

## Our Campus

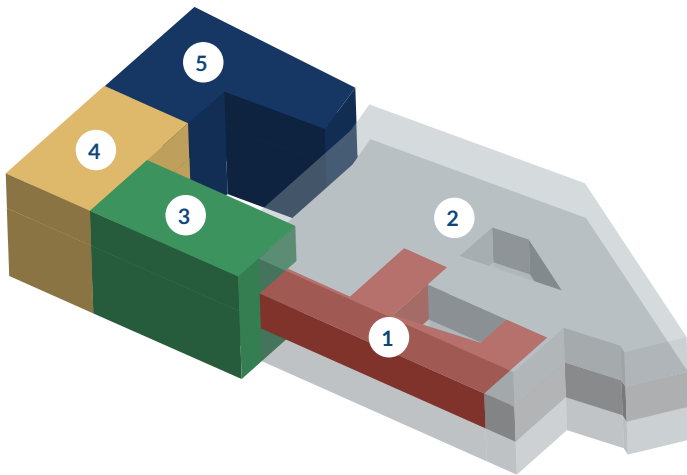
Moorfields CRF is the largest ophthalmic experimental medicine and early phase facility in the world. Our ambulatory outpatient centre facility spans **7,545 ft<sup>2</sup>** and is aligned with NIHR Moorfields Biomedical Research Centre translating world leading innovations.



**Moorfields Clinical Research Facility (CRF)** has an international reputation for ophthalmic research. With world-class researchers and staff supported by investment in state-of-the-art specialist devices, Moorfields CRF has 26 patient examination rooms with multiple associated research and treatment units to test new methods to diagnose eye diseases and to evaluate innovative treatments for common and rare diseases.



**Moorfields Eye Hospital NHS Foundation Trust** is located on City Road, London with 30 outreach centres and is the largest provider of eye services in globally. We are a world-leading centre of excellence for research and education and are at the forefront of ophthalmic innovation. As a major education centre, we attract very large numbers of ophthalmology trainees and researchers.



The £20 million **Richard Desmond Children's Eye Centre** is the largest ophthalmic children's hospital in the world and is located on the main hospital campus. A hub for paediatric research and treatment, it supports world-class specialist expertise in all eye conditions. The rapid transference of 'bench to bedside' research is promoted by its proximity to the UCL Institute of Ophthalmology.

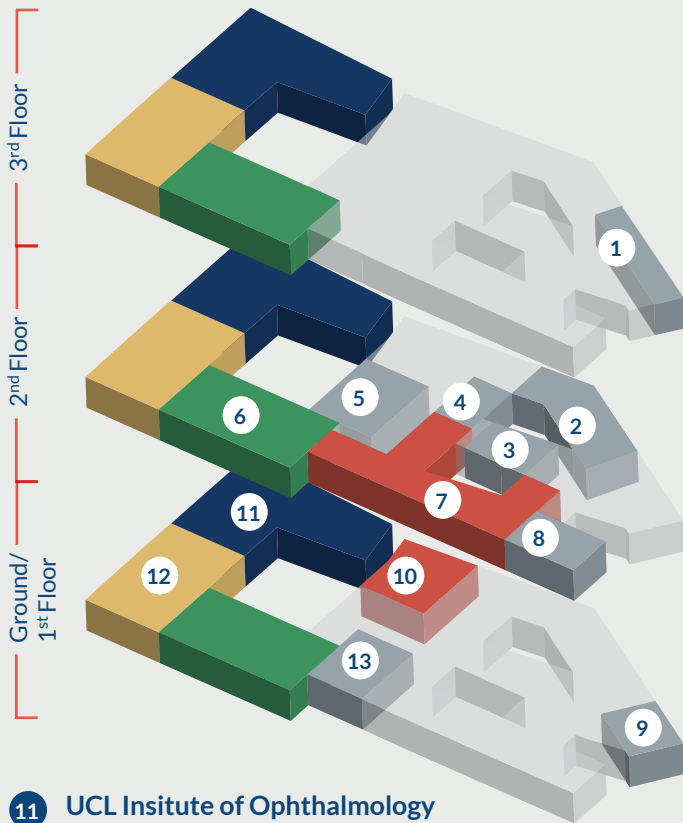


**Henry Wellcome Building for Translational Eye Research** (£11M Wellcome Trust funding) supports extensive cellular and molecular biology facilities for cellular and gene therapies, gene editing, ocular pharmacokinetic, microdevice testing and retinal chip research. It houses stem cell therapy groups including Cells for Sight, the first UK MHRA accredited facility for human stem cell therapy.



**UCL Institute of Ophthalmology** has the largest number of ophthalmic scientists in Europe. Our research partnership is delivering an extensive ophthalmic research portfolio, ranked 1<sup>st</sup> globally for publications. Its location adjacent to Moorfields Eye Hospital enables rapid translation of biomedical research to clinical studies at Moorfields CRF.

# Moorfields CRF

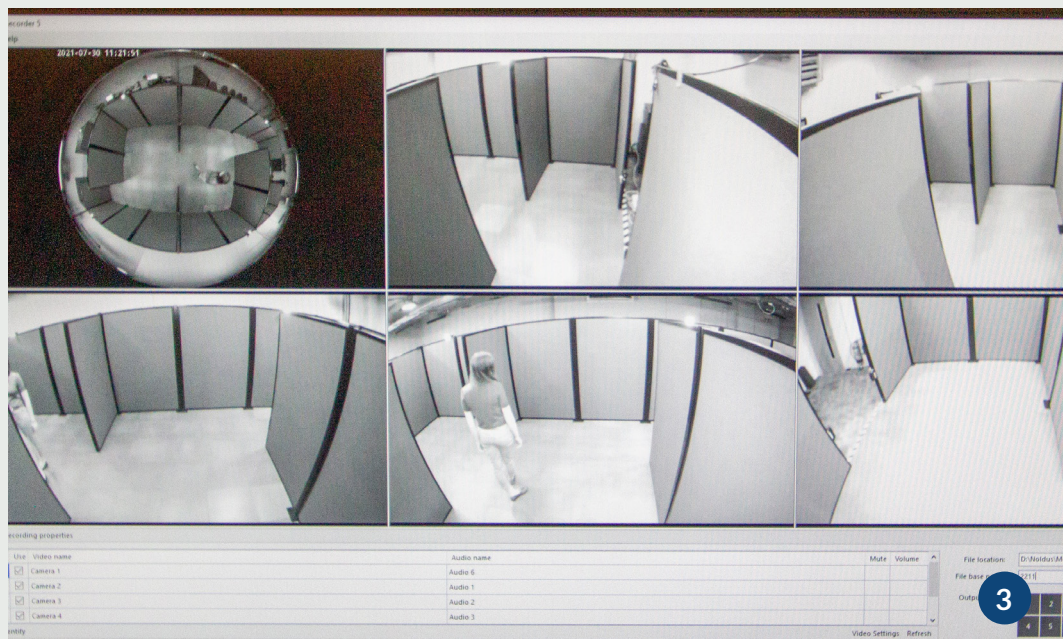


- 1 **Retinal Therapy Unit** is a specialised recruitment hub for patients receiving intravitreal injections to treat age related macular degeneration.
- 2 **Moorfields R&D** houses research management and administration staff supporting all Moorfields CRF studies.
- 3 **Diagnostic Hub** monitors patients with chronic retinal conditions recruited for experimental medicine and NIHR Bioresource.
- 4 **The Garfield Weston Assessment Unit** is a dedicated facility for functional vision assessment and developing clinical end-points.
- 5 **Genetic Service** links CRF patients to Genomics England and NIHR Bioresource, providing genetic information to inform gene therapy studies.
- 6 **Moorfields Children's CRF** is one of the world's largest children's eye research facilities, leading innovative trials ranging from a new treatments for lazy eye to gene therapy.
- 7 **Moorfields CRF** provides dedicated space for specialist staff and equipment for experimental medicine research.
- 8 **Image Reading Centre** is a global clinical trial image grading centre, which is also developing and validating digital analytical tools to enhance clinical trials.
- 9 **Electrodiagnostics Centre** is the UK's largest centre with the most advanced devices for studying electric activity of the eye as endpoints in clinical trials.
- 10 **Moorfields Accident & Emergency** is the largest ophthalmic A&E in the UK and is a source of recruitment for clinical trials, with acutely presenting patients, for example, retinal detachment and optic neuritis.

- 11 **UCL Insitute of Ophthalmology**  
Delivers advanced ophthalmic research and education in partnership with Moorfields Eye Hospital and part of UCL Faculty of Brain Sciences.
- 12 **The Henry Wellcome Building for Translational Eye Research** supports extensive molecular biology facilities for translational projects including cellular and gene therapies.
- 13 **Moorfields Eye Hospital Operating Suite** supports the delivery of CRF experimental surgical trials with novel genes, stem cells, devices and intraocular therapeutics.

## Adjacent sites

**A Patient Navigation Maze**, based at the Moorfields Hoxton clinical site is used to assess the impact of gene therapy on functional vision required for FDA approved clinical endpoints.

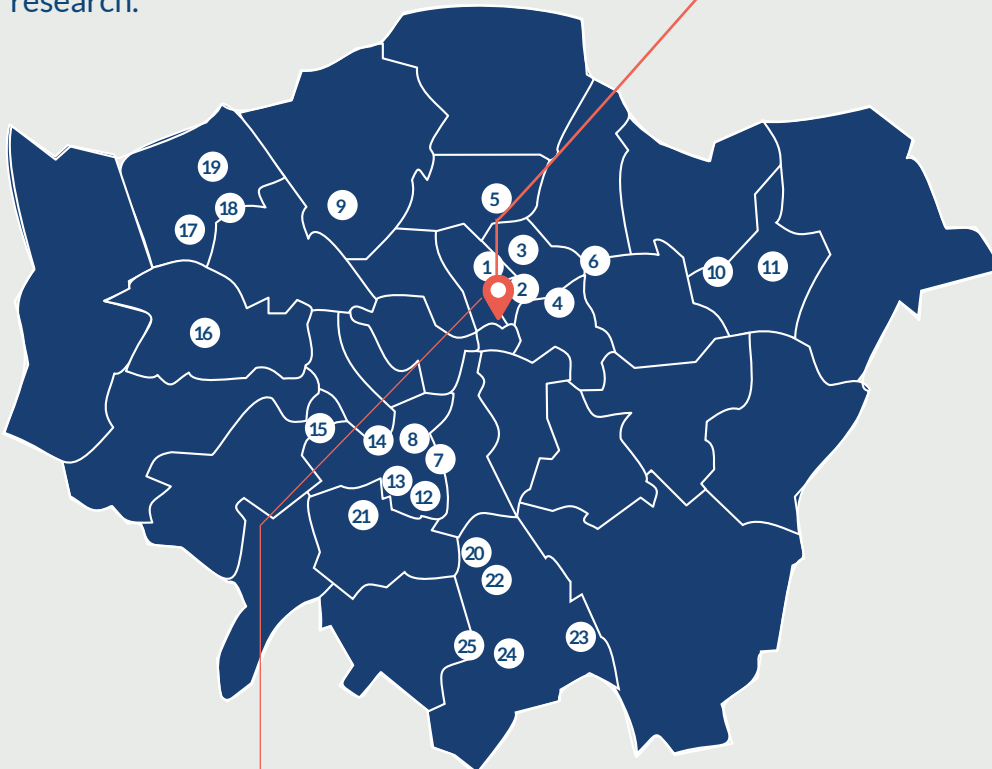


# Patient Recruitment Sites

Moorfields CRF patients are recruited from a diverse population across London. Moorfields Eye Hospital is a network care model with all sites linked by electronic medical records. Our Artificial Intelligence data-mining analytic tool will identify, in real-time, eligible patients from the cohort of patients who have consented for their data to be screened and be contacted for research.

## Moorfields CRF

1. Moorfields at Hoxton Diagnostic Hub
2. The Homerton Hospital
3. Hackney Ark
4. Mile End
5. St Ann's Hospital
6. Sir Ludwig Guttmann Health & Wellbeing Centre
7. Balham Health Centre
8. Nightingale Nursing Home
9. Brent Cross (Hercules)
10. Barking Hospital
11. Henry Morgans Opticians Dagenham
12. Tooting Bec Medical Centre
13. St George's Hospital
14. Brocklebank Health Centre
15. Queen Mary's Hospital
16. Ealing Hospital
17. Parker & Hammond Opticians
18. Northwick Park Hospital
19. Visioncare Medical Eye Centre
20. Croydon University Hospital
21. The Nelson Health Centre
22. Croydon Vision
23. Parkway Health Centre, Croydon
24. Sanderstead Health Centre
25. Purley War Memorial Hospital



## Outside London

26. Watford General Hospital
27. Moorfields Partnership at Boots
28. Potters Bar Community Hospital
29. Bedford Hospital (South)
30. Bedford Hospital (North)

## Rare disease patient recruitment



As a global centre of excellence for rare disease research, Moorfields CRF has the ability to genotype and deep phenotype patients at the photoceptor cell level. Patients are referred from outside the UK.

## National collaborators for patient recruitment

### Outside London

1. Cambridge BRC
2. Manchester BRC
3. Oxford BRC
4. Southampton CRF
5. Newcastle BRC
6. Bristol Eye Hospital
7. Birmingham NHS Trust

### 8. London

- UCL Hospital BRC
- Great Ormond Street Hospital BRC
- Imperial BRC

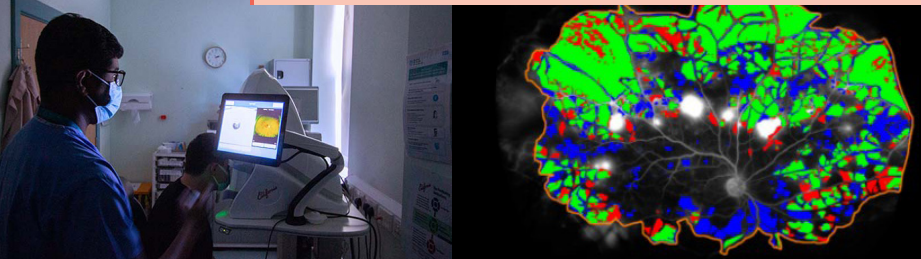


# Moorfields CRF Floorplan



7,545 ft<sup>2</sup>

## 1 Automated Quantification of Retinal Non-Perfusion



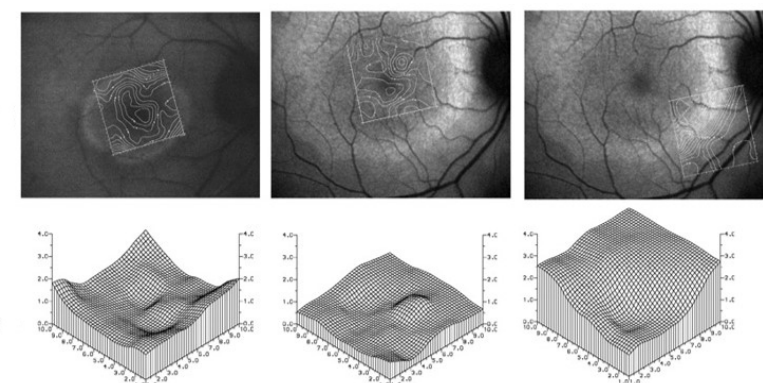
## 2 Testing of Individual Points of Retinal Sensitivity



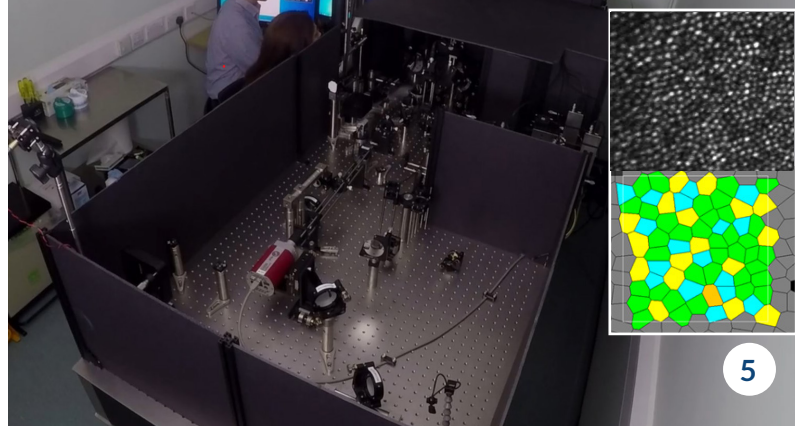
We have designated Moorfields CRF into five operational areas to ensure the efficient flow of patients between clinical study assessments within our facility.

- **11 functional assessment rooms** for visual fields, psychophysical tests and colour vision testing and perimetry
- **8 structural assessment rooms** for high resolution imaging for diagnosis and assessing disease progression
- **3 treatment rooms** for intravitreal injections and laser treatments
- **4 clinical rooms** for patient consultation and ocular examinations
- **1 laboratory** for blood and tissue sample processing and storage

## 3 Structure-Function Correlation - Fine Matrix Mapping



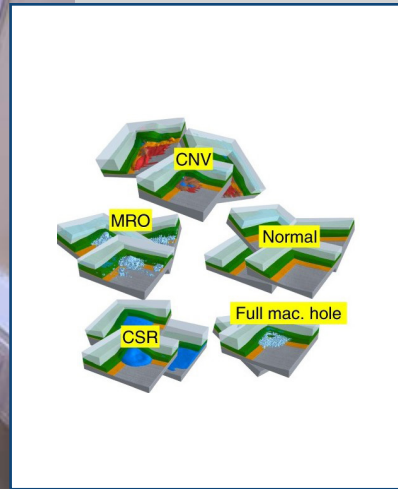
## 4 Prototype for Photoreceptor Cell Imaging



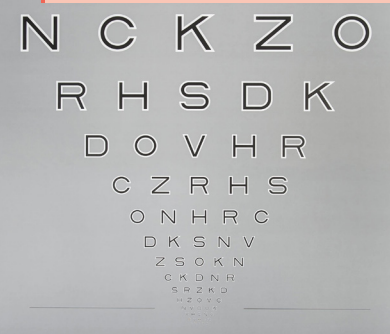
5

# Moorfields CRF Rooms

5 Developing AI Algorithm from OCT Images



6 Moorfields Vision Chart



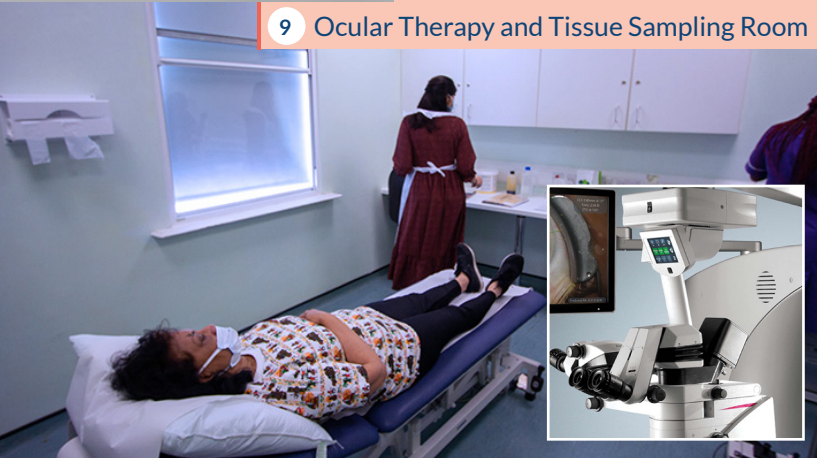
7 Early Diagnosis of Glaucoma



8 Post-operative Assessment



9 Ocular Therapy and Tissue Sampling Room



10 CRF Laboratory Facility for Sample Handling



11 Screening for Age Related Macular Degeneration

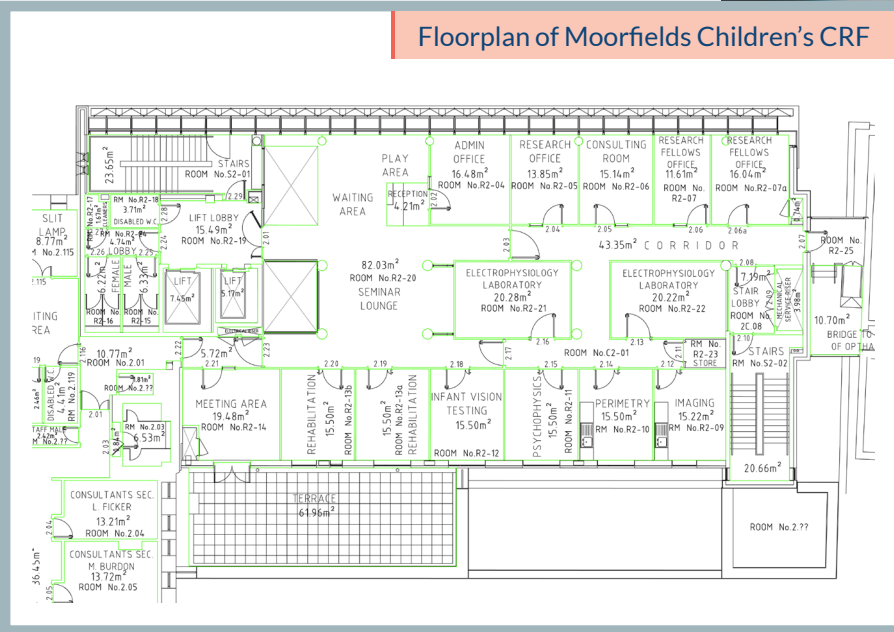


# Moorfields Children's CRF

Moorfields Children's CRF is the largest paediatric ophthalmic CRF in Europe, created with £1M funding from Fight for Sight and Moorfields Eye Charity. Located on the 2<sup>nd</sup> Floor of the Richard Desmond Children's Eye Centre, it is equipped with specialised testing for novel therapies and devices for our paediatric patients and meets all the UK regulatory requirements to conduct paediatric research.



Floorplan of Moorfields Children's CRF



Child-Friendly Waiting Area



Visual Rehabilitation for Aniridia using Special Goggles



Novel Treatment for Lazy Eye using Digital Technology



We have developed a new treatment for "lazy eye". The standard treatment is wearing an eye patch on the better eye for a few hours every day, or using blurring eye drops (atropine) twice a week. The new treatment involves watching a movie on a Nintendo 3DS XL console for one hour every day, either as one block of 60 minutes or two blocks of 30 minutes.

## | Patient Navigation Maze

The patient navigation maze has been established with £800k investment from industry partners to assess the impact of novel therapies like gene therapy and devices on functional vision. The facility provides FDA-approved measures for clinical trials and has attracted over £20M funding from industry, delivering experimental medicine research projects for severely visually impaired adults and children. The vision guided mobility assessment measures the patient's ability to navigate a maze structure, avoiding obstacles under different lighting conditions mimicking real life situations.



## | Digitisation of Moorfields CRF

The Image Reading Centre is an integral part of our experimental medicine research enterprise, providing bioinformatics expertise in support of ophthalmic research. It receives ocular images from CRF patients and other national and international clinical trials to define trial eligibility and outcome measures. The multidisciplinary team is integral in developing AI tools to identify patients eligible for first-in-man clinical trials and also develop technologies to speed up clinical trials.





# Research Delivery Workforce

The core CRF workforce is defined as those who directly contribute to CRF activities. As these activities are not only contained within the dedicated CRF floorplan, staff who provide input to the trial activities in adjacent premises are defined as wider workforce.

## CRF Scientific and Clinical

**32 Principal Investigators:** Clinical and scientific CRF project leads

**30 Clinical Research Fellows:** Sub-Investigators in CRF projects

**21 Translational PhD Students:** Trainees on projects from pull through molecules to complex late phase trials

**3 Clinician Scientists:** Electrodiagnostics to show electrical activity of retina

**1 Clinician Scientist:** Specialist cellular level imaging and reporting projects

## CRF Technical and Nursing staff

**7 CRF Research Imaging Technicians:** Trial certified ocular imaging for eligibility and outcome assessment

**2 Research Photographers:** Trial certified ocular imaging for eligibility and outcome assessment

**4 Electrodiagnostic Technicians:** Recording electric activity of the eye to evaluate visual function

**1 Laboratory Technician:** Sample processing and handling

**9 CRF Research Nurses:** Patient assessments, safety checks and on-call

**2 Clinical Research Assistant:** Assist nursing care

**7 Research Optometrists:** Primary outcome assessment and visual function tests

**7 Research Orthoptists:** Evaluating ocular movement in paediatric trials

**5 Research Pharmacists:** Prepare CTIMPs and other drugs for CRF studies

## CRF Management and Administration

**5 Senior Managers:** CRF strategic oversight

**2 CRF Receptionists:** Patient liaison and monitoring

**9 Patient Recruitment Coordinators:** Facilitate informed consent of patient recruitment

**9 Research Project Managers:** Multi-site research study management

**8 Research Study Coordinators:** Research study management

**2 Staff Training Officers:** Professional development and training

■ **166 Core CRF Workforce**

■ **65 Shared Workforce with NHS Trust Contributing to CRF Activity**

## Shared Scientific and Clinical

**6 Senior Translational Scientists:** Translational study leads for early phase studies and mechanistic studies

**1 Anaesthetist:** Safety cover, anaesthesia for surgical trials

**1 Pharmacologist:** Early phase safety monitoring

**3 Computer Scientists:** Electrodiagnostics to show electrical activity of retina

## Shared Technical and Nursing staff

**1 Radiographer:** Neuroradiology for neuro-ophthalmology trials

**1 Pharmacologist:** Early phase safety monitoring member

**5 Data Scientists:** Mining data to develop analytical tools for early phase studies

**5 Image Graders:** Analysis of ocular exams and images

**2 Digital Medicine Programmers:** Programme analytic tools, apps and telemedicine networks

**5 Theatre Nurses:** Assist gene therapy, robotics, cell therapy and surgical early phase trials

**7 Intravitreal Nurse Injectors:** Injection of intravitreal therapies

## Shared Management and Administration

**5 Research Governance Managers:** UK Regulatory submissions, study set-up and quality assurance

**5 Finance Team:** CRF budget oversight, management and reporting

**2 Legal Advisors:** Legal advice, contract negotiation and management

**2 PPIE Managers:** Patient and Public Involvement, Engagement and Participation

**1 Industry Partnership/Intellectual Property Manager:** Commercial liaison and IP management

**4 Communications Managers:** Communications and patient engagement

**2 IT System Programmers:** Development of research and operational systems

**7 Data Managers:** Research data management, quality and validation

# Inventory

Our CRF activities are integrated with various departments in Moorfields Eye Hospital. Dedicated laboratory facilities available to support CRF activities housed in the adjacent Henry Wellcome Translational Building for Eye Research and UCL Institute of Ophthalmology with direct corridor link to the CRF.

## Functional Assessment – Retinal function

- 1 Bascom Palmer Ocular Photosensitivity Analyzer
- 2 RETeval Electroretinographers
- 2 Dark Adaptometers

## Functional Assessment – Colour testing

- 1 Cambridge Research Systems Spectroscopy
- 1 X-Rite Light Simulator
- 1 Oculus Colour Vision Diagnosis Equipment

## Functional Assessment – Visual fields

- 1 Nidek Microperimeters
- 3 CenterVue Microperimeters
- 1 CenterVue Fundus Perimeter
- 2 Haag-Streit Field Analysers
- 2 Zeiss Field Analysers

## Functional Assessment – Visual Acuity

- 2 Single Sided Test Charts
- 1 Mobile Logmar Chart
- 9 Sussex Vision Logmar Charts
- 2 Thomson Electronic Eye Test Charts

## Structural Assessment - Imaging

- 1 Optovue Optical Coherence Tomograph (OCT)
- 1 Bioptigen Spectral Domain OCT
- 2 Heidelberg Spectralis OCTs
- 1 Adaptive optics OCT
- 2 Ultra-wide field OCTs
- 1 Zeiss Cirrus HD 5000 AngioPlex OCT
- 2 Adaptive Scanning Laser Ophthalmoscopes
- 2 HRA Retinal Angiographs
- 1 Topcon Retinal Camera
- 1 Optos California 200 Single Capture photography
- 2 Konan Cellcheck SL Specular Microscopes
- 1 Kowa Flaremeter

## Structural Assessment – Ocular Examination

- 1 Zeiss Optical Biometer
- 1 Nidek Auto Refractometer/Keratometer
- 2 Oculus Cataract Quantifiers
- 2 Pachymeters

## Treatment - Surgical equipment

- 1 Iridex Micropulse Laser

82 Core CRF items of equipment

472 Moorfields' items of equipment available to the CRF

27 UCL Institute of Ophthalmology items of equipment available to the CRF

## Clinical Assessment – Intraocular pressure

- 1 Tonometer - Perkins MK-3
- 3 Tonometers - Perkins MK-2
- 2 Digital Tonometers I-Care IC100

## Clinical Assessment – Ocular examination

- 5 Haag-Streit Slit Lamps
- 3 Keeler Indirect Ophthalmoscopes

## Clinical Assessment – Patient safety

- 3 GE Healthcare ECG Recorders
- 1 Mortara ECG Recorder

## Clinical Assessment – Experimental devices

- 2 GenSight GS030 Visual Instimulators

## Laboratory

- 1 Siemens Blood Gas Analyser
- 1 Hettich Lab Centrifuge
- 1 LifeSign Incubator
- 2 SciQuip Centrifuges
- 2 -80°C Freezers

## Functional Assessment – Visual Fields

- 82 Perimeter/Field Analysers

## Structural Assessment – Imaging

- 85 Ocular Coherence Tomographs
- 27 Ultra - WideField Retinal Scanners
- 22 Corneal Scanners
- 12 Retinal Fundus Cameras
- 3 3D Imaging Capture System for Face and Necks

## Structural Assessment – Ocular Examination

- 57 Ocular Coherence Tomographs
- 34 Ultrasound Scanners
- 22 Optical Biometers
- 3 Refractometer/Keratometers
- 3 Ophthalmic Scanners
- 3 Coneal Topographer/Aberrometers

## Structural Assessment – Intraocular pressure

- 37 Ocular Response Analysers

## Inventory

### Clinical Assessment- Ocular Examination

6 Video Capture Slit Lamps

### Clinical Assessment – Patient Safety

19 Electrophysiologies

4 X-Rays

1 CT Scanner

### Treatment – Surgical Equipment

15 Laser - Photocoagulators

14 YAG/SLT Lasers

4 Infrared Diode Lasers

8 Multispot Lasers

3 Pascal Lasers

3 PDT Lasers

3 Femto second lasers

2 Excimer Lasers

84 Core CRF Items of Equipment

472 Moorfields' Items of Equipment available to the CRF

33 UCL Institute of Ophthalmology Items of Equipment available to the CRF

### Laboratory

2 Flow Cytometers

10 Cryopreservation Units

10 Cell Culture Hoods

1 Fluorescein Microscope for Cell Therapy

2 Ultracentrifuges

### Prototyping

2 3-D Printers

### Pharmacokinetics Laboratory

6 Microflow Eye Models and Pumps

## Certifications

### United Kingdom

#### Cells for Sight

MHRA Accreditation

#### Moorfields Biobank

Research Ethics Committee

Human Tissue Authority Research Storage Licence

#### UCL Department of Eye Pathology

UKAS ISO15189 certification

#### Moorfields Eye Hospital

European Vision Clinical Research certification - clinical site of excellence

MHRA Inspection March 2014 – No critical findings

#### CRF staff and devices

Central Administrative Research Facility (CARF)

Moorfields Reading Centre

### Europe

#### CRF Staff and Devices

Coimbra Ophthalmology Reading Centre (CORC)

Vienna Reading Centre (VRC)

Bern Photographic Reading Centre

### North America

#### CRF Staff and Devices

Digital Angiography Reading Centre (DARC)

### North America (continued)

#### CRF Staff and Devices

Doheny Image Reading Centre (DIRC)

Duke Reading Centre

Emmes

Casey Reading Centre (CASEY)

Cornea Image Analysis Reading Centre (CIARC)

Excelsior EyeKor

Jaeb Centre for Health Research - Foundation

Fighting Blindness Consortium

Ocular Imaging Research and Reading Centre (OIRRC)

## Services

### Clinical Research Consultancy

Scientific Advice on Clinical trials design and conduct

Building Early Phase Clinical Development Plans

Clinical Trial Protocol Design

Statistical Methodologies in Clinical Trials

Developing and Validating Imaging Endpoints

Training of research personnel

Centralised Imaging Review by Reading Centre

Image Analysis

Clinical Trial Delivery