interests**

The authors declare that they have no competing interests.

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The study was not funded.

## Authors' contributions

KC: Study conception and design, acquisition of data, analysis and interpretation of data. Manuscript drafting and revision. MA: Conception and design of study, acquisition of data, analysis and interpretation of data. Manuscript drafting and revision. SV: Study conception and acquisition of data. RM: Study conception and acquisition of data. AA: Study conception and acquisition of data. RS: Data analysis and interpretation. Manuscript drafting and revision. SS: Study conception and design. PW: Study conception and design. AB: Study conception and design, analysis and interpretation of data. Manuscript drafting and revision. All authors have read and approved the final manuscript.

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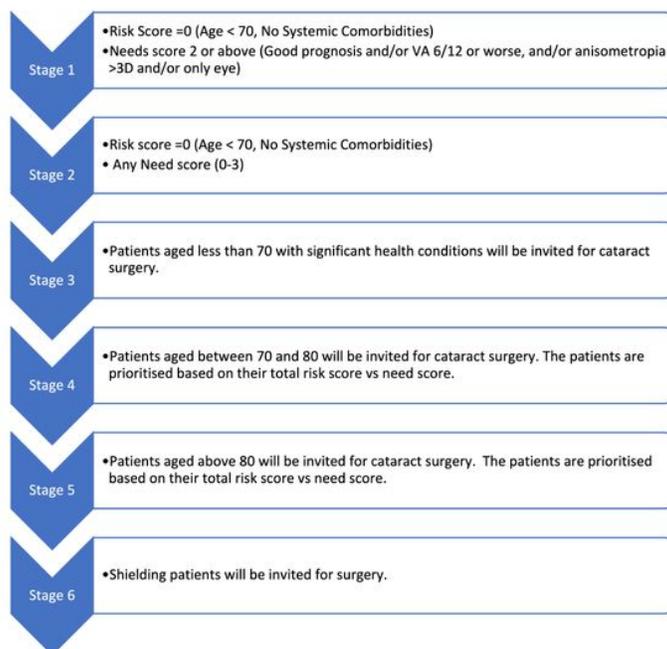
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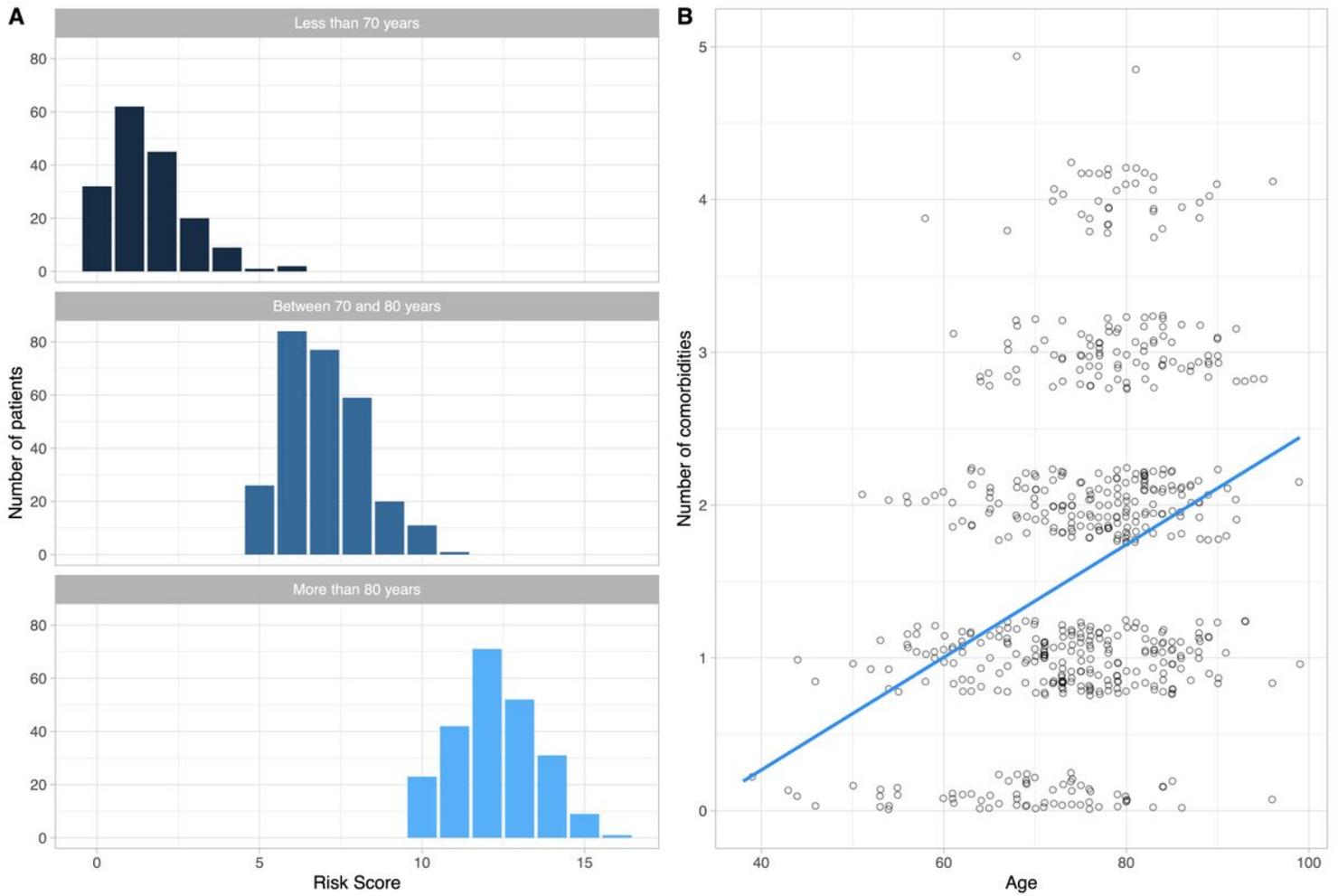
## Figures

**Figure 1: Cataract Surgery Prioritisation Stages**



**Figure 1**

Cataract Surgery Prioritisation Stages



**Figure 2**

A. Risk Score of patients in each age group, B. The number of comorbidities increased significantly with age.