Supplementary Material S1 – CARAT supporting manual

The CARAT supporting manual was sent to participants who were assigned the online CARAT or paper CARAT.

Participants assigned the paper CARAT were emailed the CARAT flowchart and supporting manual following the videoconference training session. Participants were also mailed the hardcopy paper CARAT and supporting manual.

Participants assigned the online CARAT were able to access the CARAT supporting manual via the amdcarat.info website upon logging into their account.

The CARAT supporting manual contains definitions relating to AMD and the CARAT, the Beckman Initiative Macular Disease Classification System (2013) (Ferris et al., 2013), instruction on how to use the CARAT, information on how to manually calculate a patient’s risk of progression to late AMD, and other resources (such as instructions regarding the Amsler grid test, smoking cessation counselling, dietary intake and nutritional supplementation advice, and a patient tracker to record details of patients cared for as part of the study).

The following text is the supporting manual as distributed to participants.
Classification of Age-related macular degeneration and Risk Assessment Tool (CARAT)

Instruction manual and supporting documentation
CLASSIFICATION OF AGE-RELATED MACULAR DEGENERATION AND RISK ASSESSMENT TOOL (CARAT)

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DISCLAIMER

The Classification of Age-related macular degeneration and Risk Assessment Tool (CARAT) aims to provide optometrists with information and resources to assist in providing clinical care to people with age-related macular degeneration (AMD).

The tool provides evidence-based information about the current, best practice diagnosis and management of AMD, but does not necessarily include all risk factors associated with an increased risk of developing AMD or having progressive AMD. The tool is not a formal treatment or management protocol. The suggested clinical review periods serve as a guide only and may need to be altered to the individual needs of the patient.

The CARAT does not provide a medical service; information provided is for the clinician’s use only and does not intend to diagnose, cure, treat or prevent disease. It does not aim to replace the clinical expertise provided by an optometrist when making healthcare decisions.

The tools and resources provided in the CARAT Instruction Manual and Supporting Documentation’ are for your personal use only, as a participant in this research project. All resources remain the copyright of the authors. All contents of this document should not be copied, distributed, sold, published or reproduced, in whole or in part, nor passed onto any third party, without a written license agreement with the authors.
# 1. DEFINITIONS RELEVANT TO THE CARAT

| Family history of AMD | A person with a first-degree member with AMD (e.g., mother, father, sibling, child). |
|-----------------------|----------------------------------------------------------------------------------|
| **Family history present** | No known relative with AMD |
| **Family history absent** | Second-degree family member with AMD |
| **Family history absent** | Unknown family history |

| Smoking status | A current smoker is a person who has: |
|----------------|----------------------------------------------------------------------------------|
| Current smoker | Smoked at least 1 cigarette per day OR |
|                | Smoked at least 1 cigar per week OR |
|                | Chewed at least 30 grams of tobacco accumulated for at least one month during the past year. |
|                | For the purpose of this tool, all other frequencies of tobacco use, are not consistent with a ‘current smoker’. |

| Choroidal neovascularisation (CNV) | ▪ Symptoms suggestive of macular disease (distortion, loss of central vision) and no other cause found, |
|------------------------------------|----------------------------------------------------------------------------------|
| Suspected new onset CNV^            | OR No symptoms but unexplained retinal haemorrhage involving the macula |
| Definite new onset CNV^             | OR No symptoms but OCT detected new intra retinal cysts (IRC) and subretinal fluid (SRF) |
| Signs suggestive of CNV without symptoms^ | Subretinal fluid (SRF) only on OCT without other obvious cause (e.g., not central serous choroidopathy), |
|                                   | OR Intraretinal cysts (IRC) with no other symptoms or signs and no other cause (e.g., not diabetic macular oedema) |
| Longstanding CNV | Previous diagnosed CNV and patient is under ophthalmological care (either receiving anti-VEGF injections or being managed/monitored by an ophthalmologist), |
|                   | Patient may be co-managed with an optometrist, as informed by the ophthalmologist, for spectacle/visual aid needs |

^ Definitions according to The Royal Australian and New Zealand College of Ophthalmologists (RANZCO) Referral Pathway for AMD Screening and Management by Optometrists (2018)
1. AMD CLINICAL CLASSIFICATION
(Based upon the Beckman Initiative for Macular Research Classification Committee, Ferris et al. 2013)

| AMD classification          | Definition                                                                 |
|-----------------------------|-----------------------------------------------------------------------------|
| (for lesions assessed within a two-disc diameter radius of the fovea, in either eye, in individuals aged 55 years or older) |
| No apparent ageing changes  | No drusen and no AMD pigmentary abnormalities.*                             |
| Normal ageing changes       | Only drupelets (small drusen ≤63µm) ^ and no AMD pigmentary abnormalities.  |
| Early AMD                   | Medium drusen (>63µm and ≤125µm) and no AMD pigmentary abnormalities.       |
| Intermediate AMD            | Large drusen (>125µm) and/or any AMD pigmentary abnormalities.              |
| Late AMD                    | Neovascular AMD (a) and/or geographic atrophy (b).                          |

Notes: This classification is based upon the Beckman Initiative Classification (Ferris III et al., 2013), for individuals aged 55 years or older; the potential for other hereditary macular dystrophies resembling AMD should be considered in younger individuals. 
*AMD pigmentary abnormalities are defined as any definite hyper- or hypo-pigmentary abnormalities associated with medium or large drusen but not associated with known disease entities. ^The sizing of drusen refers to the size of each druse at its smallest diameter; 125µm is approximately as wide as a major branched retinal venule crossing the optic disc margin.
### 3. GENERAL DEFINITIONS

| **AMD pigmentary abnormalities** | Any definite hyper- or hypo-pigmentary abnormalities associated with medium or large drusen but not associated with other known, non-AMD, disease entities. |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| **Anti-VEGF (Vascular endothelial growth factor) therapy (in AMD)** | Intravitreal injection of a pharmacological agent that inhibits the physiological action of VEGF (involved in the neovascular process in CNV). Examples of anti-VEGF agents include ranibizumab, bevacizumab, aflibercept and brolucizumab. |
| **Choroidal neovascularisation (CNV)** | Abnormal growth of new blood vessels originating from the choroidal vasculature through a break in Bruch’s membrane into the sub-retinal pigment epithelium and/or sub-retinal space. |
| **Drupelet** | A druse less than 63µm in diameter, at its smallest diameter. Considered a sign of normal ageing changes. |
| **Drusen** | Extracellular materials, principally composed of lipoproteineous material, formed between the basal lamina of the RPE and the inner collagenous layer of Bruch’s membrane. They may be accompanied by disruptions of the RPE, as evidenced by pigmentary abnormalities. |
| **Fundus autofluorescence (FAF)** | A type of ophthalmic imaging that detects the accumulation of lipofuscin in the ocular fundus by exposure to a short to medium wavelength of visible light; this allows the lipofuscin to autofluoresce. |
| **Geographic atrophy (GA)** | Any sharply delineated round or oval area of hypo-pigmented, or apparent absence of the RPE, in which choroidal vessels are more visible than in surrounding areas. |
| **Classification of Age-related macular degeneration** | **On OCT, GA presents as RPE absence for at least 250μm in diameter, with overlying outer retinal thinning and ellipsoid zone dropout. This creates a homogeneous hyper-transmission of the overlying choroid.** |
|---|---|
| **Infrared reflectance (IR) imaging** | A type of ophthalmic imaging that utilises the reflectance of infrared wavelengths of light to image the retina. IR imaging is useful in the diagnostic workup of specific retinal pathologies, such as AMD, by highlighting a range of sub-retinal features, such as drusen subtypes, changes in retinal pigmentation, and reticular pseudodrusen (RPD). |
| **Macula region** | The area defined by a radius of two-disc diameters, centred on the fovea. |
| **Nutritional supplement** | A product manufactured to supplement the diet of an individual. Examples include omega-3 fatty acids, vitamins, minerals, and amino acid supplements. |
| **Reticular pseudodrusen (RPD)** | Sub-retinal drusenoid deposits that appear in a reticular pattern as small, yellow-white, round or oval lesions, usually located in the superior outer macula and/or supertemporal to the macula. RPD (green arrows) appear as hyper-reflective elevations above the RPE; compared to regular drusen (white stars) which appear as elevations originating below the RPE (image to the right). RPD are distinct from typical drusen and confer a 4-6-fold higher-risk for the development of late-stage AMD. |
4. HOW TO USE THE CARAT

Using the CARAT flowchart, follow the path that best describes your patient to obtain information regarding AMD severity classification, AREDS simple severity scale score (used to obtain the risk of progression to late-stage AMD in 5 years), management advice regarding modifiable risk factors, and an appropriate review period.

Information required of the patient:

1. Patient age (in years)
   a. 55-64
   b. 65-74
   c. >75

2. Family history of AMD? (refer to Section 1 for definition)
   a. Yes
   b. No

3. Current smoker? (refer to Section 1 for definition)
   a. Yes
   b. No

4. Presence of reticular pseudodrusen (RPD)?
   a. Yes
   b. No

5. Is there late-stage AMD (CNV or GA) in either eye?
   a. If yes, CNV detected?
   b. If no, is there GA in the fellow eye?

6. Size of largest drusen (at its smallest diameter) (refer to Appendix A for drusen size guide)
   a. Small (<63µm)
   b. Medium (63-125µm)
   c. Large (>125µm)

7. Presence of AMD pigmentary changes?
   a. Yes
   b. No

Interpreting the output management advice in the CARAT tool (purple text)

- The classification of AMD severity is based on the Beckman Classification (2013): normal ageing changes, early AMD, intermediate AMD, late AMD (GA and/or CNV); refer to Section 2: AMD Clinical Classification, page 5, for further details.

- AREDS Simple Severity Scale Score (SSSS): use this score and the patient’s risk factors (i.e., age, family history and smoking status) and refer to Section 5 (page 10 and 11) to calculate the patient’s risk of progression to late-stage AMD in 5 years, as follows:
  o Use Table 1 if neither eye has late-stage AMD
  o Use Table 2 if there is late-stage AMD in at least one eye

- Recommended review period
  o The recommended review period is in line with RANZCO guidelines, however, may need to be adjusted to be more frequent at the optometrist’s discretion, based on individual patient risk factors and clinical signs.

- Symbols used to indicate management approach such as:
  - Amsler grid for weekly home monitoring
  - High-dose anti-oxidant vitamin supplementation
  - Management approach not indicated
5. CALCULATION OF RISK OF PROGRESSION TO LATE-STAGE AMD IN 5 YEARS

Using the AREDS Simple Severity Scale Score (SSSS) obtained from the CARAT flowchart, refer to the tables below to estimate the patient’s risk of progression to late-stage AMD in 5 years (calculated using the ‘Advanced AMD Risk Calculator’ on http://caseyamdcalc.ohsu.edu/ accessed June 2019).

The presence of reticular pseudodrusen is not accounted for in the final risk of progression values in Table 1 and 2. However if a patient has reticular pseudodrusen, this may confer an added 4-6-fold increase in the risk of progression to late-stage AMD.

The tables below (Table 1&2) are divided into three columns that represent three different patient age ranges, as stratified in the CARAT.

Each age range is further divided into columns that relate to the presence or absence of two key risk factors: (i) whether the person has a family history of AMD, and (ii) whether the person is a current smoker, as follows:

- Family history of AMD
- Current smoker
- Absence of the respective risk factor

Case study examples
Scenario 1: 67-year-old male, with a family history of AMD, who is not a current smoker. He does not have late-stage AMD in either eye. The CARAT indicates he has an AREDS SSSS of 2.

Use Table 1, 2nd main column (age range 65-74). Patient has a positive family history of AMD but negative current smoking status, so the column of interest would contain the symbols:

Using the AREDS SSSS of 2 from the respective row, this patient has a 15% risk of progressing to late-stage AMD, in at least one eye at five years.

Scenario 2: 80-year-old female with no family history of AMD, who is not a current smoker. She has geographic atrophy in one eye, and intermediate AMD in the fellow eye. The CARAT indicates she has an AREDS SSSS of 3.

Use Table 2, 3rd main column (age range >75). Patient has a negative family history of AMD and negative current smoking status, so the column of interest would contain the symbols:

Using the AREDS SSSS of 3 from the respective row, this patient has a 37% risk of progressing to late-stage AMD in the fellow eye at five years.
Table 1 - For patients who do not have late-stage AMD in either eye: Risk of progression (%) to late-stage AMD in at least one eye, at 5 years, as determined by the AREDS simple severity scale score (SSSS) and relevant risk factors

| AREDS SSSS | Age 55-64 | Age 65-74 | Age >75 |
|------------|-----------|-----------|---------|
| 0          | 1 1 1 2   | 1 1 1 2   | 1 2 2 3 |
| 1          | 4 5 7 9   | 5 7 9 12  | 7 9 12 16 |
| 2          | 8 11 14 19 | 11 15 19 25 | 14 20 24 32 |
| 3          | 19 26 32 41 | 25 33 40 51 | 32 41 49 61 |
| 4          | 27 35 43 54 | 34 44 52 65 | 43 54 63 75 |

Table 2 - For patients who have late-stage AMD in at least one eye: Risk of progression (%) to late-stage AMD in the fellow eye, at 5 years, as determined by the AREDS simple severity scale score and relevant risk factors

| AREDS SSSS | Age 55-64 | Age 65-74 | Age >75 |
|------------|-----------|-----------|---------|
| 2          | 10 14 17 23 | 13 18 22 30 | 17 23 29 38 |
| 3          | 23 30 37 47 | 29 38 46 58 | 37 48 56 69 |
| 4          | 32 41 49 61 | 40 51 59 72 | 49 61 70 82 |
6. RESOURCES

Amsler grid
Patient instructions for how to use an Amsler grid:
- Wear the glasses or contact lenses normally used for reading
- Hold Amsler grid at normal reading distance (approximately 30cm) in a well-lit room
- Fully cover one eye then use the uncovered eye to focus on the black dot in the centre of the grid
- While focusing on the central dot, ensure all four corners of the grid are visible
- While continuing to focus on the central dot, look for any lines (horizontal or vertical) that appear wavy, distorted or missing
- Repeat this for the other eye
- If the patient is noticing any changes, advise them to book an appointment to see an optometrist as soon as possible.

Patients should repeat this test at home, at least once per week.
To order Amsler grids, visit https://www.mdfoundation.com.au/content/magnetised-amsler-grid

Smoking cessation advice
Provide the patient with information regarding the potential effects of smoking on eye health:
- Current smokers have 2- to 4-fold increased risk of developing AMD compared to people who have never smoked (Smith et al. 2001 and Tomany et al. 2004)
- A direct link exists between the risk of developing late AMD and the number of cigarettes smoked over time (Khan et al. 2006)
- Current smokers have a higher risk of a poor response to intra-vitreal anti-VEGF treatment for choroidal neovascularisation (late-stage AMD) (Detaram et al. 2019 and Lee et al. 2013)
- Quitting smoking significantly reduces the risk of developing AMD and the risk of progression to late-stage AMD (Hughes et al. 2007, Rennie et al. 2012, and Vingerling et al. 1996)

Assess a patient’s level of readiness to cease smoking (refer to Appendix E, page 20, for the Quantitative clinical smoking behaviour tool)

Resource for the patient (optional): pamphlet regarding smoking cessation and support provided by The Australian Government Department of Health can be accessed by scanning QR code or visiting: https://www.health.gov.au/sites/default/files/guide-to-a-smoke-free-life.pdf

QR code for smoking cessation pamphlet
Dietary advice

The following points summarise key evidence-based information relating to the potential influence of diet on the development and/or progression of AMD (Chapman et al. 2019):

- Mediterranean diet (Merle et al. 2015 and De Koning-Backus et al. 2019)
  - High consumption of fruits, vegetables (i.e., leafy green vegetables), legumes, whole grains and nuts [vegetables ≥ 200g/day; fruit ≥ 200g/day]
  - Moderate consumption of fish, poultry and dairy [fish ≥ 32g/day, or oily fish twice per week]
  - Use of olive oil instead of other oils/fats
  - Limited consumption of red meat [less than or equal to twice a week]

- Examples of leafy green vegetables include kale, spinach, watercress, basil, peas, lettuce, zucchini, broccoli and leeks etc.

- Consumption of oily fish more than twice a week, to increase intake of the omega-3 fatty acids, DHA and EPA. Examples include salmon, anchovy, tuna, sardines and swordfish.

- Minimal intake of omega-6 fatty acids, such as vegetable oils and animal fats.

- Low GI food choices [such as oatmeal, whole meal/mixed-grain bread, and cereal fibre] should be consumed, rather than high-GI foods [such as white bread]
  - A diet containing higher GI foods is associated with an increased risk of developing early AMD, compared with the consumption of lower GI [such as cereal fibre]. (Kaushik et al 2008)
**Nutritional supplementation**

High-dose antioxidant vitamin and mineral supplements may be considered for people with intermediate AMD, to potentially reduce the risk of progression to late-stage AMD at 5 years.

The AREDS study (2001) reported that daily, long-term supplementation with vitamin C (500mg), vitamin E (400 international units (IU)), beta-carotene (15mg), zinc^ (80mg, as zinc oxide), and copper (2mg, as cupric oxide) reduced the relative risk of progression to late-stage AMD from 28% (observed with placebo) to 20% at 5 years, in people with at least intermediate AMD.

The AREDS2 study concluded that addition of xanthophyll carotenoids, such as lutein and zeaxanthin, and omega-3 EFAs to the original AREDS formulation did not further reduce the risk of progression to late-stage AMD (2013). Furthermore, lowering the dose of zinc (25mg) and eliminating beta-carotene did not demonstrate any statistically significant effect on reducing the progression to late AMD (2013). However, replacement of beta-carotene with lutein and zeaxanthin may reduce risk of lung cancer in former smokers (2013).

Current clinical evidence indicates that high-dose antioxidant vitamins and mineral supplements are not beneficial for people with normal ageing changes, early AMD and/or late AMD in both eyes (AREDS report 8 and Evans et al 2017). Nutritional supplements are also not intended to substitute dietary intake, as they cannot replicate the full spectrum of nutrients present in whole foods.

Before providing advice about nutritional supplementation, it is recommended for a person’s baseline dietary intake to be assessed (please refer to Appendix F, page 26, for the Quantitative Dietary and Nutritional Supplement Tool).

---

^ The upper recommended level of intake of zinc for a healthy adult is 40mg/day, therefore the use of this formulation should be consulted with the patient’s general practitioner (https://www.nrv.gov.au/nutrients/zinc)

**Table 3: Antioxidant vitamin and nutritional supplements currently available in Australia (2019)**

| Brand/Supplement       | Formulation per capsule                                      |
|------------------------|--------------------------------------------------------------|
| Macutec Once Daily     | 500mg Vitamin C, 400 IU Vitamin E, 25mg Zinc Oxide, 2mg Copper, 10mg Lutein, 2mg Zeaxanthin |
| Blackmores Macu-Vision Plus | 250mg Vitamin C, 200 IU Vitamin E, 40mg Zinc oxide, 1mg Cupric Oxide, 5mg Lutein, 1mg Zeaxanthin |
| MD Eyes                | 500mg Vitamin C, 400 IU Vitamin E, 25mg Zinc oxide, 2mg Cupric oxide, 10mg Lutein, 2mg Zeaxanthin |
| Bausch & Lomb PreserVision | 250mg Vitamin C, 200 IU Vitamin E, 40mg Zinc, 1mg Copper, 5mg Lutein, 1mg Zeaxanthin |
**SECTION 8: PATIENT TRACKER**

The following table is designed to assist you with tracking your patients with AMD for whom you have performed a comprehensive eye examination. This will assist you with auditing your clinical records at a later date, so that you may refer to the respective patient’s clinical notes.

Record the patient initials and date of the consultation below. If you have used your assigned intervention, please tick the corresponding row.

| Week 1 | Patient initials | Date of consult | Intervention used (tick) |
|--------|------------------|-----------------|-------------------------|
| Week 2 | Patient initials | Date of consult | Intervention used (tick) |
| Week 3 | Patient initials | Date of consult | Intervention used (tick) |
| Week 4 | Patient initials | Date of consult | Intervention used (tick) |
| Week 5 | Patient initials | Date of consult | Intervention used (tick) |
| Week 6 | Patient initials | Date of consult | Intervention used (tick) |
| Week 7 | Patient initials | Date of consult | Intervention used (tick) |
| Week 8 | Patient initials | Date of consult | Intervention used (tick) |
| Week 9 | Patient initials | Date of consult | Intervention used (tick) |
| Week 10| Patient initials | Date of consult | Intervention used (tick) |
| Week 11| Patient initials | Date of consult | Intervention used (tick) |
| Week 12| Patient initials | Date of consult | Intervention used (tick) |
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1. Consider risk factors

- Patient age (years)
  - 55-64
  - 65-74
  - > 75

- Family history of AMD?
  - Yes
  - No

- Current smoker?
  - Yes
  - No

- Presence of reticular pseudodrusen (RPD)?
  - Yes
  - No

2. Clinical signs & Management

Is there late-stage AMD (i.e., choroidal neovascularization [CNV] or geographic atrophy [GA]) in either eye?

- Yes
- No

CNV detected?

- Yes
- No

Is there GA in both eyes?

- Yes
- No

Size of drusen in the fellow eye?

- Small <63μm
- Medium 63μm-125μm
- Large >125μm

AMD pigmentation changes, in their fellow eye?

- Yes
- No

Legend

* Worst eye: based on macula phenotype in the context of AMD
AREDS SS: AREDS Simple Severity Scale Score

- Provide patient with Amsler grid for weekly home monitoring
- High-dose anti-oxidant vitamin supplementation may be considered
- OCT imaging required to check for RPD
- Management approach is not indicated

- All current smokers should be counselled regarding smoking cessation (refer to Section 6 of the manual)
- All patients should receive evidence-based advice about dietary intake to modify AMD risks (refer to Section 6 of the manual)
- Smokers should not be recommended high-dose anti-oxidant supplements containing beta-carotene because of an increased risk of lung cancer
- A summary of the dx and rx, including the risk of progression details, should be noted on the patient’s clinical record

Classification of Age-related macular degeneration and Risk Assessment Tool (CARAT)
Department of Optometry and Vision Sciences, University of Melbourne
Version 3, 6th November 2019
Supplementary Material S3 – Statistical analysis of change in confidence from baseline between groups

†Refer AMD patients to medical retinal sub-specialist’s care

AMD, age-related macular degeneration; CARAT: classification of age-related macular degeneration and risk assessment tool

| Area Assessed                              | Kruskal Wallis statistic (H) | P value | Intervention comparison | Mean rank difference | Adjusted p value |
|--------------------------------------------|------------------------------|---------|-------------------------|---------------------|------------------|
| Risk factor knowledge for AMD development  | 9.16                         | 0.01    | Placebo vs Paper CARAT  | -10.08              | 0.01             |
|                                            |                              |         | Placebo vs Online CARAT | -8.44               | 0.06             |
|                                            |                              |         | Paper CARAT vs Online   | 1.64                | >0.99            |
|                                            | 3.02                         | 0.22    | Placebo vs Paper CARAT  | -4.80               | 0.51             |
| Risk factor knowledge for AMD progression  |                              |         | Placebo vs Online CARAT | -5.94               | 0.31             |
|                                            |                              |         | Paper CARAT vs Online   | -1.14               | >0.99            |
| Asking patients about risk factors         | 7.30                         | 0.03    | Placebo vs Paper CARAT  | -9.49               | 0.03             |
|                                            |                              |         | Placebo vs Online CARAT | -3.44               | >0.99            |
|                                            |                              |         | Paper CARAT vs Online   | 6.04                | 0.28             |
| Providing patients with advice             | 0.88                         | 0.64    | Placebo vs Paper CARAT  | -3.10               | >0.99            |
|modifiable risk factor advice               |                              |         | Placebo vs Online CARAT | -2.83               | >0.99            |
|                                            |                              |         | Paper CARAT vs Online   | 0.27                | >0.99            |
| Diagnose earlier stages of AMD             | 1.41                         | 0.49    | Placebo vs Paper CARAT  | 0.68                | >0.99            |
|                                            |                              |         | Placebo vs Online CARAT | 4.00                | 0.81             |
|                                            |                              |         | Paper CARAT vs Online   | 3.32                | >0.99            |
| Manage earlier stages of AMD               | 3.18                         | 0.20    | Placebo vs Paper CARAT  | -6.06               | 0.26             |
|                                            |                              |         | Placebo vs Online CARAT | -1.72               | >0.99            |
|                                            |                              |         | Paper CARAT vs Online   | 4.34                | 0.66             |
| Refer AMD patients†                        | 6.71                         | 0.04    | Placebo vs Paper CARAT  | -8.90               | 0.04             |
|                                            |                              |         | Placebo vs Online CARAT | -6.67               | 0.21             |
|                                            |                              |         | Paper CARAT vs Online   | 2.23                | >0.99            |
Supplementary Material S4 – Statistical analysis of change from baseline in MCQ scores

Wilcoxon test comparing pre- and post- MCQ score within AMD clinical tool groups. AMD, age-related macular degeneration; CARAT: classification of age-related macular degeneration and risk assessment tool.

| Area Assessed       | Kruskal Wallis statistic (H) | P value | Intervention comparison                     | Mean rank difference | Adjusted p value |
|---------------------|------------------------------|---------|--------------------------------------------|----------------------|-----------------|
| Risk factors        | 1.28                         | 0.53    | Placebo vs Paper CARAT                     | -3.96                | 0.86            |
|                     |                              |         | Placebo vs Online CARAT                    | -8.44                | 0.06            |
|                     |                              |         | Paper CARAT vs Online CARAT                | 1.64                 | >0.99           |
| Clinical examination| 0.73                         | 0.69    | Placebo vs Paper CARAT                     | 3.14                 | >0.99           |
|                     |                              |         | Placebo vs Online CARAT                    | 1.00                 | >0.99           |
|                     |                              |         | Paper CARAT vs Online CARAT                | -2.14                | >0.99           |
| AMD severity diagnosis| 1.88                       | 0.39    | Placebo vs Paper CARAT                     | -5.15                | 0.51            |
|                     |                              |         | Placebo vs Online CARAT                    | -2.83                | >0.99           |
|                     |                              |         | Paper CARAT vs Online CARAT                | 2.32                 | >0.99           |
| AMD management      | 0.60                         | 0.74    | Placebo vs Paper CARAT                     | -0.14                | >0.99           |
|                     |                              |         | Placebo vs Online CARAT                    | 2.50                 | >0.99           |
|                     |                              |         | Paper CARAT vs Online CARAT                | 2.64                 | >0.99           |
**Supplementary Material S5 – Pre-versus post-intervention data for all clinical audit domains assessed using the MaD-CCAT**

Change in compliance (pre- versus post- intervention audit period) for assigned AMD clinical tool groups

† Data combined for management of patients with earlier stages of AMD (normal ageing changes, early AMD, intermediate AMD)

‡ Data combined for management of patients with early AMD and intermediate AMD

AMD, age-related macular degeneration; CARAT: classification of age-related macular degeneration and risk assessment tool; N/A, not applicable (insufficient data for analysis)

| Area Assessed                  | Documented parameter | AMD clinical tool          | Audit period | n  | Median (%) | 25<sup>th</sup> – 75<sup>th</sup> percentile |
|--------------------------------|----------------------|-----------------------------|--------------|----|------------|---------------------------------------------|
| **Risk factor analysis**      |                      | Placebo                     | Pre          | 9  | 100        | 100-100                                    |
|                                |                      |                             | Post         | 9  | 100        | 80-100                                     |
|                                |                      | Paper CARAT                 | Pre          | 11 | 100        | 84-100                                     |
|                                |                      |                             | Post         | 11 | 100        | 100-100                                    |
|                                |                      | Online CARAT                | Pre          | 9  | 80         | 57.14-80                                   |
|                                |                      |                             | Post         | 9  | 100        | 100-100                                    |
| **Family history of AMD**     |                      | Placebo                     | Pre          | 9  | 40         | 20-40                                      |
|                                |                      |                             | Post         | 9  | 40         | 40-80                                      |
|                                |                      | Paper CARAT                 | Pre          | 11 | 44.44      | 0-70                                       |
|                                |                      |                             | Post         | 11 | 80         | 50-100                                     |
|                                |                      | Online CARAT                | Pre          | 9  | 40         | 14-40                                      |
|                                |                      |                             | Post         | 9  | 60         | 50-80                                      |
| **Dietary behaviours**        |                      | Placebo                     | Pre          | 9  | 0          | 0-20                                       |
|                                |                      |                             | Post         | 9  | 20         | 0-20                                       |
|                                |                      | Paper CARAT                 | Pre          | 11 | 20         | 0-21                                       |
|                                |                      |                             | Post         | 11 | 50         | 17-78                                      |
|                                |                      | Online CARAT                | Pre          | 9  | 0          | 0-20                                       |
|                                |                      |                             | Post         | 9  | 20         | 13-71                                      |
| **Nutritional supplement intake** |                    | Placebo                     | Pre          | 9  | 10         | 0-20                                       |
|                                |                      |                             | Post         | 9  | 20         | 0-40                                       |
|                                |                      | Paper CARAT                 | Pre          | 11 | 0          | 0-20                                       |
|                                |                      |                             | Post         | 11 | 40         | 25-65                                      |
|                                |                      | Online CARAT                | Pre          | 9  | 0          | 0-40                                       |
|                                |                      |                             | Post         | 9  | 20         | 0-20                                       |
| **Presence/ absence of reticular pseudodrusen (RPD)** |                  | Placebo                     | Pre          | 9  | 0          | 0-0                                        |
|                                |                      |                             | Post         | 9  | 0          | 0-0                                        |
|                                |                      | Paper CARAT                 | Pre          | 11 | 0          | 0-0                                        |
|                                |                      |                             | Post         | 11 | 0          | 0-21                                       |
|                                |                      | Online CARAT                | Pre          | 9  | 0          | 0-17                                       |
|                                |                      |                             | Post         | 9  | 0          | 0-0                                        |
| **Clinical examination techniques** |                | Placebo                     | Pre          | 9  | 100        | 100-100                                    |
|                                |                      |                             | Post         | 9  | 100        | 100-100                                    |
|                                |                      | Paper CARAT                 | Pre          | 11 | 100        | 100-100                                    |
|                                |                      |                             | Post         | 11 | 100        | 100-100                                    |
| Procedure                                      | Placebo     | Paper CARAT | Online CARAT |
|-----------------------------------------------|-------------|-------------|--------------|
| Monocular pinhole acuity                      | Pre 4 42   | Post 5 83   | Pre 9 46     |
|                                               | Post 11 25 | Post 10 42  | Post 7 50    |
| In-office Amsler grid test                    | Pre 8 45   | Post 8 74   | Pre 9 40     |
|                                               | Post 11 40 | Post 11 55  | Post 9 20    |
|                                               |             |             | Post 9 33    |
| Dilated fundus examination                    | Pre 9 40   | Post 9 20   | Pre 9 40     |
|                                               | Post 11 40 | Post 11 40  | Post 9 33    |
| Retinal imaging                               | Pre 9 100  | Post 9 100  | Pre 9 100    |
|                                               | Post 9 100 | Post 9 100  | Post 9 100   |
| Optical coherence tomography (OCT)            | Pre 9 20   | Post 9 67   | Pre 9 20     |
|                                               | Post 11 100| Post 11 100 | Post 9 100   |
|                                               |             |             | Post 9 100   |
| Multimodal imaging                            | Pre 9 40   | Post 9 40   | Pre 9 20     |
|                                               | Post 9 40   | Post 9 67   | Post 9 100   |
|                                               |             |             | Post 9 100   |
| AMD severity classification                   | Pre 9 40   | Post 9 60   | Pre 9 40     |
|                                               | Post 11 70  | Post 11 100 | Post 9 94    |
|                                               |             |             | Post 9 94    |

**Notes:**
- Online CARAT results are represented as 100%.
- Placebo results are shown for comparison.
- Paper CARAT results are shown for comparison.
- Multimodal imaging results are shown for comparison.
- Accurate AMD severity classification results are shown for comparison.
| AMD management | Smoking behaviours discussed† | Placebo | Pre | 9 | 40 | 0-40 | Post | 9 | 50 | 25-83 |
| | | Paper CARAT | Pre | 11 | 25 | 0-100 | Post | 11 | 75 | 37-100 |
| | | Online CARAT | Pre | 8 | 38 | 15-54 | Post | 8 | 100 | 55-100 |
| | Dietary/ nutritional supplementation intake† | Placebo | Pre | 9 | 40 | 0-80 | Post | 9 | 60 | 0-100 |
| | | Paper CARAT | Pre | 11 | 50 | 0-90 | Post | 11 | 83 | 45-100 |
| | | Online CARAT | Pre | 8 | 50 | 32-80 | Post | 8 | 76 | 63-100 |
| | Risk of progression to late-stage AMD‡ | Placebo | Pre | 7 | 0 | 0-0 | Post | 7 | 0 | 0-25 |
| | | Paper CARAT | Pre | 9 | 0 | 0-50 | Post | 9 | 100 | 67-100 |
| | | Online CARAT | Pre | 8 | 0 | 0-0 | Post | 8 | 13 | 0-68 |
| | Amsler grid provision‡ | Placebo | Pre | 7 | 40 | 17-88 | Post | 7 | 80 | 55-100 |
| | | Paper CARAT | Pre | 9 | 100 | 67-100 | Post | 9 | 100 | 100-100 |
| | | Online CARAT | Pre | 8 | 42 | 0-66 | Post | 8 | 67 | 46-100 |
| | Nominating appropriate review period† | Placebo | Pre | 9 | 100 | 80-100 | Post | 9 | 100 | 100-100 |
| | | Paper CARAT | Pre | 10 | 100 | 100-100 | Post | 10 | 100 | 100-100 |
| | | Online CARAT | Pre | 8 | 100 | 81-100 | Post | 8 | 100 | 100-100 |
Supplementary Material S6 – Change from baseline in documentation of AMD risk factors

Plots show change from baseline in compliance (%) for clinical record documentation of patient: family history of AMD, current smoking status, dietary behaviours, nutritional supplementation and presence/absence of reticular pseudodrusen.

AMD, age-related macular degeneration; CARAT, classification of age-related macular degeneration and risk assessment tool; RPD, reticular pseudodrusen.
Supplementary Material S7 – Change from baseline in documentation of AMD severity

Plot shows change from baseline in compliance (%) for clinical record documentation of the appropriate classification of AMD severity, per eye, according to the Beckman classification (2013).

AMD, age-related macular degeneration; CARAT, classification of age-related macular degeneration and risk assessment tool.
Plots show change from baseline in compliance (%) for documentation of clinical examination techniques.

AMD, age-related macular degeneration; CARAT, classification of age-related macular degeneration and risk assessment tool; RPD, reticular pseudodrusen.
Supplementary Material S9 – Change from baseline in documentation of management approaches for all patient severities

Plots show change from baseline in compliance (%) for documentation of management of patients with any severity of macular finding.

AMD, age-related macular degeneration; CARAT, classification of age-related macular degeneration and risk assessment tool; RPD, reticular pseudodrusen.