Transforming Cancer diagnosis through technology and AI

An Innovation Exchange Webinar presented by the Health Innovation Network and the South East London Cancer Alliance

Wednesday 17 November, 2021 – 9.00-10.30am

Health Innovation Network South London

NHS South East London Cancer Alliance

Agenda

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9.00-9.05	**Introduction from Chair** **South East London Cancer Alliance**	**Anthony Cunliffe** *Macmillan National Clinical Adviser for Primary Care* *Macmillan Lead Clinical Adviser and Clinical Adviser for London* *Joint Clinical Chair, South East London Cancer Alliance*
9.05-9.10	**Health Innovation Network**	**Lesley Soden** *Programme Director – Innovation Theme, Health Innovation Network*
9.10-9.25	**Kheiron Medical** **Presentation:** Machine Learning and AI, what is it, and how can it be used in diagnostics for cancer detection? A case study from Kheiron Medical Technologies.	**Dr Jonathan Nash** *Medical Director for UK and Ireland at Kheiron* **Alan Martyn** *Machine Learning Engineer at Kheiron* **Simon Harris** *Senior Project Manager for the NHSx AI Award at Kheiron*
9.25-9.35	**Two 3-minute pitches**	
	Behold Simon Rasalingham CEO & Chairman	Behold.ai is the first CQC registered AI company. Our regulated company brings AI technologies to radiology departments in the NHS to support the accelerated diagnosis of acute, chronic and healthy patient examinations.
	Ibex Richard Nicholson Sales Director	Ibex Galen Platform - An Integrated AI-powered diagnostics application for prostate and breast biopsies.
9.35-9.45	**The SELCA Rapid Diagnostics Clinic** **Presentation:** South East London Rapid Diagnostic Clinic- Research and innovation.	**Geraint Jones** *RDC Programme lead for SELCA* **Maria Monroy Iglesias** *PhD student/Research Assistant, Translational Oncology and Urology Research (TOUR) group at KCL.*

9.45-9.55	**Two 3-minute pitches**	
	Pinpoint Data Science **Dr Nigel Sansom** *Executive Chairman*	The PinPoint Test is a decision support tool for clinicians. A stratification, prioritisation, safety netting and triage test for NHS cancer patients using data from a single blood draw, running on existing NHS IT/laboratory testing systems under NHS control.
	Skin Analytics **Sarah Blank** *Director of Business Development* **Dan Mullarkey** *Medical Director & practicing NHS GP*	Skin Analytics creates AI products to enable innovative Dermatology pathways within the NHS. Skin Analytics has created DERM Decision Support and DERM Decision Support Hub Access, decision support products that both use a Class I medical device to help clinicians classify 11 different lesion types including the most common malignant, pre-malignant, and benign lesions.
9.55-10.10	**Odin Vision** **Presentation:** A New Era of Cloud AI Enabled Endoscopy: Odin Vision's CADDIE AI system supports doctors in the detection and characterization of polyps during colonoscopy.	**Peter Mountney** *Odin Vision*
10.10-10.25	**Panel discussion and Q&A session**	Speakers and company representatives
10.25-10.30	**Closing remarks**	Chair

Follow the hashtag #CancerDiagnosisAI for all of the action from our event and to join in the discussion.
@NHS_SELCA @HINSouthLondon

KHEIRON
MEDICAL TECHNOLOGIES

Transforming cancer diagnostics through the power of deep learning to give every patient the best fighting chance against cancer

Kheiron develops cutting-edge deep learning solutions that support radiologists to improve cancer detection

By combining data science, clinical rigour, and human expertise, our solutions help radiology departments become more **effective and efficient,** overcome resource challenges, and improve patient experience.

Click here to find out more

Patient safety and clinical rigour are our priority.

Through our work with world-renowned radiologists and leading academic and healthcare institutions, we are setting the standard for clinical rigour. Within breast radiology AI, our robust, independent, global clinical studies are unprecedented in size and scale, and use real-world healthcare data to ensure our solutions work to the same standard on diverse patients and in different clinical settings.

Click here for our pre-print request form

Our initial focus is breast cancer, and our award-winning AI breast screening solution is called Mia®. A suite of solutions, Mia is designed to support clinicians to deliver **confident, accurate and timely results to every woman, everywhere.**

Mia®
By Kheiron Medical

Click here for more information on Mia

With offices in the UK, US, the Netherlands and Hungary, **we are an international, multi-disciplinary team** of senior radiologists and clinicians, leading academics, health and tech industry experts, engineers, deep learning scientists and Silicon Valley scale-up veterans.

Click here to meet the team

First UK company to receive **CE mark** for a deep learning software in radiology

Expert radiologists on staff

Employ and work with breast cancer **survivors**

Partner with **leading global** institutions

Generalisable AI solutions

KHEIRON
MEDICAL TECHNOLOGIES

To learn more about how Kheiron is developing AI to transform cancer diagnostics.
Visit kheironmed.com or email info@kheironmed.com

behold.ai

WHAT IS RED DOT®?

Put simply, red dot® is an artificial intelligence algorithm that processes chest X-rays (CXRs) and almost instantly returns a result for the purpose of triage and diagnosis.

AUTONOMOUS REPORTING OF NORMAL CXRS

red dot® can remove 15% of all CXRs from the reporting workload **with only 0.33% error rate**, based on a peer reviewed validation of 'rule out normal'. CE mark to enable clinical use is in place.

- A peer reviewed retrospective validation of rule-out normal was conducted across 4 NHS sites with 3,997 CXRs
- 15% of all CXRs can be removed having been identified as normal with a high degree of confidence, with a 0.33% error rate
  - Urgent finding error rate was only 0.1%
  - This compares to the equivalent clinician miss rate of 13.5%

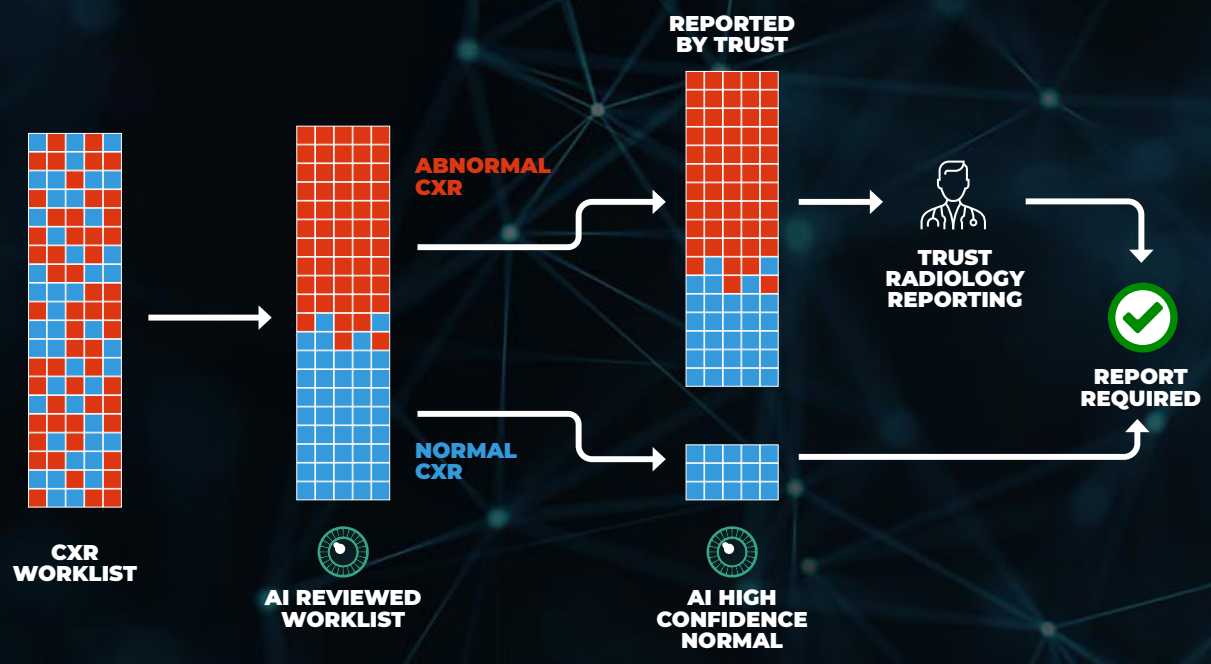
To deliver the highest standard in clinical safety, behold.ai will perform a 100% audit of examinations autonomously reported using GMC registered FRCR consultant radiologists.

As "the radiologist workforce will be understaffed by 43% by 2024" and "only 1% of NHS Trusts ... are able to report all scans within radiologists' contracted hours" (RCR 2019), behold.ai's red dot® can save Trusts costs vs existing outsourcing arrangement.

15%
CXRS SAFELY REMOVED FROM NHS TRUST BACKLOG BY RED DOT®

0.33%
ERROR RATE

0.1%
URGENT FINDING ERROR RATE VS CLINICIAN MISS RATE OF 13.5%

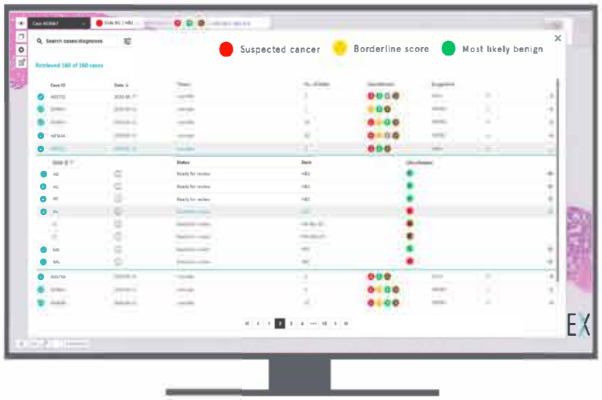


IBEX

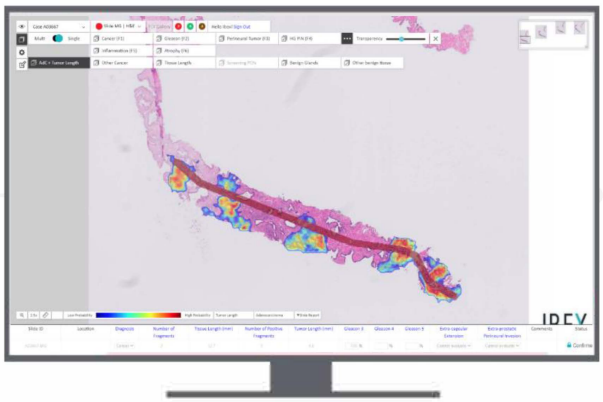
The Galen™ Platform

The First Read Application: AI Integrated Diagnostics

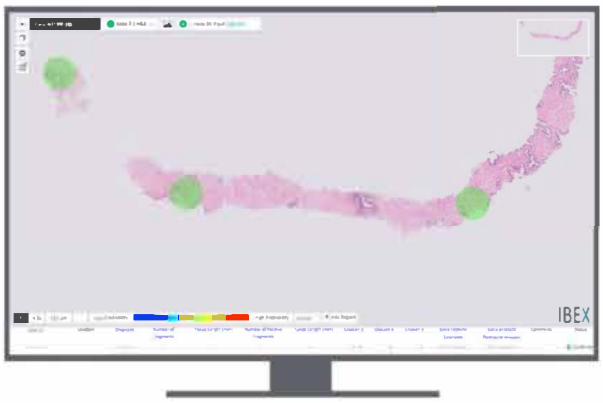
- Real time quality diagnosis
- Aimed at reducing turnaround times, improving productivity and lab efficiency gains
- AI-powered diagnostic tools: Worklist, slide viewer, AI-supported triage, grading, measurements and reporting
- Strong AI algorithm detecting cancer and beyond
- Clinical grade: Highest reported accuracy in the field, sensitivity for prostate cancer detection >99%[1]



AI-BASED WORKLIST



CANCER HEATMAP AND MEASUREMENTS



POINTS OF INTEREST

Outstanding Diagnostic Productivity[1]

Efficiency Gains

Diagnosis	Cases	Average Time (AI vs. microscope)
Benign	34	-32%
Cancer	85	-25%

Case Turnaround Time

Diagnosis	Cases	Average Time
Microscope	238	1.8 days
Galen Prostate	217	9.4 min

37% INCREASE IN PRODUCTIVITY

1) Data from a study on Galen Prostate at Medipath, France, presented at USCAP 2021

WWW.IBEX-AI.COM

Current Situation

The COVID-19 pandemic has created a backlog of patients in need of investigation whilst diagnostic capacity continues to be reduced (by as much as 50% in some centres). Delayed investigation of cancer symptoms can lead to later stage diagnosis, stage-shift and an increase in lives lost. NHS Trusts lack the time, money, facilities and specialist staff to procure, house and run new diagnostic equipment. Hence, the COVID-19 backlog is a challenge to clear.

The PinPoint Test

- A machine Learning algorithm that rapidly triages symptomatic patients who might have cancer
- It was developed with NHS and academic partners, and is performed in NHS labs
- A low cost blood test which 'red-flags' symptomatic patients with the highest chance of cancer
- CE-marked for 98% of the NHS Two Week Wait (2WW)
- Connects to any NHS lab, and has overcome the key systems integration and Information Governance issues
- Currently undergoing a large Service Evaluation in Yorkshire & Humber
- Starting an SBRI award involving 3 AHSNs and 5 Cancer Alliances from NIHR and the NHSE National Cancer Team for a large scale up project in December 2021

What is the problem with the current standard of care?

- At its inception in 2010, the 2WW pathway received 1 million referrals. This has grown to over 2.5 million referrals at a rate in excess of 10% year on year, at a cost of ~ £1.5 billion.
- 93% of referrals thankfully do not have cancer but there is currently no reliable alternative to triage and prioritise patients with the greatest need.

Conclusions:

- Getting the test into routine use as soon as possible will help the NHS deal with the mounting backlog.
- Support from the AHSNs, Cancer Alliances, ICS clinicians, NIHR and the National Cancer Team, is getting us closer to realising this goal.

Collaborators

The PinPoint team has collaborated with a number of eminent clinicians, including Professor Sean Duffy, a former National Clinical Director for Cancer, and Professor Richard Neal, a professor of primary care oncology. Professor Peter Selby CBE is the Honorary Chair of the Scientific Advisory Board.

Context

Skin cancer is the most common cancer in the UK[1] with more referrals in 2019/20 in the NHS than for any other cancer[2]. However, referrals and cancer rates have not grown linearly. As over the past 10 years, referrals have increased 5x faster than cancer rates[3]. Today, the NHS faces a shortage of dermatologists, with an estimated a shortfall of over 250 Dermatologists across the UK in 2015[4].

To address this, many clinical organisations have implemented teledermatology solutions, which is a great step in the right direction, but still relies on the overburdened NHS workforce. Artificial Intelligence has the ability to sustainably transform skin cancer pathways in the NHS as it offers the prospect of discharging benign referrals without relying on trust dermatologists.

Who Is Skin Analytics?

Skin Analytics is a solutions partner that creates AI products to enable innovative Dermatology pathways within the NHS. Skin Analytics has created DERM Decision Support and DERM Decision Support Hub Access, decision support solutions that both use a Class I medical device to help clinicians classify 11 different lesion types including the most common malignant, pre-malignant, and benign skin lesions.

Founded in 2012 in the UK, Skin Analytics has published 6 papers including the world's first prospective study for machine learning in dermatology published in JAMA. DERM is a registered Class I UKCA and CE marked medical device and all Skin Analytics products comply with DCB 0129 and have been built in line with data protection best practice.

Skin Analytics is a member of the NHS Innovation Accelerator, is an alumnus of the DigitalHealth.London Accelerator, and has recently been awarded as a winner of NHS AI Lab's Artificial Intelligence in Health and Care Award.

Pathway Deployments

Skin Analytics builds products to enable innovative dermatology pathways, so can be deployed across a variety of pathways. A few popular pathways include:

1. AI-supported teledermatology hubs (deployed at University Hospitals Birmingham)
2. GP practices (deployed at Mid and South Essex Health and Care Partnership)
3. Community Diagnostic Hubs (in discussions for deployment)

Impact

Today, Skin Analytics solutions are deployed at University Hospitals Birmingham, West Suffolk NHS Foundation Trust, and Mid and South Essex Health and Care Partnership. Over the past year+ of live deployments, Skin Analytics has assessed over 13,000 patients. In primary care, Skin Analytics can help clinical organisations safely reduce GP potential 2ww referrals by 50%; while in secondary care, the Skin Analytics service has safely discharged 20% of 2ww referrals without needing NHS dermatologist review. In addition, Skin Analytics teledermatology features have enabled NHS dermatologists to reduce 2ww to face appointments by just under 50%, with a pathway that is 99.97% sensitive.

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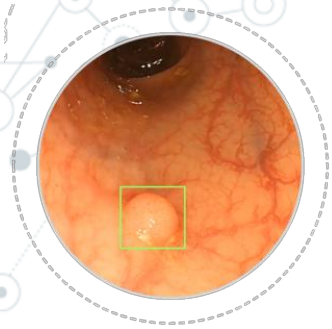
[1] https://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type
[2] https://www.england.nhs.uk/statistics/wp-content/uploads/sites/2/2020/07/Cancer-Waiting-Times-Annual-Report-201920-Final.pdf
[3] http://www.ncin.org.uk/cancer_type_and_topic_specific_work/topic_specific_work/tww_conversion_and_detection
[4] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4953248/



CADDIE

Computer Aided System for Endoscopy
Powered by Artificial Intelligence

Colorectal Cancer (CRC)

CRC is a leading cause of cancer related deaths. Colonoscopy is the gold standard procedure for detecting and diagnosing CRC, however, up to 25% of polyps are missed[1]. A 1% increase in adenoma detection rate is associated with a 3% decrease in the risk of cancer[2].

Artificial Intelligence (AI)

CADDIE is a real-time AI support tool for colonoscopy. It has been trained on endoscopic videos of colorectal lesions including small, large and flat polyps with the aim of helping doctors to perform high quality colonoscopy.

Detect: CADDIE highlights regions of tissue that have the visual appearances of polyps. The area of interest is visualized on the live endoscopic video stream with a bounding box and accompanied with an audio alert.

Characterise: CADDIE analyses the visual characteristics of polyps and provides supporting information to aid the user to characterise the tissue as adenoma or non-adenoma. CADDIE is a support tool for optical diagnosis and not a replacement for histopathology.

Quality:
Like a doctor, CADDIE can only analyse the tissue it sees and it cannot evaluate mucosa hidden by poor bowel preparation. To help users get the most benefit from CADDIE, live information is provided on the percentage of visible mucosa in the endoscope's field of view.

CADDIE reminds the user to turn on detection once they have identified the caecal anatomy (appendiceal orifice) ahead of the withdrawal phase.

Easy to Use

CADDIE has a simple and intuitive user interface that has been created for real-time AI support. It has been designed to fit seamlessly into the clinical workflow and is compatible with existing endoscopy equipment.
Flexible Deployment: Local computer and cloud computing. The CADDIE software can run on a computer in the endoscopy room or by streaming information to a secure real-time, cloud computing service.

[1]Rex, Douglas K. "Colonoscopic withdrawal technique is associated with adenoma miss rates." Gastrointestinal endoscopy 51.1 (2000): 33-36.
[2]Corley, Douglas A., et al. "Adenoma detection rate and risk of colorectal cancer and death." New England journal of medicine 370.14 (2014): 1298-1306

Contact Us:

Health Innovation Network
@HINSouthLondon
healthinnovationnetwork.com

South East Cancer Alliance
@NHS_SELCA
www.selca.nhs.uk