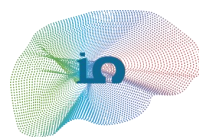




i5 Analytics

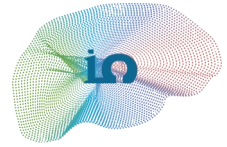
Future of Artificial Intelligence in Healthcare Planning





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Foreword

The use of **“smart” Artificial Intelligence** (AI) technology is one of the key new methods now helping the **healthcare sector** manage future needs and costs.

On a broader level, the whole issue of using AI in healthcare delivery and analysis has been brought into sharp focus globally in the past couple of years.

McKinsey reports that AI is one of the current megatrends emerging from the broad digitalization of society and the economy. These ‘smart’ technologies have mainly attracted the attention of e-businesses, consumer goods sectors and the motor industry. A similar development is now taking place in the healthcare sector.

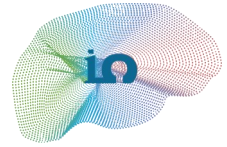
Accenture believes AI is a “self-running engine” for growth in healthcare. According to its analysis, health applications can potentially create 150 billion USD in annual savings for the US healthcare economy alone by 2026.

PwC concludes that: “Unprecedented increase in the volume of patient healthcare data has left the industry struggling to put that data into practical use. Artificial Intelligence (AI) ,with its capability to draw ‘intelligent’ inferences based on vast amounts of raw data, may hold the solution. Follow the money and you’ll see big bets on healthcare AI across the globe: 63% of healthcare executives worldwide already actively invest in AI technologies, and 74% say they are planning to do so”.



i5 AI systems are transferrable IT solutions which combine healthcare data and Artificial Intelligence to provide preliminary diagnosis, outcome prediction, service recommendations and health economy planning.

Our systems can either be plugged into existing databases as a **software solution** (no data sharing is required) or provide sophisticated predictive analytics **reports** based on the billions of healthcare records on which the systems have been trained.

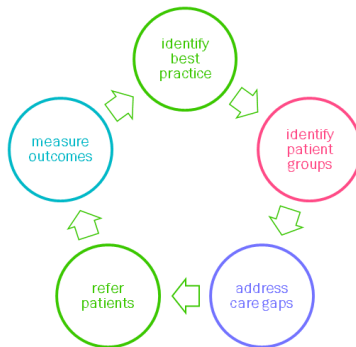


i5 Artificial Intelligence (AI) Systems

How can i5 AI systems be used?

i5 AI systems have been successfully used in the UK through the entire cycle of healthcare in population health management:

- **identification of best practice** delivered by the healthcare organisations to get it right first time
- **matching patient groups** that will benefit from local services by supporting planning and implementation
- **addressing care gaps** in pathways and developing new packages of care

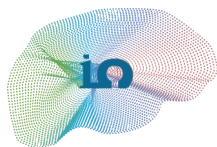


i5 AI systems provide support throughout the entire cycle of healthcare, from identifying best practice and patient groups, addressing care gaps and referring patients to optimum services to measuring outcomes.

What are the benefits of i5 AI systems?

i5 AI systems have been successfully used by service providers and strategic decision makers across the UK for:

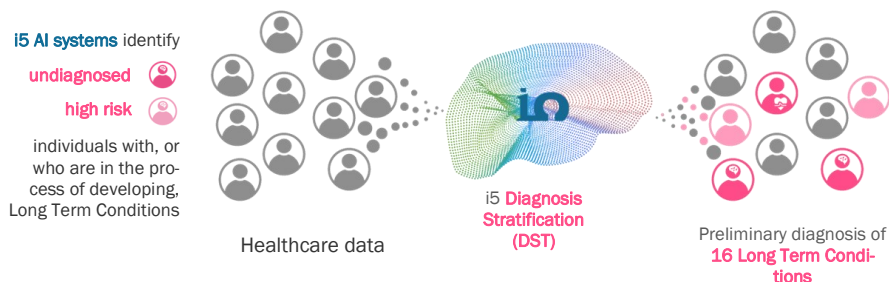
- preliminary diagnosis of 16 long term conditions
- improved targeted screening
- transition from 'emergency' care to 'preventative' care
- matching patients to optimum services
- providing instant solutions for local health economies
- optimising healthcare resources to improve efficiency and value



i5 Artificial Intelligence (AI) Systems

Preliminary Diagnosis

i5 AI identifies individuals for targeted screening to prevent unnecessary suffering and expensive secondary care treatment.

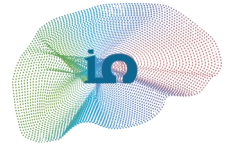


i5 Diagnosis Stratification (DST) is an Artificial Intelligence and algorithm based decision support tool that can identify undiagnosed patients with a high likelihood of having, right now or at some date in the near future, a Long Term Condition (LTC). This **Population Health Management (PHM)** approach to finding **undiagnosed populations** uses patient medical history and calculates the probability that the patient has an LTC. The results can be used by GPs and hospital clinicians to identify patients suitable for clinical reviews and targeted screening programmes.

Impact Evidence

Haringey **AF Register**
Increased by **115%**

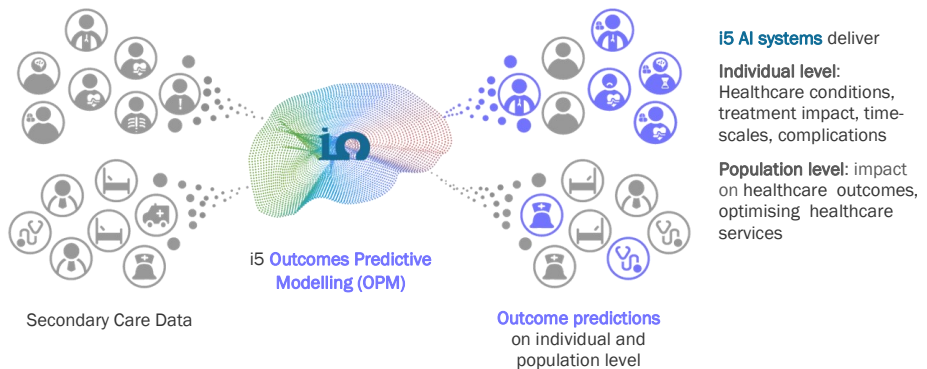
i5 Diagnosis Stratification (DST), in collaboration with Helicon Health, have identified 363 untreated individuals with Atrial Fibrillation (AF, AFib) and 2,310 undiagnosed high risk individuals in the Haringey district of London, increasing the potential AF Haringey register by 115% in 2017/18.



i5 Artificial Intelligence (AI) Systems

Outcome Prediction

i5 AI searches through data to predict outcomes like treatment waiting time, hospital length of stay, complications and readmissions.

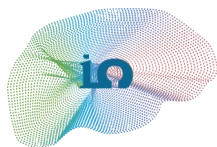


Effective service planning is dependent on a full understanding of Long Term Conditions and co-morbidities and their impact on healthcare outcomes. Analysis of these factors allow decision makers to optimise local healthcare services to make best use of available budgets while also ensuring the best possible healthcare outcomes for patients. **i5 Outcomes Predictive Modelling (OPM)** interrogates secondary care data at either the **population level** or the **individual level** to predict outcomes such as treatment waiting time, hospital length of stay (LoS), complications and readmissions.

Impact Evidence

i5 Outcome Predictive Modelling (OPM) has predicted A&E attendance tendencies for 1,210,584 individuals one week in advance for the Sussex region in England.

Predicting over
**1,2million A&E
Attendances in
Sussex**

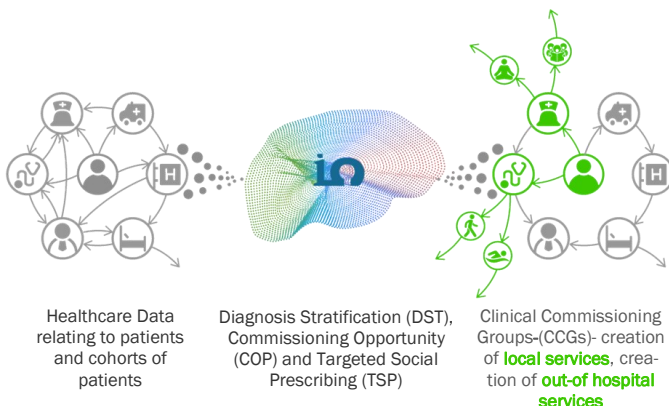


i5 Artificial Intelligence (AI) Systems

Services Recommendations

i5 AI provides evidence for out-of-hospital initiatives and provides decision support for clinicians referring patients in more appropriate and often cheaper services.

i5 AI systems identify opportunities for local healthcare services including out-of-hospital initiatives



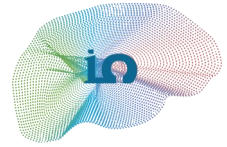
i5 AI systems provide candidates and evidence for out-of-hospital services and support clinicians in referring patients into the most amenable services. **i5 Targeted Social Prescribing (TSP)** is based on AI that incorporates this approach into Population Health Management (PHM).

TSP AI algorithms match patient groups to social prescribing services and interventions. Patient cohorts that will most benefit from a specific social prescribing intervention are identified based on best practice evidence.

Impact Evidence

£3.45m per year savings to healthcare economy in one district of Liverpool

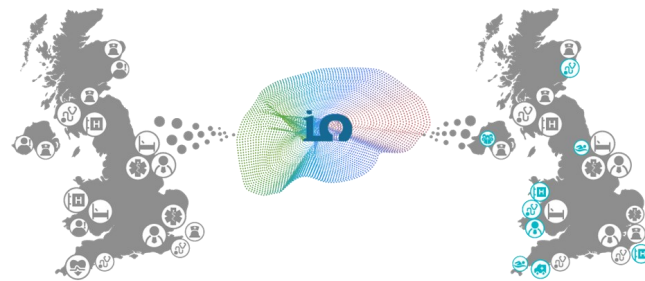
In one district of Liverpool, i5 AI systems have provided evidence for 25 initiatives for improvement providing £1.95m of savings in one year. They have also identified alternatives for overspending in Cardiology, Mouth/ Head/ Neck & Ears, Orthopaedic Non-trauma and Urology interventions to save a further £1.5m per year to the local healthcare economy.



i5 Artificial Intelligence (AI) Systems

Healthcare Economy Planning

i5 AI analyses healthcare needs of patients and supports changes to better align services to patients' needs and reduce overall costs.



Hospital activity, workforce figures, prescribing data, demographic data, patient safety data, etc.

i5 AI systems

48 digital initiatives

Such as: virtual triage, e-consultations, AI decision support, electronic alerts, big data, self management tools, etc.

i5 AI systems evaluate various healthcare and demographic data to review and forecast the impact of new services.

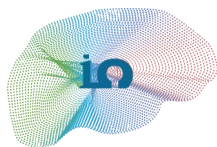
Services in a health economy are often not aligned with the clinical and non-clinical needs of the population. By utilising AI and expert systems that understand the healthcare needs of individuals, health economies can be aligned to match patients' needs.

The **i5 Commissioning Opportunity (COP)** module facilitates such transformations by automatically matching hundreds of successful healthcare initiatives at patient level to calculate their applicability for referral into a specific service.

Impact Evidence

i5 AI systems have identified 48 Digital Initiatives for London which will provide £3bn recurring annual savings in the 10th year of implementation. These digital initiatives result in reduction in workforce, increase in available capacity in Primary Care, A&E and hospitals, and reduction of hospital admissions and hospital bed days.

£3bn savings from 48 digital initiatives for London



i5 Artificial Intelligence (AI) systems

Summary

i5 AI systems combine healthcare data and Artificial Intelligence.

We offer three principal services: Diagnosis Stratification (DST), Commissioning Opportunity (COP) and Targeted Social Prescribing (TSP) which apply to **preliminary diagnosis**, **outcome prediction**, **service recommendations** and **health economy planning**.

i5 AI systems can either be plugged into an existing database as an IT tool or can directly create highly sophisticated and actionable reports based on the knowledge and experience they have been trained on.

In addition, i5 products and services include an IT platform for collaboration called the Commissioning Suite ("Csuite"), Invoice Validation, Medicines Management, Referral Facilitation and Hospital Merger support.

i5 currently supports a quarter of NHS commissioning organisations and NHS England itself. i5 AI systems can be applied to more than 100 WHO member countries around the world which are using standardised ICD-10 and OPCS coding systems.

Benefits for Patients



Diagnosis and management of previously **undiagnosed conditions**

Promotion of **adherence**

Participation in **targeted screening** programmes

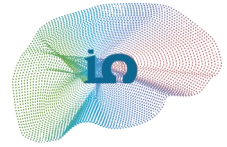
Tailored **treatment** plan and services

Optimised medications and improved **self care**

Reduction of dependency on **clinical and drug solutions**

Creation of mutual **support groups** (e.g. walking, singing, dancing)

Encouraging of **self management**



i5 Artificial Intelligence (AI) systems

Benefits for Service Providers



Diagnosis of patients with LTCs to **improve population health**

Patient activation to **promote self care**

Pro-active care management

Better outcomes for patients that do not engage with Primary Care

Reduction in urgent care activity through pro-active patient care

Minimising of resource burden

Reduction of clinically avoidable **readmissions**

Easing pressure on limited clinical **resources**

Enabling provision of **joined-up care** with Primary Care

Avoiding non-payments on contractual caps

Reduction of Primary Care surgery appointments

Reduction of Emergency Department (ED) and Outpatient (OP) attendances

Provision of **patient lists** to Primary Care and link workers

Benefits for Strategic Decision Makers



Identification of **transformation opportunities**

Improved management of patients with multiple co-morbidities

Disease group based **care management**

Identification and implementation of **new models of Primary Care**

Activation of patients and healthcare professionals

Reduction in costs through better patient management

Navigating population data using online tools and cost calculators

Identification and management of **high cost patients**

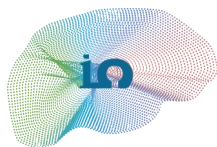
Facilitation for service **reviews** and service **re-configuration**

Support for business cases based on the needs of the population

Economic evaluations including ROI and benefits realisation

Optimisation of health care resources

Annual **monitoring of outcomes** by reviewing specific patient cohorts



i5 support for National Systems

Many governments and administrations are now implementing programmes designed to address the present-day challenges of population growth, increased longevity and the increasing prevalence of Long Term Conditions together with the substantial costs which they incur. i5 offers AI products and services designed to ideally complement such initiatives. Broadly speaking, i5 envisages **three stages of assistance**:

Stage 1 - Information Review

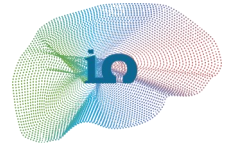
The objective here is to evaluate **data quality and structures** in the health economy to ensure that the forecasting ability of AI systems is optimised. In order to do so, i5 will review health data systems by engaging with information stakeholders and reviewing data collection structures, coding schemes, update intervals and data quality. i5 can support local health professionals in creating data collection systems that are **future-proofed and suitable for AI**. The output will take the form of an **Information Review** report, which incorporates a **Data Quality Assessment**.

Stage 2 – Training of i5 Artificial Intelligence

The aim here is to prepare the **machine learning systems** to suit prediction needs. i5 collects the Use Cases of the national or local strategic teams and clinicians and translates these into machine learning algorithms. In circumstances where local data is sparse, i5 will identify suitable training cases from other health economies, e.g. U.K., U.S., India, etc. and add them to the process to increase efficacy. A **data sheet** outlining training, testing and the prediction performance will be provided for benchmarking. Maintenance of the AI system includes the capture of new local data and the re-training of the system to improve performance. The output will be a **trained AI system ready for integration**.

Stage 3 – Integration of i5 Artificial Intelligence

The trained AI system can either be **hosted by i5 as a cloud service** in the relevant country or be **incorporated into the local IT infrastructure**. Cloud services hosted in the country will be provided through a partnership model involving the data collection organisation. Support will be provided on the **integration of AI into local databases or into the server code stack**. The output will be information on how to **use trained AI from a hosted web service** or on how it might be **wrapped into programming code** for local database integration.



i5 customers

Recipients of i5's services range from **Clinical Commissioning Groups (CCGs)** and **Commissioning Support Units (CSUs)** from the North West of the country through the Midlands and across East Anglia into Kent - as well as all the CCGs and Sustainability and Transformation Partnerships (STPs) in London. i5 has also helped **over a dozen hospital trusts** in their merger planning.

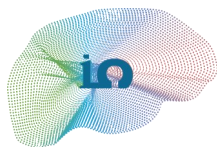
Customer response to i5 has been **very positive**. For example, the Director of Applied Analytics at a very large 'Commissioning Support Unit' (CSU) within the NHS covering a region from the North West of the country to the Midlands and across East Anglia wrote recently:

"i5 are a key partner for Arden & GEM CSU. Their tools and analysis are excellent and their insight into and understanding of the world of health and its data are key to bringing about real change and improved services for patients".

Its reputation is such that i5 was chosen to represent UK Healthcare data analytics at the world-famous **Arab Health Exhibition in Dubai** (29th January – 1st February 2018).



i5 Analytics representing Healthcare UK at the Arab Health 2018 in Dubai



i5 Health and Analytics Group

The firm i5 Analytics was set up as a specialist AI spin out from i5 Health founded in 2011. i5 uses its most up-to-date Big Data assets to develop revolutionary AI algorithms for the NHS and other Healthcare providers.

i5 Analytics Founders and Directors

Dr Harald Braun (Operations Director)



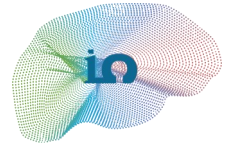
Harald has more than 25 years experience in the analytics and technology innovations field. He has a **PhD in Artificial Intelligence and Algorithms**, is certified in General Insurance by the London Chartered Insurance Institute and is certified by Microsoft in databases and software design and has a Dipl-Ing from Germany in digital communications systems.

He has spent the past **fifteen years in the service of the NHS**, more recently with i5 of which he is co-founder. He has led engagements for i5 in London, East of England, Sussex, Kent, Merseyside, the East and West Midlands, Liverpool City and the Middle East identifying areas for improvements through AI and advanced analytics resulting in better patient care. He has also previously worked as a scientist for the Humana Group, is the former senior IT architect for Xchanging for Lloyds of London in the reinsurance market and was developing algorithms for ratings agencies.

Keith Davies (Managing Director)



Keith has been the **CEO of multinational businesses** in the financial services and healthcare sectors and has extensive experience of business and governmental relations in the UK, Continental Europe, the Middle East, China, Australasia, the USA and Canada. Before Dr Braun and he set up i5, Keith was the **National Director at the UK Department of Health** missioned by the Secretary of State for Health to turn around the financial performances of one third of NHS organisations; the 'NHS Turnaround Programme' resulted in recurring savings of £1.36 billion per annum. Keith has also led a major healthcare consultancy contract for PwC Canada, helped develop PwC's Healthcare Advisory business throughout that country and headed up international business development for the Humana.



i5 partners



Public Health
England



Department for
International Trade

HealthcareUK

NHS

Department
of Health

IBM

pwc

Humana.

Arden&GEM

LONDON
COUNCILS

Healthy
London
Partnership

IBM Watson

NHS
Improvement

Melanoma
Institute Australia

NHS
The Leeds
Teaching Hospitals
NHS Trust

UNIVERSITY OF
OXFORD

Queen Mary
University of London

ALDWYCH PARTNERS

CITY UNIVERSITY
LONDON

NEL | Commissioning
Support Unit

Helicon Health™



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