

A retrospective multi-centre clinical study of a deep learning system in identifying breast cancer through the assessment of mammograms

Submission date 10/01/2022	Recruitment status No longer recruiting	<input type="checkbox"/> Prospectively registered <input type="checkbox"/> Protocol
Registration date 03/02/2022	Overall study status Completed	<input type="checkbox"/> Statistical analysis plan <input type="checkbox"/> Results
Last Edited 11/02/2025	Condition category Cancer	<input type="checkbox"/> Individual participant data <input type="checkbox"/> Record updated in last year

Plain English summary of protocol

Background and study aims

Breast cancer is a leading cause of cancer-related mortality among women worldwide, accounting for approximately 600,000 deaths annually.

There is a need for rigorous large-scale studies to assess the performance of artificial intelligence (AI) for the diagnosis of breast cancer from breast scans (mammography). This should be done on diverse cohorts of women across multiple screening sites and on unenriched data representative of a true screening population.

The aim of this study is to evaluate the performance of a novel AI system in detecting breast cancer on diverse cohorts and unenriched data representative of a true screening population.

Who can participate?

Being a retrospective study, no participants are directly involved in the study, and there will be no effect or change to any participant's care. The study will evaluate the AI system based on its analysis of historical, de-identified cases from study sites where outcomes data (e.g. biopsy, histopathology results, follow-up information) is also collected.

What does the study involve?

Eligible cases will be presented to the AI system for analysis.

What are the possible benefits and risks of participating?

No benefits or risks of participating are anticipated.

Where is the study run from?

Kheiron Medical Technologies (UK)

When is the study starting and how long is it expected to run for?
March 2021 to December 2023

Who is funding the study?

The study is funded by an AI Award, awarded to Kheiron Medical Technologies, by the Accelerated Access Collaborative (AAC) in partnership with NHSX and the National Institute for Health Research (NIHR) (UK)

Who is the main contact?

Dr. Annie Ng
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Contact information

Type(s)

Scientific

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Additional identifiers

Clinical Trials Information System (CTIS)

Nil known

Integrated Research Application System (IRAS)

304086

Protocol serial number

KMT004, IRAS 304086, CPMS 50959

Study information

Scientific Title

A retrospective multi-centre clinical study of a novel medical technology solution in the assessment of mammography images

Acronym

ARIES

Study objectives

The primary aim of this study is to evaluate the performance of Kheiron's software, Mia, in detecting malignancy to determine its effectiveness to serve as decision support in breast screening in a multi-centre setting.

Assessing the standalone behaviour of Mia characterises the contribution it could have as an independent reader in the overall double reading workflow. Assessing simulated double reading performance with Mia in various workflows enables the evaluation of Mia as an independent reader within various double reading configurations and workflows in breast screening.

Ethics approval required

Ethics approval not required

Ethics approval(s)

Ethics approval not required as the research is limited to the use of previously collected, pseudonymised data.

Study design

Retrospective multi-centre clinical study of a CE marked medical device

Primary study design

Other

Study type(s)

Screening

Health condition(s) or problem(s) studied

Decision support in breast cancer screening

Interventions

The intervention is the sponsor's deep learning software (Mia), assessed on de-identified randomised retrospective breast screening cases and outcomes. Comparison is made against the control arm of existing reference outcomes within the retrospective dataset where the deep learning software was not in use.

Intervention Type

Device

Phase

Not Applicable

Drug/device/biological/vaccine name(s)

Mia

Primary outcome(s)

Sensitivity of the standalone case-wise malignancy detection performance of Mia, measured as the number of positive cases recalled divided by the total number of positive cases, over the full study dataset time period. Specificity of the standalone case-wise malignancy detection performance of Mia, measured as the number of confirmed negative cases not recalled divided by the total number of confirmed negative cases, over the full dataset time period.

Key secondary outcome(s)

Current secondary outcome measures as if 17/07/2023:

1. Measurement of relevant clinical metrics for Mia standalone and descriptives of cancer subtypes that Mia picks up to understand Mia's contribution to double reading.
2. Comparison of Mia standalone and the historical first reader to understand differences in how their performance contributes to double reading.
3. Measurement of relevant clinical metrics, including resource/workload savings, and descriptives of cancer subtypes picked up in double reading workflows that incorporate Mia as an independent reader, to understand the performance of each workflow and to inform future health economic assessments.
4. Comparison of double reading workflows with and without Mia on clinically relevant metrics to understand differences in performance.
5. Comparison of double reading workflows with Mia against UK national guidelines to assess if guidelines thresholds would be met if Mia was used in double reading.
6. Secondary outcomes will also include performance stratified by region/site and ethnicity to confirm generalisability.

Previous secondary outcome measures:

1. Recall rate, negative flag rate, cancer detection rate, sensitivity, specificity, interval cancer rate, positive predictive value, percentage of interval cancers recalled, area under the receiver operating characteristic curve will be measured for Mia's standalone performance over the study dataset time period and a selected one year period with the most complete data
2. Recall rate, cancer detection rate, sensitivity, specificity, interval cancer rate, positive predictive value, arbitration rate will be measured for various simulated double reading workflows with Mia over the study dataset time period and a selected one year period with the most complete data
3. Non-inferiority and superiority and associated absolute and relative differences between Mia standalone against the historical first reader will be measured for cancer detection rate, sensitivity, specificity, for either the study dataset time period or a selected one year period with the most complete data
4. Non-inferiority and superiority and associated absolute and relative differences between simulated double reading with Mia against historical double reading will be measured for cancer

detection rate, sensitivity, specificity, recall rate, for either the study dataset time period or a selected one year period with the most complete data

Completion date

31/12/2023

Eligibility

Key inclusion criteria

1. Female participants
2. Participants attending for breast screening purposes (normal and opportunistic screening)*
3. Participants for whom a 2D FFDM standard four-view mammography examination was acquired (MLO-R, CC-R, MLO-L, CC-L)

* Includes: 1) early recall cases (e.g. participants brought back for screening earlier than the established screening interval); and 2) participants of UK age extension trial (AgeX).

Participant type(s)

Patient

Healthy volunteers allowed

No

Age group

Adult

Sex

Female

Key exclusion criteria

Does not meet inclusion criteria

Date of first enrolment

31/01/2022

Date of final enrolment

30/06/2023

Locations

Countries of recruitment

United Kingdom

England

Study participating centre

North London Breast Screening Programme (Royal Free London NHS Foundation Trust)

Pond Street

Hampstead

London
United Kingdom
NW3 2QG

Study participating centre
Gateshead Breast Screening Unit
Queen Elizabeth Hospital
Shrieff Hill
Gateshead
United Kingdom
NE9 6SX

Study participating centre
North East Devon Breast Screening Programme
Royal Devon and Exeter NHS Hospital Foundation Trust
Barrack Road
Exeter
United Kingdom
EX2 5DW

Sponsor information

Organisation
Kheiron Medical Technologies (United Kingdom)

ROR
<https://ror.org/01r3ct535>

Funder(s)

Funder type
Government

Funder Name
Accelerated Access Collaborative (AAC) in partnership with NHSx and the National Institute for Health Research (NIHR)

Funder Name

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated and analysed during the current study will be available upon request from science@kheironmed.com. Data will be shared according to a data-sharing plan.

IPD sharing plan summary

Available on request