Bwrdd Iechyd Prifysgol Hywel Dda University Health Board

PWYLLGOR DIGIDOL, DATA AC ARLOESI
DIGITAL, DATA AND INNOVATION COMMITTEE

DYDDIAD Y CYFARFOD: DATE OF MEETING:	07 October 2025
TEITL YR ADRODDIAD: TITLE OF REPORT:	Analytical and Modelling Work
CYFARWYDDWR ARWEINIOL: LEAD DIRECTOR:	Huw Thomas, Executive Director of Finance
SWYDDOG ADRODD: REPORTING OFFICER:	Anthony Tracey, Digital Director

Pwrpas yr Adroddiad (dewiswch fel yn addas) **Purpose of the Report** (select as appropriate)
Er Gwybodaeth/For Information

ADRODDIAD SCAA
SBAR REPORT

Sefyllfa / Situation

The Data Science team is part of Digital Services and has been undertaking several analytical and modelling projects within Hywel Dda University Health Board (HDdUHB). Data science is an interdisciplinary field that uses computer science, mathematics, and scientific processes to examine large amounts of data to uncover hidden patterns, generate insights, and help decision making. The mission of the Data Science Team is to support high quality decision-making for clinical, operational, and strategic services by using data science techniques. Underpinning this, the Data Science team operates using four core principles. Firstly, work must be evidence based, with transparent and reproducible methods. Secondly, any endeavours should be problem driven, otherwise any output will be useless if addressing the wrong question. Thirdly, collaboration is fundamental as data science will achieve little if the decision-making processes are not designed to embrace it. Finally, communication is essential; complex ideas need to be explained simply, and simple ideas mustn't be over complicated.

The purpose of this report is to provide a high-level information overview of some of the core projects the data science team have completed, along with current workstreams in progress.

Cefndir / Background

HDdUHB is experiencing numerous challenges across the organisation. Some of these may be mitigated through improved understanding and more effective use of available data. The data situation within HDdUHB is far from straightforward. While it can be observed that there appears to be an abundance of data, it is often the case data is poorly recorded, incomplete, incorrect and not always timely. Data often resides in different locations and controlled with varying standards. With the proliferation of digital tools there is a growing trend of services generating and storing their own data. These factors contribute to the difficulty in linking the data and extracting greater meaning. A key part of data science work is the foundational understanding of the data and how it can be appropriately linked. With appropriately combined data, advanced data science techniques such as forecasting, machine learning and

visualisation can be used to further explore whether previously hidden insight can be uncovered.

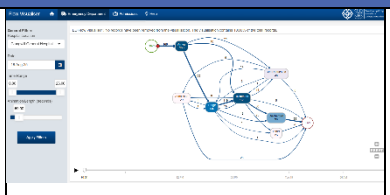
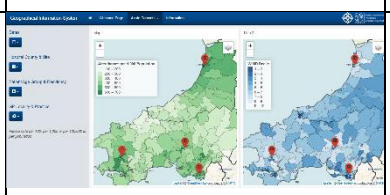
It is important to note the widespread use of the term Artificial Intelligence (AI). Its definition and meaning are often misused and commonly interchanged with existing technologies that are in fact not AI. There is not a universal definition of AI, but the Alan Turing Institute defines AI as any technology that imitates human intelligence or performs human tasks. The link to data science is that AI uses a subset of tools and technique from data science to build its technology.

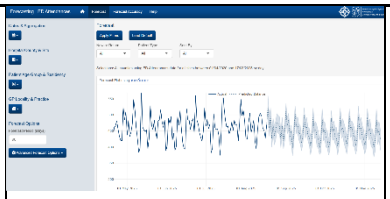
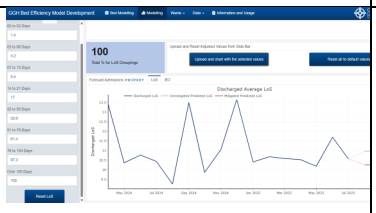
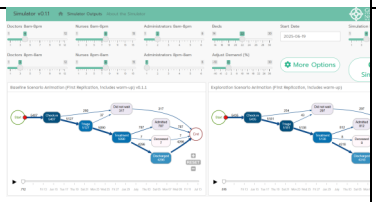
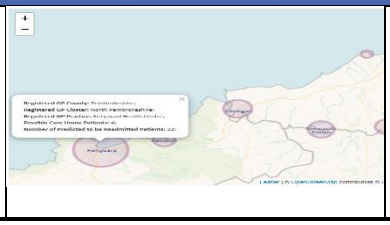
There are service areas within HDdUHB that could potentially benefit operationally or strategically from the use of data science. For example, any service that has uncertainty with demand and capacity can benefit from demand and capacity modelling for better service utilisation. Did Not Attends (DNA) for outpatient appointments remain challenging across the NHS, resulting in poor service utilisation and delayed care for other patients. It is also noted that HDdUHB must regularly submit annual plans to Welsh Government. Certain planning metrics are appropriate for data science forecasts, that can be used to influence change and monitor progress.

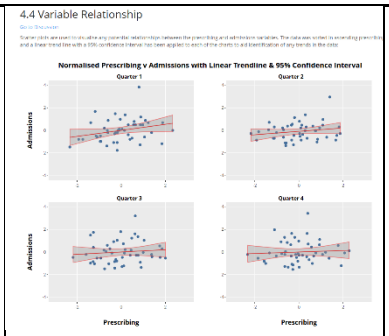
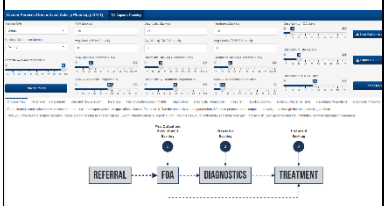
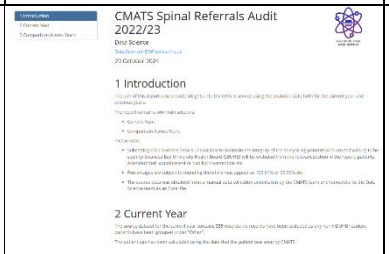
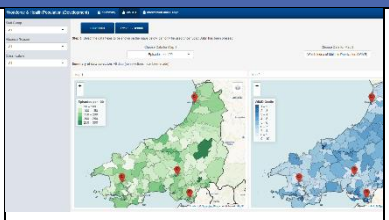
Data science is a rapidly evolving field offering potential significant advantages if deployed collaboratively internally. Developing and maintaining these relatively new skills in a workforce is challenging. HDdUHB has several academic partnerships with local universities. This facilitates the sharing of cutting-edge research from universities to HDdUHB, also fostering the possibility of talented university professionals working directly within HDdUHB. Furthermore, it highlights HDdUHB as a potential employer for students within these universities. The Data Science Team works closely with Aberystwyth and Swansea Universities. Currently there are two PhD's being undertaken, one from each of these universities. One is exploring the possibility of predicting of Emergency Department (ED) presentations and the other will research the development of a digital twin for prostate cancer. However, there is still a need to greater develop the core internal team, evolve the level of expertise and create a structure that can grow.

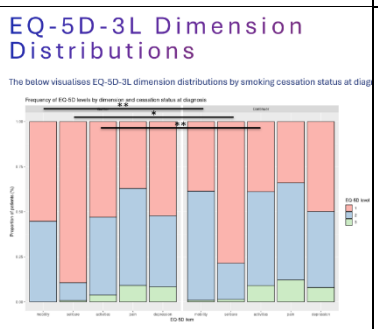
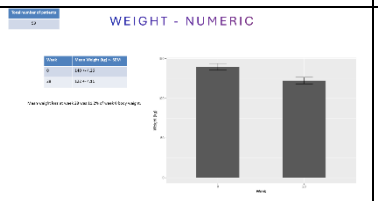
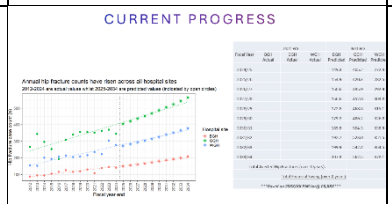
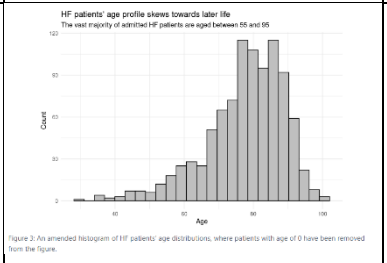
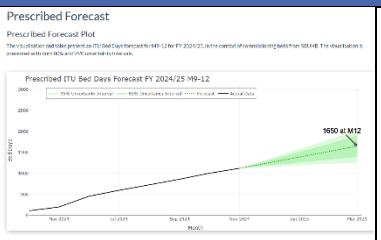
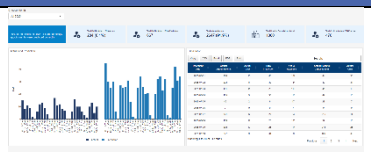
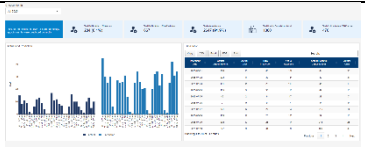
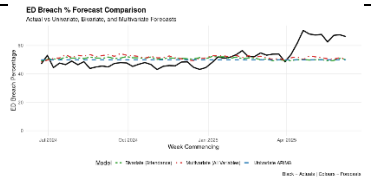
Asesiad / Assessment

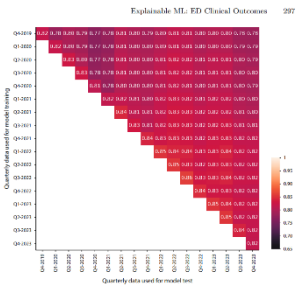
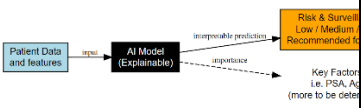
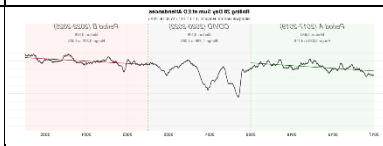
The following are some of the applications and outputs from the Data Science Team. Whilst not comprehensive, this list is an indication of currently available analytics and modelling.

Unscheduled Care		
Flow Visualiser (		Using time stamped data from Welsh Patient Administrative System (WPAS_, Flow Visualiser creates an animated representation of the data and how patients traverse through adminstrative nodes. Adminstrative data for ED and Admissions are present in this application.
Geographical Information System		ED attendance and Admissions from WPAS are represented geographically in this application. They can be compared alongside geographical deprivation indicators.

Forecasting		ED attendance and various aspects of Admissions from WPAS can be forecast with this application. Current datasets with forecast: • ED Attendances • Admissions • Average Length of Stay • Bed Occupancy (Actual) • Bed Occupancy (Midnight Count) • Discharges
TUEC Weekly Performance Report		The Transforming Urgent Emergency Care (TUEC) weekly performance report forecasts for the following measures: Emergency Department • Emergency department new attendances; • Ambulance new arrivals at an emergency department. Admissions • Emergency admissions via an emergency department; • Emergency patients with a LoS of 0 or 1 day; • Emergency patients with a LoS > 21 days; • Emergency Same Day Emergency Care (SDEC) attendances; • Emergency patients with a LoS of > 50 days & > 100 days (Activity only) Bed Occupancy • Occupied bed days for emergency patients with a LoS > 21 days; • Occupied bed days for emergency patients with a LoS >21 days as a % of total occupied bed days. Discharges • Discharges within 72 hours (emergency patients only).
Glangwili Hospital (GGH) Bed Efficiency Modelling		An application that can model the effect of changing the distribution of Length of Stay and Bed Occupancy.
Discrete Event Simulator - ED		A prototype simulator to test whether discrete event simulation can examine different planning scenarios within Emergency Department. This type of tool is better suited for planned care, or appointment based events.
Primary Care		
Admission Prediction Model		A monthly report predicting potential admission of patients. This report uses Machine Learning to examine historical WPAS administrative data of patient's past admissions and interaction with ED to predict whether it is likely they will be admitted in the next 28 days.

GP Antimicrobial Prescribing & Hospital Admissions		Overprescribing antibiotics can lead to antibiotic resistance, which is a global health threat. When bacteria become resistant to antibiotics, it leaves healthcare providers with fewer options, or sometimes no options, for treating bacterial infections. This can make common infections harder to treat and can accelerate resistance. Despite the direction to reduce antibiotic prescribing, there is thought amongst some GPs that higher antimicrobial prescribing reduces infection related hospital admissions. The aim of this work was to test this assumption by checking if there was a correlation between prescribing and hospital admissions within HDdUHB.
Planned Care		
Ophthalmology Outpatient DNA Prediction		An application that shows predictions for potential future DNAs within ophthalmology. The application uses an AI/Machine Learning (ML) model to generate predictions.
Cancer Capacity Planning		An application built off a national initiative to replicate similar solutions already built and deployed, within Aneurin Bevan Health Board, to enable Cancer Demand and Capacity planning.
Clinical Musculoskeletal Assessment and Treatment Service (CMATS) Spinal Referral Audit		The aim of this analysis is to provide insights into the CMATS service using the available data both for the current year and previous years. The report contains two main sections: • Current Year • Comparison Across Years
Workforce		
Workforce GIS		An application that can examine Health Board workforce data geographically and compare with known indicators such as the Welsh Index of Multiple Deprivation (WIMD).
Value Based Health Care		
Deep Dive Explorative Analysis Reports Value Based Health Care (VBHC)		Deep dive explorative analysis reports on the following areas: • Patient Reported Outcome Measures (PROMs) Lung Cancer • PROMS Lymphoedema • PROMS Heart Failure • PROMS Trauma and Orthopaedics (T&O) • PROMs Colorectal • PROMs Musculoskeletal (MSK) Physiotherapy • PROMs Diabetes • PROMs Spirometry

LungCAST EQ-5D Analyses		Piece of analysis to determine if there are self-assessed differences in health-related quality of life, as measured by questionnaires, between and within current smokers who quit smoking (validated sustained cessation) versus those who continued to smoke during the initial 12-months following Non-Small Cell Lung Cancer diagnosis.
Weight Loss Drug Analyses		Analysis to understand whether Wegovy has been clinically impactful in supporting weight loss for patients.
Fracture Liaison Service Benefits		Analysis to understand the clinical and cost efficiency benefits of the Fracture Liaison Service (FLS), in-line with the principles of evidence-based FLSs presented in the 5IQ model (Society, 2019).
Heart Failure Pathway Redesign Impact		VBHC have been providing annual funding to the Cardiology Service to sustain the redesigned Heart Failure (HF) diagnostic and clinic pathway. However, this funding source is due to expire and analyses of the value of the redesigned pathway, examined through HF PROMs and admission and readmission rates, is requested to inform Cardiology Service business case development.
Commissioning		
Intensive Therapy Unit (ITU) Bed Days Forecast Commissioning		The purpose of this analysis is to provide a robust forecast of ITU bed days commissioned by HDdUHB, for patients treated at Swansea Bay University Health Board (SBUHB). This insight is required to support the commissioning team in their strategic planning.
Future Developments		
Gynaecology Outpatient DNA Prediction		Similarly to the Ophthalmology DNA prediction application an AI/ML model will be built to predict Gynaecology outpatient DNAs
Paediatrics Outpatient DNA Prediction		Similarly to the Ophthalmology DNA prediction application an AI/ML model will be built to predict Paediatrics outpatient DNAs
Baseline Scenarios for Annual Plan		The Annual Plan often require long range trends/forecasts. Trends can often lack details and long range forecasts can be difficult to generate the further into the future they go. This piece of work will evaluate the robustness of forecasting methods

		for metrics in the annual plan, and provide assurance and a means to track them.
Adaptive and Explainable AI for Predicting Patient Presentations in NHS Emergency Departments (PhD in Progress)		A collaboration with Swansea University where is PhD student is looking to use AI to predict ED presentations.
Enhancing Personalised Management of Active Surveillance in Prostate Cancer (PhD Starting Oct 2025)		Developing and applying Artificial Intelligence tools to augment clinical decision-making for Prostate Cancer. This is a collaboration with Aberystwyth University where a member of the Data Science team is undertaking a part time PhD on a scholarship fund.
Urgent and Emergency Care (UEC) System Flow		Deep dive look into all the componenet of urgent and emergency care, both historically and present with the aim to develop a systems flow model.

In summary, the analytical and modelling work delivered by the Data Science Team continues to provide valuable insights that support evidence-based decision-making across HDdUHB. By applying robust methodologies and fostering collaborative partnerships, the team is helping to address complex challenges and drive improvements in patient care, operational efficiency, and strategic planning.

Looking ahead, the team will focus on several key areas of future development. These include expanding predictive modelling for outpatient DNA rates in specialties such as Gynaecology and Paediatrics, enhancing long-range forecasting methods to support annual planning, and advancing research collaborations with academic partners on projects such as adaptive and explainable AI for ED presentations and digital twin development for prostate cancer management. Additionally, the team will continue deep dive analyses into urgent and emergency care system flow and explore new opportunities to apply data science techniques to emerging operational and strategic priorities.

Ongoing investment in data science capability, alongside the development of innovative tools and models, will be essential to ensuring that the Health Board remains agile and responsive to evolving needs. The Committee is invited to note both the breadth of work delivered to date and the forward-looking programme that will further enhance the organisation's analytical maturity and impact.

Argymhelliad / Recommendation

The Committee are requested to :

- **NOTE** the content of the report and the future developments of the Data Science Team

Amcanion: (rhaid cwblhau) Objectives: (must be completed)	
Committee ToR Reference: Cyfeirnod Cylch Gorchwyl y Pwyllgor:	2.1.2 That the organisation is discharging its responsibilities with regard to the quality and integrity; safety, security and appropriate access and use of information and data, to support health improvement and the provision of high-quality healthcare.
Cyfeirnod Cofrestr Risg Datix a Sgôr Cyfredol: Datix Risk Register Reference and Score:	N/A
Parthau Ansawdd: Domains of Quality Quality and Engagement Act (sharepoint.com)	7. All apply
Galluogwyr Ansawdd: Enablers of Quality: Quality and Engagement Act (sharepoint.com)	6. All Apply
Amcanion Strategol y BIP: UHB Strategic Objectives:	All Strategic Objectives are applicable
Amcanion Cynllunio Planning Objectives	All Planning Objectives Apply
Amcanion Llesiant BIP: UHB Well-being Objectives: Hyperlink to HDdUHB Well-being Objectives Annual Report 2021-2022	9. All HDdUHB Well-being Objectives apply

Gwybodaeth Ychwanegol: Further Information:	
Ar sail tystiolaeth: Evidence Base:	N/A
Rhestr Termau: Glossary of Terms:	Contained within the body of the report
Partïon / Pwyllgorau â ymgynhorwyd ymlaen llaw y Pwyllgor Digidol, Data ac Arloesi Parties / Committees consulted prior to Digital, Data and Innovation Committee:	Internal process

Effaith: (rhaid cwblhau) Impact: (must be completed)

Ariannol / Gwerth am Arian: **Financial / Service:**	Data science outputs facilitate the potential for better service and financial utilisation.
Ansawdd / Gofal Claf: **Quality / Patient Care:**	Data science outputs facilitate the potential for better patient care.
Gweithlu: **Workforce:**	Data science outputs facilitate the potential for better workforce utilisation.
Risg: **Risk:**	Data science outputs facilitate the potential for risk mitigation.
Cyfreithiol: **Legal:**	N/A
Enw Da: **Reputational:**	Data science outputs facilitate the potential for improved reputation by using up to date evidence-based methodologies.
Gyfrinachedd: **Privacy:**	IG policies adhered to.
Cydraddoldeb: **Equality:**	N/A