NHS Greater Glasgow and Clyde	**Paper No. 24/35**
Meeting:	**NHSGGC Board Meeting**
Meeting Date:	**30 April 2024**
Title:	**Department of Research & Innovation Annual Report (2023): Resilience & Growth**
Sponsoring Director/ Manager	**Dr Jennifer Armstrong**
Report Author:	**Prof Julie Brittenden**

1. Purpose

The purpose of the attached paper is to: provide a high level summary of Research and Innovation activity across NHS Greater Glasgow and Clyde in 2023 for information purposes.

2. Executive Summary

The paper can be summarised as follows:

- Over 330 new studies have commenced
- Over 1,000 studies are recruiting or in follow-up in NHS GGC
- Increase in the number of investigators and NIHR associate fellows
- Overall recruitment to clinical trials has increased by 14% compared to 2022
- 30% Increase in recruitment of patients to commercial trials
- Centre of Excellence, complexity and impact of the portfolio
    - 45% of clinical trials involve novel drug therapies
    - 40% are cutting edge early phase trials I/II
    - 59% are Commercial trials
- Early Cancer Medicine Centre Funding award (2.2 Million over 5 years)
- Increase in projects involving artificial intelligence

- Realisation of the benefits of digital pathology for the service and research

3. Recommendations

The NHSGGC Board is asked to consider the following recommendations:

Not applicable

4. Response Required

The NHSGGC Board is asked to note the contents

5. Impact Assessment

The impact of this paper on NHSGGC's corporate aims, approach to equality and diversity and environmental impact are assessed as follows:

- **Better Health** **Positive**
- **Better Care** **Positive**
- **Better Value** **Positive**
- **Better Workplace** **Positive**
- **Equality & Diversity** **Positive**
- **Environment** **Neutral**

6. Engagement & Communications

The issues addressed in this paper were subject to the following engagement and communications activity: The Communication team have kindly input into the format of this report

7. Governance Route

This paper has been previously considered by the following groups as part of its development: Board Clinical Governance Forum meeting on12/2/24, CMT 7/03/24, Clinical Care & Governance Committee 12/3/24

8. Date Prepared & Issued:

Date prepared: 15/04/24

Date issued: 23/04/24

NHS Greater Glasgow and Clyde

Department of Research and Innovation: Board Report 2023

Resilience and growth

Contents

Foreword

Clinical research and innovation leads to improved quality of care and better outcomes for patients, more cost-effective treatments and economic growth. In the post-pandemic era, research, innovation and the redesign of services are at the heart of the NHS Recovery plan. The pressures and challenges currently facing health and social care can only be addressed if new treatments and innovations, which are cost-effective, improve outcomes and patients' experiences, can be rapidly identified and adopted.

NHS Greater Glasgow and Clyde (NHSGGC) is well placed to play a key role as a powerful driver of innovation and to take advantage of new opportunities while adapting to the changing landscape. **Scotland's National Innovation Strategy**, published in June 2023, aims for Scotland to build on its outstanding track record of research excellence and cross sector collaboration, and to become one of the most innovative small nations in the world. Health and Life sciences along with Data and Digital technologies are key priorities. As is evident from this report, Glasgow's outstanding Research and Innovation ecosystem and expertise is being used to evaluate disruptive technologies, including artificial intelligence (AI), novel medicines and devices and digital transformation of service delivery.

The **'Greater access, better insight, improved outcomes: a strategy for data-driven care in the digital age (February 2023)'** aims to improve data quality across health and social care in Scotland. It will enable research and innovation through streamlined and safe access to social and health care data for researchers, industry and academia via five Safe Havens. The West of Scotland Safe Haven has played a leading role in enabling secure access to data at scale to facilitate the modelling, development and evaluation of pathways of care, as well as novel medicines and technologies. On-going collaboration with industry and academia will further enhance the ability to annotate, catalogue, link and analyse large datasets in order to improve health outcomes and also create economic value.

In 2023, the R&I phase II recovery plan aimed to ensure not only the restoration of clinical research activity that was underway pre-COVID, but to improve on our processes. It is reassuring to note that the number of researchers, studies and overall recruitment is now back to the level seen prior to the pandemic. National streamlined and efficient study set-up processes have also been piloted and implemented.

In the year ahead, the focus is to further develop NHSGGC's Research and Innovation portfolio and increase opportunities for patients and clinicians to take part in high quality research and access state of the art therapeutics, devices and innovative technologies which will transform patients' pathways and service delivery. Whilst national and local

challenges continue to exist, R&I is well-placed to overcome these and take advantage of opportunities to work closely with industry, academia and charities.

1.0 Introduction

This report provides a high level summary of the Research, Resilience and Growth plan and Research and Innovation activity across NHSGGC. It focuses on activity which has been supported and enabled by staff within the sub-Directorate of Research and Innovation.

2.0 Research Resilience and Growth

2.1 UK Post-pandemic Recovery

During the pandemic, the UK has been at the forefront of world leading Research and Innovation and has led on the development of vaccines, mass vaccination programmes and large scale clinical platform trials. These have delivered novel outpatient and inpatient treatments which were translated into global guidelines and clinical practice at remarkable and unprecedented speed. The research focus, capacity, and expertise to lead and run COVID-19 trials while under unprecedented pressure was clearly evident, as demonstrated within previous board reports.

In the post-pandemic period, the UK Research Recovery and Resilience (RRG) programme was set up to address the changes and many challenges across the UK clinical research delivery system. The aim was to rebuild and strengthen the UK's research base and life science sector by:

- Ensuring the restoration of clinical research activity that was underway pre-COVID
- Maximising opportunities to build back a better research ecosystem
- Deliver on the commitment to make the UK the leading global hub for life sciences.

2.2 Saving and Improving Lives: Future of UK Clinical Research Delivery

The ambitious 10 year vision **'Saving and Improving Lives: The future of UK clinical research Delivery'** was published in 2021. This was followed by the publication of the 2021 and then 2022-2025 implementation plan which aims to achieve a **"more patient centered, pro-innovation and digitally enabled clinical research environment"**.

The five key themes underpinning the vision and implementation plan are:

- Clinical research embedded in the NHS;
- Patient centered-research;
- Streamlined, efficient and innovative research;
- Research enabled by data and digital tools
- A sustainable and supported work plan.

Locally, these are addressed within the NHSGGC Research and Innovation Strategy 2020-2023, and in our new strategy which is undergoing stakeholder review.

2.3 Delivering Commercial Trials: O'Shaughnessy Report

In order to deliver on the commitment to make the UK the leading global hub for life sciences, there is a need to re-establish the volume and performance of commercial novel drug studies to the levels achieved pre-pandemic. While the number of academic studies and recruitment have fully recovered, this is not the case for commercial trials. The UK has unfortunately seen a decline in both recruitment and the number of commercial clinical trials involving novel drug therapies. A 2022 Association of British Pharmaceutical Industries report has shown that the number of patients enrolled into commercially-led studies supported in England dropped by 44% between 2017 to 2018 and 2021 to 2022. The number of trials initiated has also fallen, with the UK's ranking for later phase III trials falling from fourth to tenth in the world.

The O'Shaughnessy report, published in May 2023, was specifically set up to review and resolve key challenges to conducting commercial clinical trials in the UK. These range from prolonged trial set up and approval processes; perceived lack of transparency and accountability; the need for prioritisation and incentives; measures to improve the promotion, ownership and visibility of research in the NHS; effective use of data and research in primary care. The report has 27 recommendations, including the development of an action plan and key performance indicators outlining how government(s) and delivery partners will implement the recommendations of this review.

The ambition is to double trial activity to get back to the pre-pandemic baseline, then to double again by 2027. Additional funding of £24 million has been allocated via the UK life sciences sector to Scotland to achieve this aim. This will cover infrastructure, use of digital technology in trials and additional staff to increase recruitment. Furthermore, £10 million funding has been made available for the Medicines and Healthcare products Regulatory Agency (MHRA) to fast-track patient access to cutting-edge medical products.

2.4 NHSGGC Research Resilience and Growth

The short life working group, which has delivered the Phase I and Phase II recovery plans, has transformed into the NHSGGC Research Resilience and Growth Operational Group. This has been expanded to include network and specialty leads who meet bi-monthly to oversee the portfolio including; study pipeline; trial set-up and approval timelines and recruitment performance metrics.

New developments in 2023, which have significantly streamlined process and reduced timelines, include the pilot and implementation of standardised UK wide costing procedures and contracts.

In order to ensure on-going capacity, the criteria for study prioritisation which were introduced in the recovery phase remain in place during this growth phase:

- NHSGGC locally led (sponsored/co-sponsored) studies
- Commercial trials involving novel medicines
- Hosted studies, which include a named Glasgow investigator on the grant.

The prioritisation of commercial drug trials aligns to one of the key recommendations of the O'shaughnessy Report. Measures are also in place to ensure that this does not occur at the expense of our locally led trials, and that we expand this component of the portfolio.

Performance management is undertaken through the Clinical Research Facility (CRF) specialty groups, which are attended by chief and principle investigators, CRF staff, Pharmacy and R&D portfolio staff. The aims of the CRF specialty groups are to oversee: study delivery-recruitment to target (RAG: Red, Amber, Green metrics); review the pipeline-ensuring capacity, avoidance of competing studies, high impact studies.

3.0 NHSGGC Research and Innovation: Infrastructure and Workforce

3.1 NHSGGC Research and Innovation Expertise and Infrastructure

NHSGGC R&I, in collaboration with the two University of Glasgow Trial units, support all of our multi-disciplinary researchers across the breadth of our clinical research portfolio. Jointly, we provide a wide range of services which ensure scientific and financial integrity, fast approvals, effective governance, active project management, and robust analytical and reporting processes (Figure 1). This includes the West of Scotland Research Ethics Service which runs four fully accredited NHS research ethics committees.

NHSGGC delivers complex, innovative and high impact clinical research and innovation, facilitated by our state of the art dedicated Glasgow Health Science Partnership research facilities shown in Figure 1.

Figure 1: Glasgow Health Science partnership Research and Innovation Infrastructure

The dedicated clinical research facilities are located at 5 sites: The Queen Elizabeth University Hospital, Glasgow Royal Infirmary, Gartnavel, Beatson and Dental hospital, in addition to a new bespoke site currently under development at the Royal Alexandria Hospital, Paisley. In addition, Glasgow is fortunate to have an Experimental Cancer Medicine Centre (ECMC). Cancer Research UK, the Scottish Government and the Little Princess Trust unveiled £2.2 million of new funding for the Glasgow centre in 2023. Early phase clinical trials form a large part of the clinical cancer research portfolio for NHS Greater Glasgow and Clyde.

3.2 Research and Innovation Workforce

Principal Investigators

The number of Principal Investigators is a key measure of research activity in the Board. This has increased from 449 just before the pandemic to 463 at the end of 2022 and to date sits at 577. These investigators are involved in studies involving patients, data or tissues.

In order to support our investigators involved in studies which recruit patients, the Glasgow CRF Education team, within the past year, have developed and delivered a National Principal Investigator Roles and responsibilities workshop.

Clinical researchers and innovators in the consultant career track need to deliver and maintain clinical practice whilst also allocating and protecting sufficient sessions to prepare for, and perform research and innovation “in real-time”. The Chief Scientific Office (CSO) Researcher Support fund afford the Board the opportunity to have protected clinical sessions for staff actively involved in a significant volume of research or Innovation. The funding from this goes directly to the departments that employ the staff. NHSGGC R&I operates an award based system in which the number of research and innovation sessions are determined by an individual’s activity and documented in individual job plans. These awards are allocated for a specified time period, have clearly defined outcome measures and are subject to performance management and annual appraisal.

Future Workforce

It is important that Glasgow develops and delivers future research capacity, by ensuring that our students and clinical trainees are exposed to research and innovation. The Glasgow Clinical Research Facilities support student nurse and medical student placements. Building on the success of winning the prestigious Student Nursing Times Award ‘Student Placement of the Year: Hospital’ in 2021, the Glasgow CRF education team have been integral in writing a UK CRF Network Student Tool Kit. This provides support for those setting up a student placement and advice for supervisors. It also offers a host of student activities and workshops to promote research careers to the future workforce.

Exposure to research has been actively promoted through the NIHR Associate Principal Investigator training. To date in NHSGGC 71 staff, from medical, nursing, pharmacy and physiotherapy specialties have enrolled or completed the scheme. It is anticipated that these staff will be inspired to take on the role as principal investigators for future studies and apply for grants to develop their own research projects.

Some of those participating in the NIHR Associate Principle investigator scheme are trainees. Other options for those in the early stages of their career include the junior fellowship scheme which provides the opportunity for doctors to gain experience in clinical research based within the Clinical Research Facilities. In addition R&I support a matched funding scheme providing 50% of funding for six trainees undertaking a higher degree involving studies active within the CRF. A new development in 2023 was the establishment of Chief Scientist Office (Scottish Government) fellowships in innovation, of which two were awarded to Glasgow candidates, providing an opportunity to undertake a higher degree.

4. Research Activity

4.1 Number of studies directly involving patients

Currently, there are 1,051 studies active in NHSGGC (recruiting and in follow-up) which directly involve patients. This is comparable to pre-pandemic figures (2018-19, N=1,100). Of these studies 352 (31%) are commercially funded, 303 (29%) locally led, and 485 (40%) are hosted.

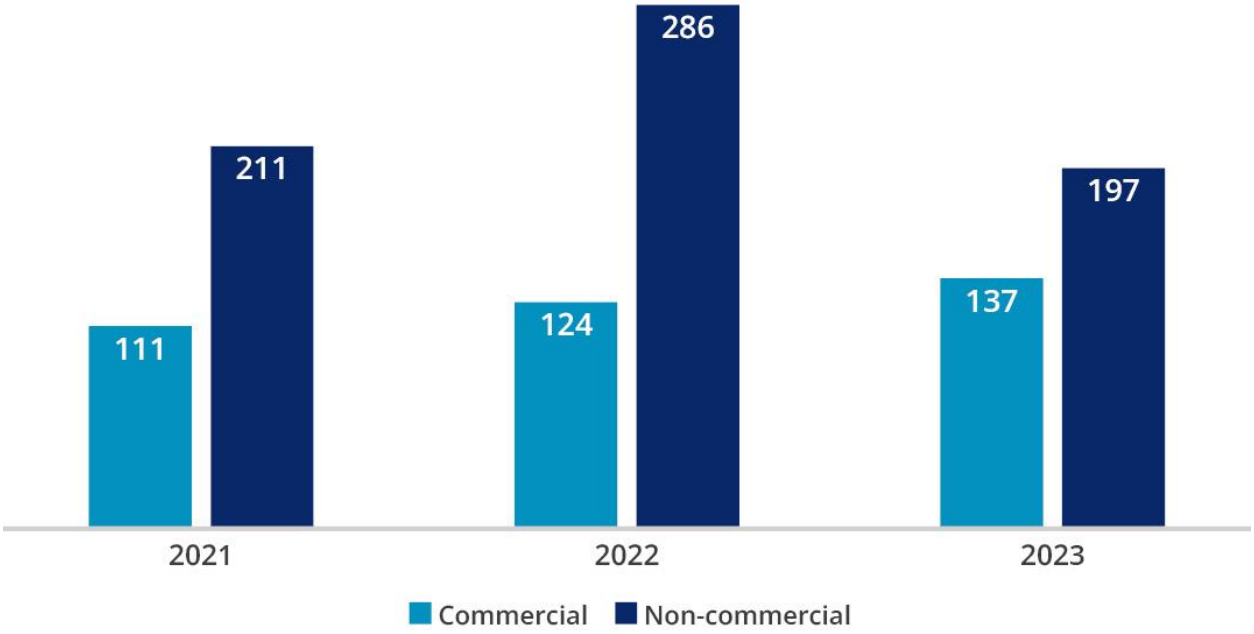
The broad and wide ranging portfolio ranges from observation to interventional studies across a large number of hospital specialties. Specific areas such as novel medical therapies and locally led studies are considered separately below.

4.2 New studies

In the first half of 2020, all new studies which were opened to recruitment were COVID-19 related and most other studies apart from those providing essential care were temporarily closed. These studies were all re-opened in the second half of 2020 and early 2021. Since then many new non-COVID related studies have commenced (see Figure 2). The opening of new studies along with the successful completion and closeout of existing studies demonstrates on going recovery and resilience despite the challenges currently facing the NHS. The portfolio is continually reviewed to ensure ongoing capacity. NHSGGC also work across national networks to ensure that high impact studies are brought to Glasgow.

It can be seen from Figure 2 that in accordance with our prioritization of locally led and commercial trials (section 2.4 above) that there has been an increase in commercial trials and reduction in non-commercial trials due to a reduced number of hosted studies.

Figure 2: New studies opened since 2021



Other ᵒ – locally funded studies, mainly student or pilot projects.
Studies involving data or Tissues are excluded.

4.3 Studies involving novel drug therapies

Almost half (487/) of the 1,051 studies involve complex clinical trials of novel drug therapies (Table 1). Of the 487 studies involving novel drugs, 41% (199) are early phase I/II trials (Table 1), which are the first steps in testing new medicines that have been developed in the laboratory. These early trials focus on drug safety and side effects (phase I), the dose and evidence that the drug has benefit (phase II) and tend to involve small patient numbers. The later trials (phase III) involve larger patient numbers and aim to test whether the new treatment is better than existing treatments. Phase IV drugs trials are undertaken when a drug is approved to gain more information on the drug's effects in various populations and longer term safety.

Table 1: Total Number of trials involving novel drugs

Novel Drug Trials - Phase	I	I/II	II	II/III	III	III/IV	IV	Total
Glasgow Led Academic	0	4	3	2	7	1	2	**19**
Hosted Academic	5	6	42	29	73	0	16	**171**
Commercially funded	17	40	82	9	144	0	5	**297**
Total	**22**	**50**	**127**	**40**	**224**	**1**	**23**	**487**

The large number of early phase studies reflect the fact that Glasgow is a centre of excellence. Undertaking these trials allows the development of new therapies, advances in medicine, cost savings and for commercial trials, the income generated ensures capacity building (see section 4.8 and 4.9). The Commercial novel drug studies account for over 60% (297) of the 487 drug trials currently open in NHSGGC (Table 1). It should be noted that NHSGGC leads the way in the number of commercial drug trials in Scotland especially those relating to “advanced medicinal therapies” which are considered further below.

Advanced Medicinal Therapies

Advanced therapy medicinal products are medicines that are based on genes, modified tissues or manipulated cell which offer patients groundbreaking new opportunities for the treatment of diseases. Indications for these advanced therapies continue to expand through haemato-oncology, solid tumour oncology and non-oncology settings such as ophthalmology and cardiovascular diseases.

NHSGGC collaborated in the Innovate UK project which established the Advanced Therapy Treatment Centre networks across the UK from 2018-2022. This attracted significant investment in infrastructure including staff, equipment and the development of standard operating procedures.

As a result of this collaboration, the number of these clinical trials hosted within NHSGGC has grown to 42. Currently, there are 23 of these trials open or in follow-up with eight others in set-up. This includes four clinical trials in set-up which involve the use of novel gene therapy products for the treatment of cancer.

Recent success include participation in the FELIX (AUTO1) pivotal clinical trial that evaluated a novel therapy (obe-cel) in patients with advanced adult Acute Lymphoblastic Leukemia. On the basis of this trial, a License Application was submitted

for the product to the American Food and Drug Administration in November 2023 by the commercial company (Autolus Therapeutics).

Experience within the research setting with these novel products continues to support NHSGGC being selected and on-boarded by the pharmaceutical industry as a centre of excellence in Scotland to deliver products when they are fully licensed.

4.4 Locally Led Glasgow Academic Studies

Currently there are 303 locally led studies (sponsored or co-sponsored studies), of which 129 are funded through competitively awarded grants. The main funders for these studies are: charities; National Institute for Health and Care Research; Chief Scientist Office; Medical Research Council; Innovate UK and a number are industry funded. These studies are varied in nature, span across a number of specialities and are led by an NHSGGC or University of Glasgow Chief Investigator.

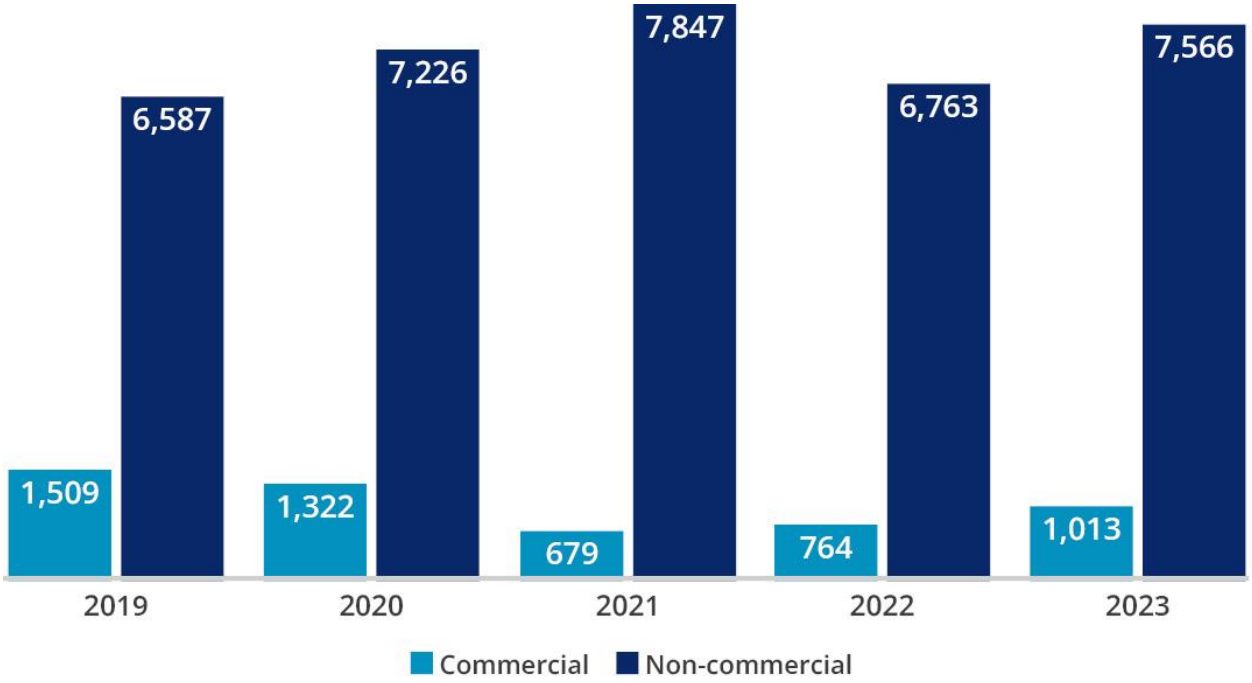
The total value of grants awarded are not routinely currently recorded, only the return to NHSGGC. However, details of funding provided by the College of Medicine, Veterinary and Life Sciences, has reassuringly shown on-going significant grant income which has increased compared to the pre-pandemic era. This is despite as particularly competitive funding climate due to many charitable fund raising streams having been negatively impacted by the pandemic.

Initiatives are underway to increase the number of prestigious Glasgow led externally funded studies. These include increased support to researchers with the aim of increasing the number of successful grant applications. NHSGGC R&I is working closely with University of Glasgow to signpost researchers to funding opportunities, support and expertise. This includes the Centre of Excellence for Trials Collaboration (CETC), launched in 2023. Led by the University of Glasgow, the centre aims to position Glasgow as an agile, world leading centre for pioneering trial methodology and design. The three under-pinning pillars include pre-funding support, methodological expertise and capacity building. This provides support to researchers to work up competitive grant proposals.

4.5 Patient Recruitment

Recruitment to clinical trials involving patients over the past five years is shown in Figure 2. Overall recruitment has exceeded that achieved pre-pandemic and has increased by 14% in 2023 compared to 2022 (8,579 versus 7,527) (see Figure 3).

Figure 3: Overall Recruitment activity ^



^Excludes studies involving tissue or data only.

Recruitment to non-commercial (academic) trials

It is reassuring to note that across the various specialties, non-commercial recruitment (shown in red in Figure 3) has exceeded that seen in 2019. NHSGGC has a balanced portfolio across a variety of specialties. In 2023, the top three recruiting specialties are Cardiovascular, Cancer and Trauma and Emergencies. Cancer is considered further below.

Recruitment to commercial trials

As discussed in section 2.3 above the main impact of the pandemic has been a reduction in recruitment to commercial novel drug studies, which is mirrored across Scotland and the UK. It can be seen from Figure 2 (commercial recruitment is shown in blue) that there has been a 30% increase in commercial recruitment in 2023 compared to 2022 (1,013 versus 764).

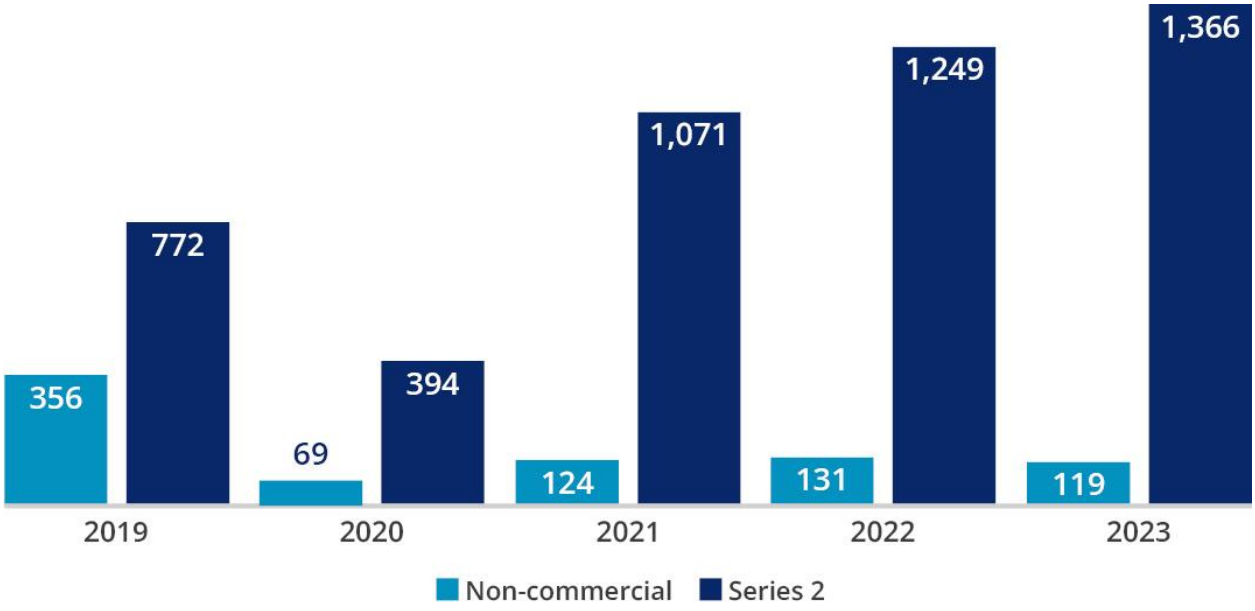
A key priority has been to increase recruitment to commercial novel drug studies and this has shown a steady rise since 2021, with a 16% increase in recruitment in 2023 compared to 2022 (242 versus 208).

4.6 Cancer Portfolio Research Recruitment

The 2021 Research and Innovation Annual Board report highlighted that in the UK the number of patients with cancer entering clinical trials had fallen by 60% over the preceding three years. Figure 3 shows the very substantial impact of the pandemic on research recruitment within NHSGGC in this very vulnerable population.

Within NHSGGC, restarting cancer research post-pandemic has been a key priority and measures have been implemented to increase capacity and address workforce shortages. As a result of these measures, it is reassuring to see activity recovering (see Figure 4) such that overall recruitment has increased year on year and exceeds that achieved pre-pandemic.

Figure 4: Recruitment to cancer studies^



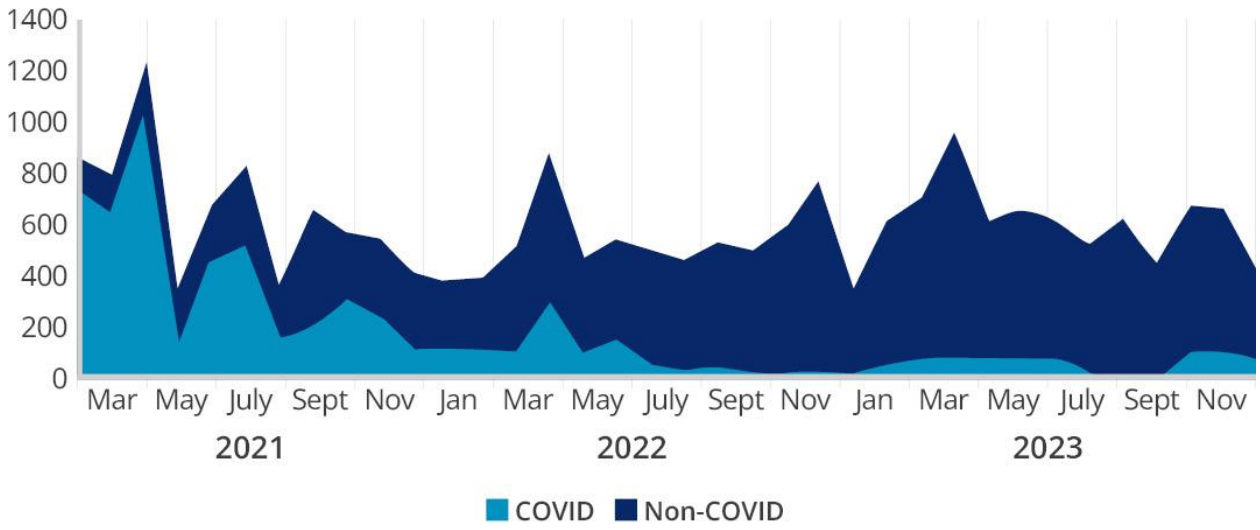
^Excludes studies involving tissue or data only.

However, as is mirrored across the UK, recruitment to commercial trials of novel cancer drugs is not yet at pre-COVID 19 levels and this has been prioritised with a focus on clinical trials of investigative medicinal therapies. Many of the trials are early phase precision medicine studies, and where possible we aim to attract much larger phase III trials.

4.7 Non COVID and COVID-19 Patient Recruitment

Recruitment to COVID-19 trials continues at a much lower rate, with increases over the winter months as shown in Figure 5 below.

Figure 5: NHSGGC recruitment activity (January 2021-December 2023)



The main activity is in the following areas:

- **CHARISMA**: Clinical Characterisation of Respiratory Viral Infections among Patients with Hospitalised Severe Acute Respiratory Illness using Point-of-Care Multiplex Assays
- **Long COVID (CISCO-21, Diabetes long Covid study; HEAL-COVID**: **Helping Alleviate the Longer-term consequences of COVID-19**: a national platform trial)
- **GENOMICC**: Genetics of susceptibility and mortality in critical care.

4.8 Capacity Building Through Commercial Income

While commercial research covers actual costs, a capacity building rate of 20% is applied, plus a Market Forces Factor tariff. A key recommendation of the ABPI and O'shaunghnessy reports is that revenue generated via industry clinical research is reinvested into increasing the provision of dedicated research time and research training, especially for nurses and other staff critical to delivering clinical trials. In NHSGGC the Glasgow Biomedicine model enables revenue generated by industry funded clinical research to be re-invested into research, enabling capacity building. The model also ensures that direct costs are reimbursed to departments where incurred, and a share of the commercial overhead is paid to the board.

Total commercial income over the past five financial years is detailed in Table 2 below.

Table 2: Commercial income

Summary	2023/24	2022/23	2021/22	2020/21	2019/20
Duration	**M1-9**	**M1-12**	**M 1-12**	**M 1-12**	**M 1-12**
Total Commercial Income	**- £4,419,096 Projected -£5,892,000**	**-£8,752,082**	**-£7,338,575**	**-£5,584,744**	**-£5,967,057**

The COVID-19 vaccine trails had led to an increase in income in 2021 and 2022. In 2023, the anticipated increase in the pipeline for vaccine trials in the UK has not occurred. However, there a number of commercial vaccine trials planned in 2024. Nonetheless the income for 2034/2024 is on course to equal the pre-pandemic commercial income (2019/20).

4.9 Research Pharmacy Cost Savings

The Pharmacy Clinical Trials team continue track phase III projects to calculate both projected and real savings where standard care therapy may be replaced by experimental study treatment (saving NHSGGC standard spend) or where the standard care therapy is funded by sponsors in addition to provision of the experimental arm. This demonstrates an added benefit of potential savings to the drug budget from undertaking Clinical Trials.

During 2023, savings due to offset of drugs not used or supplied by sponsor in the phase III setting amounted to £1.7 million. Projected cost savings for new CTIMPs opened in 2023 total £152,000 assuming all recruitment targets are met and all participants achieve their full number of treatments on trial

Actual cost savings from 2019-2023 are now tracking at £4.75 million as recruitment continues to open trials that offer savings against high cost standard care medicines that are supplied by sponsors or where trial medication replaces standard care.

5. Key Exemplars: Research

There are many examples of outstanding research over the past year, which are briefly described below. These provide some insight to the depth and variation of innovative research that is currently underway in NHSGGC.

5.1 Prize

A randomised, double blind, placebo-controlled, cross-over trial of zibotentan in microvascular angina.

Chief Investigator: Professor Colin Berry
(NHSGGC and GU co-sponsored trial)
MRC funded (£3.3 million), Astra Zeneca - £200,000

Background

Ischaemic heart disease is the leading cause of premature disability and death worldwide. Angina affects approximately 2 million people, at least one-third with an uncertain cause. One root cause may be cardiac small vessel disease, and activity of a small protein that causes constriction of coronary arteries (Endothelin). The activity is enhanced by the presence of a specific (endothelin 1) gene in human vascular cells.

Aim

Efficacy, safety and feasibility, for add-on treatment with zibotentan, an endothelin A receptor-selective antagonist (ERA), in patients with microvascular angina enrolled based on genotype.

Participant group

118 Patients with microvascular angina and impaired exercise tolerance meeting genotype-based eligibility criteria.

Intervention

Precision medicine with zibotentan in microvascular angina.

Comparator

Placebo-controlled, sequential cross-over trial.

Study Outcome

A precision medicine approach involving short term treatment with 10 mg of zibotentan daily did not improve exercise duration and target-related adverse effects were common. Resting myocardial blood increased.

Impact

Submitted for publication.

5.2 **ATTEST-2**

Chief Investigator: Prof Keith Muir
Funder: Stroke Association (£1 million)

NHSGGC sponsored trial.

Background

Dissolving blood clots (Intravenous thrombolysis) by using the drug alteplase significantly increases the probability of excellent recovery in patients who have had a stroke. Data from small studies suggest that the drug tenecteplase is potentially superior to alteplase, with respect to both safety and efficacy in stroke, as well as having much simpler administration, and lower cost.

Aim

Determine efficacy and safety of tenecteplase compared to altepase in the management of patient with non-haemorrhagic stroke.

Design

Prospective randomized controlled, multicenter parallel group (open blinded end-point)**.**

Participants

1,864 patients hospitalised with stroke.

Active group

Tenecteplase.

Comparator

Altepase.

Outcome

Stroke recovery (Modified Rankin Scale at day 90)

Teneteplase was just as effective, but less expensive and easier to use.

Impact

Tenecteplase should be used in preference to altepase in routine clinical practice.

5.3 **NOVEL Trial**

$NanO_2$ in Large VessEL Occlusion Stroke (NOVEL): a multicentre single-blind, randomised, placebo-controlled blinded biomarker end-point clinical trial of perfluorocarbon in acute ischaemic stroke due to large vessel occlusion.

Chief Investigator: Prof Keith
NIHR and Industry Funded NuvOx, (NHSGGC and GU co-sponsored trial).

Background

Hypoxia, or low oxygen, is responsible for causing brain damage in patients who have had a stroke. Long-term stroke disability is one of the most costly healthcare burdens worldwide. This trial will test a novel drug that improves the flow of oxygen from lungs to blood and from blood to tissue and has the potential to reverse tissue hypoxia.

Aim

To investigate the safety, tolerability, efficacy of NanO2.

Participant Group

150 stroke patients.

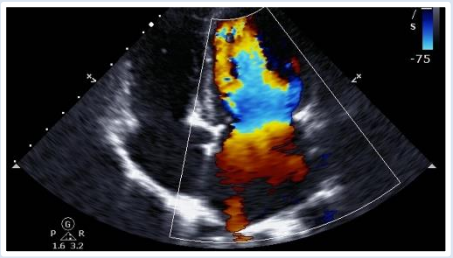
Intervention

Nan02 in addition to standard care.

Outcome

Awaited.

5.4 **Biomarkers in patients with suspected Heart Failure and reduced ejection fraction (BIOPEF)**



Locally led, collaborative project sitting within the Glasgow Biomarker Centre of Clinical Excellence (CoCEx) in Heart Failure (HF).

Chief Investigator: Dr Ross Campbell
Funder: ROCHE

Background

In clinical practice, natriuretic peptides (NT-proBNP) are used to identify patients with heart failure and reduced ejection fraction (HFpEF). In contrast, NT-proBNP does not perform well when used to detect patients with suspected heart failure in patients with obesity. Delayed diagnosis can lead to adverse outcomes for these patients.

Trial design

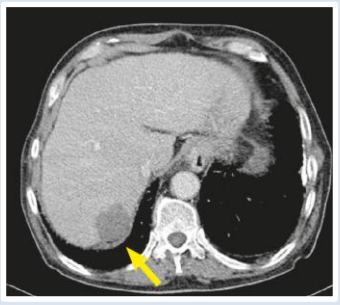
Prospective observational cohort study (**600** participants).

Comparison of obese patients with and without HFpEF.

Primary Outcome

To determine the utility and diagnostic performance of alternative cut-offs for NT-proBNP or combinations of biomarkers (including novel biomarker solutions) - with clinical variables to identify heart failure in obese patients.

5.5 The development of a new drug (Fostroxacitabine bralpamide, Fostrox; MIV-818) in patients with advanced liver cancer (hepato-cellular cancer)



Professor Jeff Evans in Collaboration with MEDIVIR (Stockholm, Sweden)

Commercial trial, with Local investigator Involved in design as Chair of Medivir's Strategic Advisory Council.

Background

Hepatocellular-liver cancer is the 6th most common cancer worldwide and 3rd commonest cause of cancer-related deaths. It occurs in patients with chronic liver disease, attributed to viral hepatitis, alcohol excess, and especially obesity and type II diabetes (non-alcoholic steatohepatitis (NASH).

Few patients are suitable for potentially curative treatments and, despite recent advances in systemic therapy of patients with unresectable disease, novel therapeutic approaches are urgently required.

Trial design

Early Phase (Ib/II) study of fostrox in combination with Lenvatinib (a standard of care agent used in 1st line treatment.

Primary Outcome

Trial demonstrated the safety and tolerability of fostrox, further studies are planned.

A prior phase I study in Glasgow had shown the drug resulted in damage selectively in tumour tissue with minimal or no impact observed in healthy liver tissue.

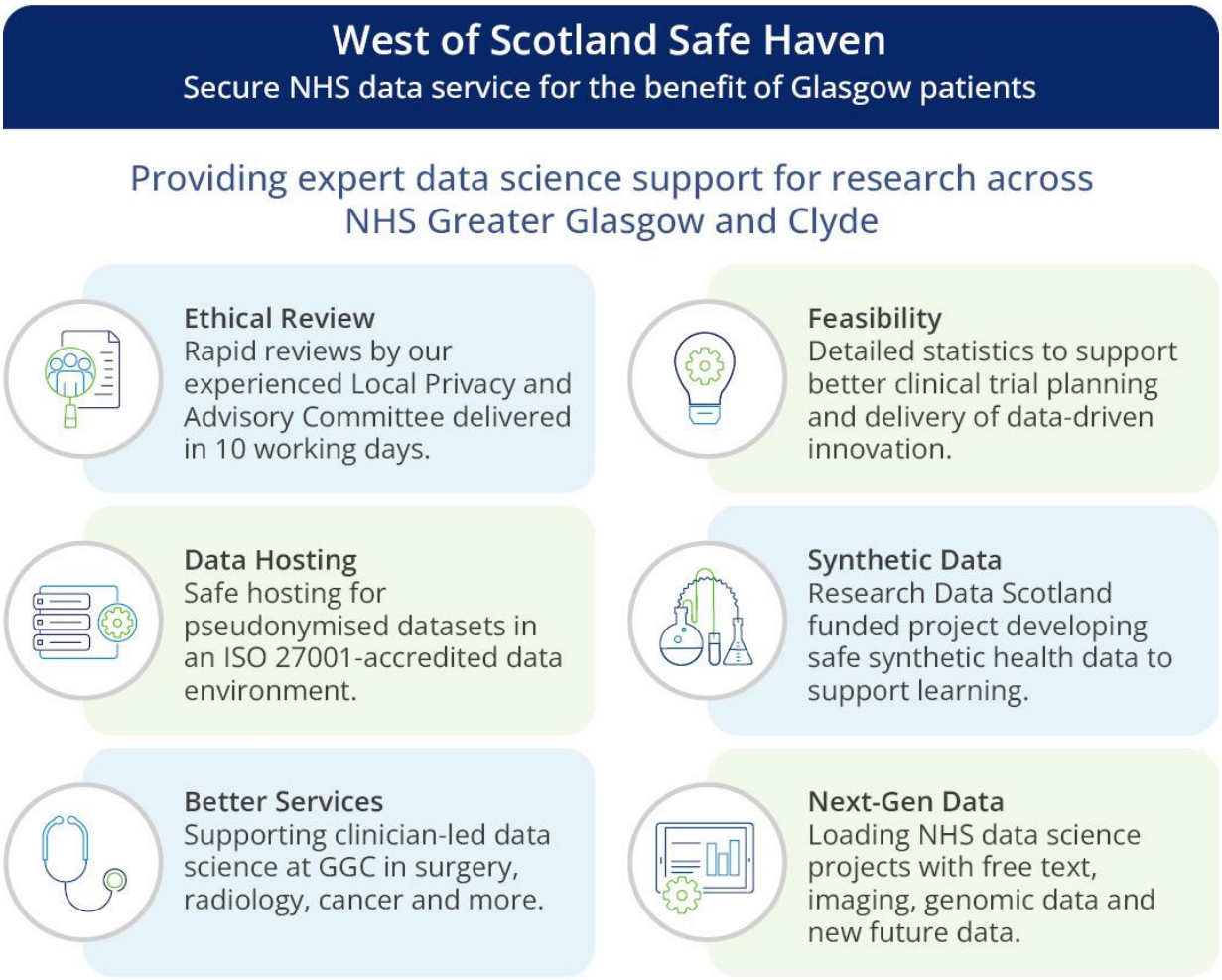
6. Safe Haven

Streamlined and safe access to social and health care data for researchers, industry and academia is enabled via the five safe havens, which includes the West of Scotland Safe Haven. The Safe Haven provides expert data science support for research across NHSGGC in a number areas as summarised in Figure 6 (on the next page).

A key priority for the West of Scotland Safe Haven is also to ensure that clinical trials are enabled by the facilitated use of data for feasibility assessments, recruitment, follow-up and generation of routinely collected data outcomes. The safe haven has led on novel data-driven initiatives to support clinical trial recruitment, including daily data linkages. It has generated recruitment lists for COVID vaccine studies, as well as targeted recruitment lists to aid Research Nurses on consented trials.

Scotland's National Data Strategy for Health and Social Care has highlighted the importance of having tools to ensure that routinely collated data which is held in unstandardized forms (ie, free text) is collated and processed to a format that can be readily used for research and innovation. To help address there has been close collaboration across the Scottish Safe Haven network on natural language processing within clinical texts. This includes a project with the Edinburgh DataLoch assessing privacy risks in using clinical text for research funded through Research Data Scotland.

Figure 6: Safe Haven data science support



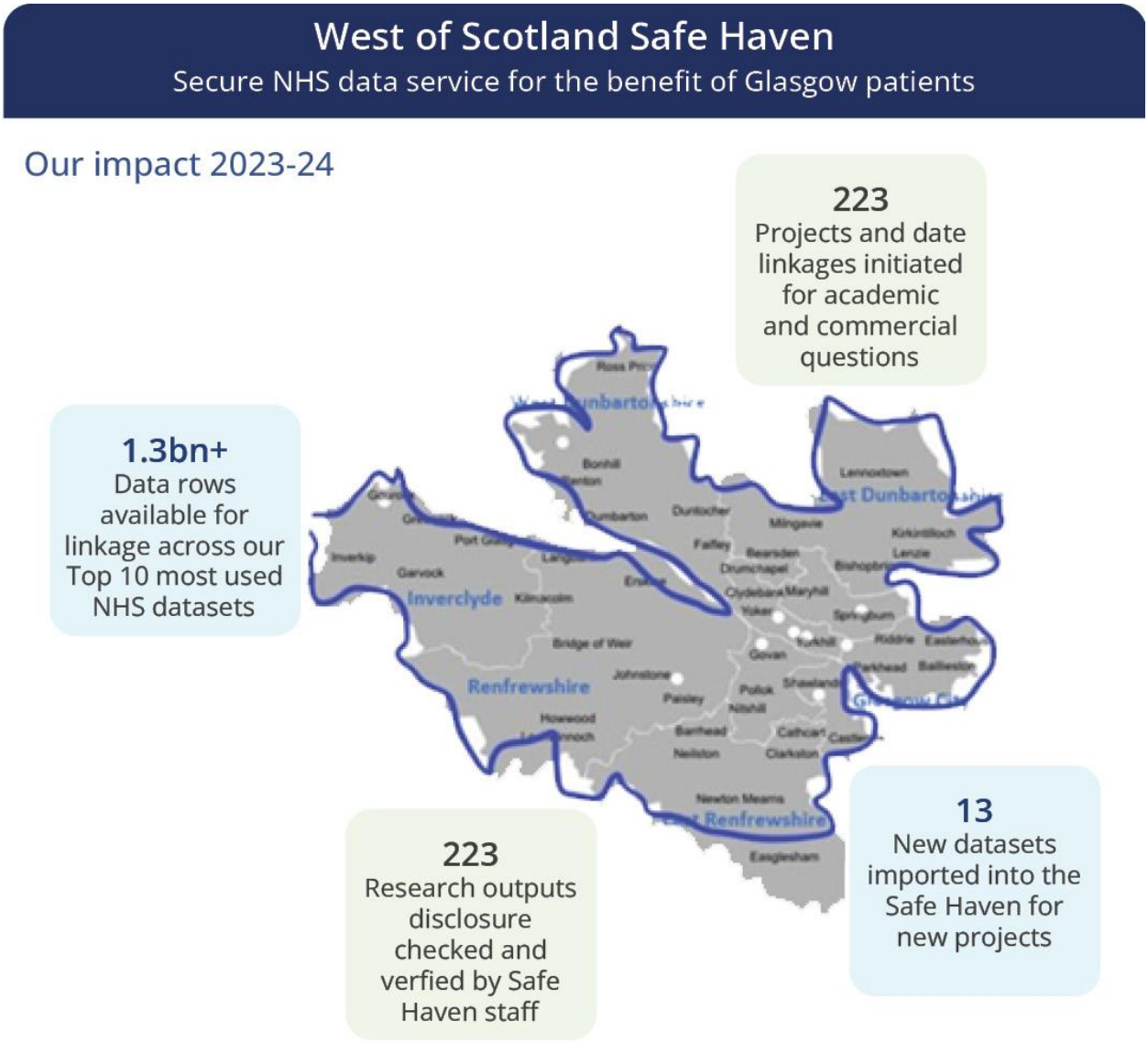
Number of projects and exemplars

In 2023, the West of Scotland Safe Haven has delivered 58 new projects, datasets, and feasibility studies, and continues to work closely with colleagues in the West of Scotland Innovation Hub to deliver novel data-driven proofs-of-concept innovative projects (Figure 7). These include AI-based studies led by Glasgow such as DYNAMIC AI, RADICAL (see section 9.1), and collaborative AI studies. The Safe Haven portfolio includes the use of linked datasets to provide outcomes for studies such as ASSIST (A Surveillance Study in Illicit Substance Toxicity). ASSIST aims to assess the feasibility of prospective surveillance of patients attending emergency departments due to acute illicit drug toxicity.

In 2023, as part of the University of Glasgow's £34 million Living Lab programme, the West of Scotland Safe Haven collaborated on the Ogre project. This large project involved the creation of a number of anonymised patient datasets, and secure access to enable 26 concurrent analyses with academic research teams from the University. The streamlined ethical approval for multiple research questions, using a team science

approach to expedite the build and access to NHS data in a single secure environment is a first for safe havens in Scotland.

Figure 7: Summary of activity



Future work

The "**Greater access, better insight, improved outcomes: a strategy for data-driven care in the digital age**" (February 2023) aims to improve data quality across health and social care in Scotland. Over the past year the West of Scotland Safe Haven has taken steps to address some of the challenges highlighted in the National Strategy. These include the ability for researchers and innovators to access information on what datasets are available. This will be accessible early in 2024 via a new website www.healrhdatagateway.org with links to NHSGGC website.

In 2024, the West of Scotland Safe Haven will continue to work closely with academia and industry in order to enhance the ability to annotate, catalogue, link and analyse large datasets to improve health outcomes. Further clarity on ethical and efficient routes for industry to access data is currently being addressed by the Scottish Government's "**Unlocking the Value of Data Program**" which provide further guidance on how public interest of use of data by industry is assessed.

7. NHSGGC Biorepository

In 2023, the Biorepository has been involved in over 75 research projects, which involved consenting more than 800 patients and the collection of over 3,000 samples. The Biorepository has continued to support tissue based studies requiring access to stored and fresh surplus diagnostic tissue, whilst also working as a central laboratory for processing and storage for several key international Glasgow led Clinical Trials including iCORMICA and PRIME-RT. One of key objectives for 2023 was to secure a date for final assessment for accreditation under ISO 20387:2018 Biobanking standards. This was scheduled for January 2024 and we have been informed that the Glasgow Biorepository has been recommended to be awarded accreditation to these standards.

Key developments and exemplars

Over the past year the Biorepository has been involved in co-ordinating and facilitating projects involving Digital Pathology images and artificial intelligence (see section 8.5). The team are collaborating with leaders in the field from Pathology, industry and academia. One such project involves collaboration with University of Glasgow and Canon Medical and is funded through the Living Laboratory Strength in Places UKRI award. This involves combining medical imaging and tissue features (digital pathology images), including genomics, with the aim of improving diagnostic accuracy and predictions. It is anticipated that this proof of concept study will help predict patients' response to therapy and prognosis enabled through artificial intelligence and machine learning.

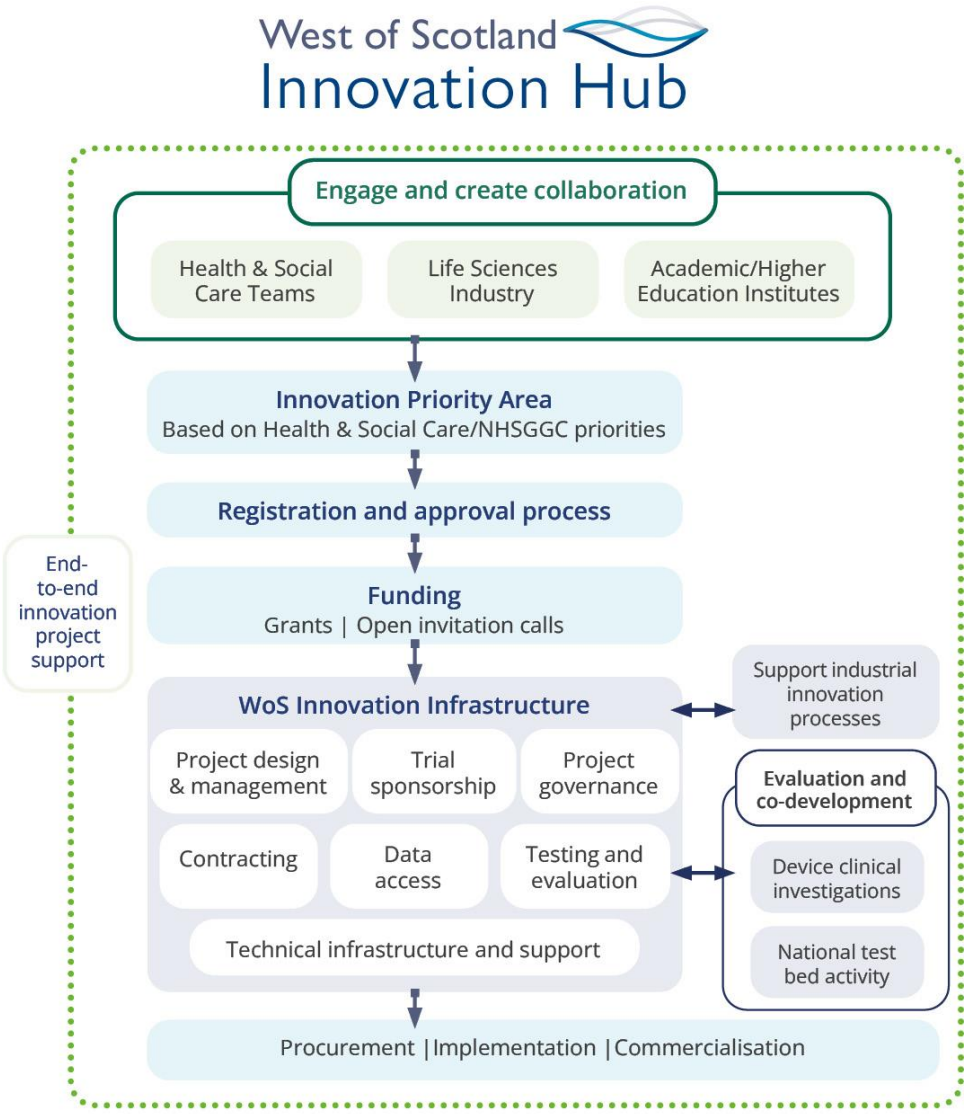
A key success in 2023 was the UKRI funded INCISE (Integrated Technologies for Improved Polyp Surveillance) project .The Biorepository is a key collaborator providing data and tissue collection for this project (see section 9.3). The Team behind this, including Biorepository staff, were recipients of the Innovative Collaboration Award at the Scotland's Life Sciences Awards 2023.

8. West of Scotland Innovation Hub

8.1 End to End Innovation Pathway

The WoS Innovation Hub, established in 2019, supports delivery of the national health and social care innovation objectives set by the Chief Scientist Office (CSO) and projects which align with NHSGGC's priority areas and Moving Forward Together strategy. It provides a front door for innovators and industry (see Figure 8).

Figure 8: End to end innovation project support



The Hub works in collaboration with NHS Scotland innovation partners including the Centre for Sustainable Delivery, Accelerated National Innovation Adoption collaborative, NHS National Services Scotland and the Innovation Test Beds of the North and East regions.

As described in previous board reports, the WoS Innovation Hub acts as a "front door" and single point of contact for both innovators and industry and provides end-to-end support for innovation projects in the region (see Figure 8). Its aim is to transform the delivery of health and social care by driving forward the early adoption, or early rejection, of novel devices, products and services through an end to end pathway.

8.2 New Developments

Continuing the impactful work done through the West of Scotland Innovation Hub with the Glasgow Children's Hospital Charity, Dr Neil Patel and colleagues successfully launched the Children's healthcare innovation charity Hi at the annual Glasgow Children's Hospital Christy Ball in November 2023. The bold ambition is to use the track record of creative collaboration to focus on innovative solutions in children's health from Scotland to the world. The first four challenges aim to: provide faster jaundice diagnosis at home; develop technology to monitor babies with major heart conditions at home; support accurate diagnosis of epilepsy with artificial intelligence (AI) and building a technological solution to allow quick and easy clinician access to the multiple existing IT systems involved in patient review and care.

In 2023, we welcomed a new Senior R&I manager, Dr Katriona Brooksbank, to the team and appointed a new Clinical Lead, Professor Chris Carlin, who will take up post in 2024. A new Primary Care Lead post has been approved, and is progressing through the interview stage. We also have two new Senior NRS Innovation fellows (Gareth Bryson for Pathology AI and Jenifer Sassarini for Women's Health).

8.3 Engagement Activities

Patients and public engagement

Through all of the Hub activities, our patients and the public are central to the co-design and evaluation of the impact of innovative changes. These are delivered as project specific involvement studies and development of validated questionnaires to include patients' perspectives of service delivery change, as well as focus group workshops and events. A key project is the 'iCARE' (Innovation in Cancer Care for and with patients), which consists of an interactive survey focused on engaging patients – alongside clinicians – and directly involving them with the co-design of their own health services in

the cancer treatment pathway. The survey had over 200 participants at the Beatson West of Scotland Cancer Centre, over 50% of whom were patients (100 staff, 121 patients) and this was followed by the first patient workshop held in July.

Conferences

The Hub team and a number of projects were featured at the sold-out CSO at Fifty conference in Glasgow, held at the newly re-opened Teaching and Learning Centre (TLC) on the Queen Elizabeth University Hospital (QEUH) site.

Hub activities also featured prominently at the launch of the University of Glasgow's Living Laboratory as the flagship initiative of the UKRI funded Strength in Places award, promoting the academic pipeline of innovative healthcare solutions. This programme of work is possible because of the support from the Hub through access to data, samples, images and expertise in clinical research and implementation.

8.4 Current Activity

In 2023, the WoS Innovation Hub team were supporting 46 Innovation projects. This includes large programmes of work such as Strength in Places and the National Consortium of Intelligent Medical Imaging. This is a network of NHS hospitals, clinical leaders and academic experts, patients, charities and industry experts in the fields of artificial intelligence and imaging. In addition, there are 15 projects at the set up stage and five at the scoping stage. The total value of the funding which the West of Scotland Innovation Hub has helped leverage to date through collaboration with academia and industry is greater than £83 million.

8.5: Evaluating Disruptive Technologies: Artificial Intelligence (AI)

Scotland's AI Strategy aims to enable trustworthy, ethical and inclusive AI which will utilise the vast health and social care datasets. It is anticipated that AI will enable early detection of disease, diagnosis, prediction of effectiveness of treatment and improvement in outcomes. It also has the potential to increase capacity and streamline services. A key requirement is to address pathways of healthcare delivery, new care technologies and mechanisms to further enable self-management of multi-morbidity and chronic disease for the ageing UK population.

Glasgow has benefitted from the UK Industrial Strategy Challenge funding of the Industrial Centre for Artificial Intelligence Research in Digital Diagnostics (ICAIRD). This collaboration between 43 partners including the NHS, academia and industry has led to digitalisation of the Pathology Department, development of a new AI licensed algorithm and a lasting legacy in terms of expertise and experience. This team have been the

recipients of a number of awards. In 2023 this included the Knowledge Exchange Awards 2023, Multiparty Collaboration Award. The NHSGGC's Biomedical Science team, alongside West of Scotland Innovation Hub colleagues, were also recipients of the Improvement in Action Award at the 2023 Chief Health Science Officer Awards.

Following on from iCAIRD eHealth within NHSGGC lead the Enabled by AI programme of work for AI solutions that impact on patient pathways and clinical decision making. This programme, which is supported by Research and Innovation, seeks to map areas for discovery or development of AI solutions that align with board priorities, assess in service and transition to a position of AI as business as usual. Using hands on experience of AI projects, the Hub team are contributing to national and international strategies to understand the potential cost savings of new technologies and the impact on our workforce and services. The two main areas of growth in AI are in radiology diagnostics and digital pathology considered further below.

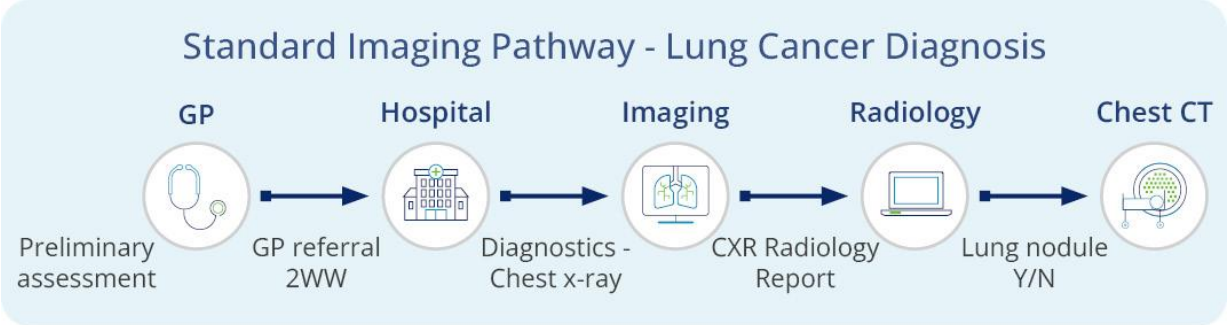
Radiology Diagnostics

Ongoing studies include evaluating the use of AI for lung cancer (see case study below) and stroke diagnosis, and risk predication in patients with chronic obstructive pulmonary disease (COPD). The latter is also evaluating the use of wearable sensors, self-care and early intervention via an interactive AI clinician assisted dashboards.

Case Study: RADICAL | Radiograph Accelerated Detection and Identification of Cancer in the Lung

Lung cancer is the third most common cancer in the UK and the most common cause of cancer death. There is overwhelming evidence that early diagnosis radically improves lung cancer survival rates.

A mixed methods study will assess the clinical effectiveness and acceptability of Qure.ai artificial intelligence software to prioritise chest X-ray (CXR) interpretation and reduce time for patients in the lung cancer diagnosis pathway. The study is led by Professor David Lowe, and funded by Scottish Government and Quire AI.



Whilst AI holds promise, neither the NICE Advisory Diagnostic Committee nor the Scottish Health Technology Group have approved the use of AI in diagnosis. NICE have recently reviewed the evidence on 14 AI diagnostic tests for detecting and measuring nodules and other abnormalities in chest x-ray images and have raised concerns regarding accuracy, false positives and costs. A recent Danish study has shown that AI tools performed less well for smaller target findings and when many findings were present. Thus, there is a real opportunity for GGC to take a national lead in the rigorous and objective evaluation of AI tools prior to deployment in the NHS. GGC has been successful in obtaining two grant awards to develop this expertise further.

Digital Pathology

Digital working has enabled improvement in workflow in terms of distribution of cases amongst pathologists within the department, allows consultants to report remotely if required and better collaboration and engagement with clinical colleagues across Scotland. It has streamlined processes, via reducing the need to undertake manual sorting of slides into cases and the retrieval of physical slides from archive where required. It also provides specimen tracking right through to the reporting stage, and thus improves patient safety. Furthermore, the greater than 1.5 million stored digital pathology images can be used for Research and Innovation with the potential for artificial intelligence and clinical decision support to make a tangible difference to the productivity and quality of outcomes from the pathology service.

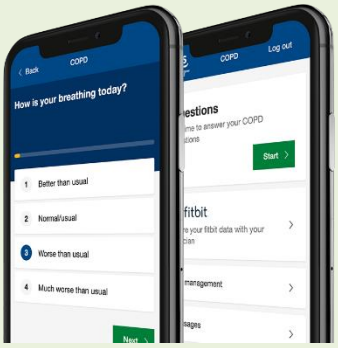
Digital Pathology, machine learning and clinical expertise has the potential to contribute to more accurate diagnosis, prognosis and individualised treatment in cancer. Machine learning requires access to large well annotated datasets. Case selection is crucial to train new algorithms and requires input from experienced pathologists, with protected time for research and innovation. Both the training and validation set must be clearly defined include all sample types or variants, including stages, grades, histologic classification to eliminate false-negatives and false-positives. Through collaboration we can ensure access to these datasets and thus enable the potential of AI to streamline workflow, reduce errors, increase reproducibility and predict outcomes to be realised. To enable this, R&I and its partners will ensure further investment in the safe haven's infrastructure alongside increasing the annotated datasets available to researchers.

9. Key Exemplars: Innovation

The exemplars below illustrate and depth of the innovation projects currently underway in GGC through collaboration with industry and academia.

9.1 **POLARIS**

Clinical Lead: Chris Carlin.
Industry partners: Astra-Zeneca, Lenus Health.



A novel pathway to embed and evaluate emerging technologies - linking wearable data, AI- based pulmonary function tests performance and interpretation support - to further deliver world leading data-driven proactive, preventative cardio-respiratory care.

Eligibility

Patient attending NHSGGC for respiratory diagnostic pathway assessment Intervention.

Outcomes

Test of change evaluation of patient and clinician user experience, clinical effectiveness and safety, cost-effectiveness. Cohort description and service activity, Service workload manageability and sustainability.

9.2 **Validation of an Artificial Intelligence Optimised Pathway for the Identification of Heart Failure in the Community (OPERA)**

Clinical lead: Dr Ross Campbell (AI component)
Industry Partners: AstraZeneca; Digital dashboard developed (LENUS).

Clinical Need

Prompt diagnosis of heart failure is essential to allow effective treatment and reduce hospital admissions. Echocardiography is the standard of care imaging modality used to confirm the diagnosis.

Aim 1

To determine feasibility and accuracy of AI enabled point-of-care echo, non-specialist versus current standard of care echo performed by specialist operators.

Participant Group

800 recruits: Approved by Research Ethics Committee, NHSGGC sponsored.

Outcome

Using AI to interpret images from a handheld ultrasound device is comparable at detecting how well the heart pumps as the gold-standard of diagnosis currently used in the NHS. The breakthrough new findings suggest that the use of AI could significantly speed up heart failure diagnosis waiting times.

9.3 **INCISE Project - INtegrated TeChnologies for Improved Polyp SurveillancE**

University of Glasgow-led collaboration with NHSGGC, Canon Medical Research, BioClavis and OracleBio)

Chief Investigator: Joanne Edwards.
Funder: NIHR £2.3 million (+ from collaborators)

Clinical Need

Currently, patients who test positive for blood in their stool are invited for colonoscopy. Approximately 5% of those patients will have cancer whilst over 30% will have pre-cancerous growths (polyps). These polyps are removed in a procedure called polypectomy; however, approximately half of those patients will go on to develop new polyps. There is an urgent need to develop a more robust criteria for screening so that we are not subjecting individuals to frequent, unpleasant and invasive procedures that, in half the cases, are unnecessary.

Aim

The project aims to transform bowel cancel screening in the UK by developing a tool that can predict which patients with pre-cancerous polyps in their bowels will develop further polyps.

Primary Outcome

Development of a comprehensive risk stratification tool which will for the first time predict polyp recurrence by utilizing the latest developments in digital pathology, machine learning and next generation sequencing.

9.4 **Paediatric Sleep Apnoea T-shirt**

Chief Investigators: Neil Gibson, Elsie Buchan.
Funder: Claymore surgical.

Clinical Need

NHSGGC clinicians and scientists have developed technology which they aim to incorporate into a t-shirt. This will allow easier, wireless assessment of childrens sleep patterns and disturbances which could be done at home. Current such assessments require in patient stays and compliance can be an issue with traditional methods of measurement.

Aim

To develop a Machine Learning Algorithm using routinely collected data from the sleep Laboratory via the West of Scotland Safe Haven.

Progress

The Hub supported development of a memorandum of understanding with Claymore surgical, a Scottish based start-up company, to develop the software solution. The phase I collaboration agreement has been signed.

The plan is to proceed to clinical evaluation studies once developed.

9.5 **CONGEST HF Correlation of the non-invasive Cardiopulmonary Management (CPM) wearable device with measures of congestion in heart failure- (CONGEST-HF)**

Chief Investigator Dr Pardeep Jhund
Investigator led commercially funded clinical investigation of a medicinal device.

Clinical Need

Heart failure is common, affecting 1-2% of the general population, with the prevalence increasing to over 10% in those over the age of 80. It is associated with high morbidity, with many patients requiring frequent and often lengthy hospitalisation for treatment with intravenous drugs (diuretics).

The ability to detect early signs of congestion may allow earlier treatment and prevent hospital admission. Analog Devices Inc have developed a wearable patch-like device called the Cardio-Pulmonary Management (CPM) wearable device which is applied to a patient's chest to assess congestion levels by measuring a number of physiological parameters over approximately five minutes.

Aim

Investigate if the measurements obtained by the wearable device correlate with invasive measures of cardiopulmonary haemodynamics.

Progress: Clinical evaluation plan in 2 cohorts of patients

- Cohort A: Patients with heart failure undergoing right heart catheterisation
- Cohort B: Patients undergoing dialysis
- Cohort C: Patients hospitalised with heart failure undergoing diuresis.

10. Patient Stories and Feedback

We are very grateful to all the patients within GGC who take part in clinical Research and Innovation projects and trials. Below are four case stories which demonstrate the feedback from patients.

At home COPD care gives me peace of mind when I need it most

A patient has praised the use of innovative technology which kept him out of hospital over winter by allowing clinical experts to monitor his chronic obstructive pulmonary disease (COPD) while he remained in the comfort of his own home. The programme has been led by Professor Chris Carlin.

Former lorry and tour bus driver Olaf Schneider, 67, said:

> “Living with COPD means that at times it feels like someone has put steel around your chest and you’re unable to breathe anymore, in those moments it’s terrifying.
>
> The technology has been hugely beneficial for me. Before if there were any issues we would have to get over to the hospital, which involved me moving and my wife having to travel with me and bring a wheelchair as I am unable to walk for any distance.
>
> Using the app means I have access to my consultant and can provide real-time updates on my condition to the team in Glasgow, who are amazing. They respond to me so quickly and I feel very supported. It gives me peace of mind when I need it most, knowing there is someone at the other end of an app monitoring my condition who can assist me if needed.
>
> I would recommend to anyone who has COPD to consider signing up to this as it means I can stay at home and be around my family, that’s so important for me.”

Olaf is one of around 500 patients who have trialed the technology, which was developed by digital health start-up Lenus Health in NHSGGC. Following its success, the programme has been rolled out to health boards across the country.

Linsey, Olaf’s wife, highlighted the impact the technology has had on the entire family.

She said:

> "The system is great, we are so pleased that it means Olaf can stay at home with us while his condition is being monitored. Olaf doesn't like us to worry but when his COPD flares up it can be really scary.
>
> Knowing that there are experts looking after him remotely gives him peace of mind, but it's also comforting to all of us too."

Innovative technology keeps families connected at Royal Hospital for Children

vCreate is an NHS-trusted secure video messaging service that helps patients, families and clinical teams stay connected throughout their care journey. The vCreate platform allows patients to register on a secure digital platform to exchange videos and photos with members of their clinical team. The programme is led by Dr Neil Patel.

Little Alfie was born nine weeks early at 31 weeks and his mum, Elizabeth has praised the technology:

> "I have been at the hospital every day, but vCreate has been so helpful in making sure all of us know how Alfie is doing and that he is getting such amazing care. It's such a great thing. You don't really get much sleep during situations like this but even knowing you'll wake up to an overnight update from staff on your phone keeps you going and it makes your day to see pictures and videos of him doing so well.
>
> "Myself and my partner George have been able to visit Alfie and stay with him, but his siblings and extended family haven't, so vCreate has meant we are able to share real-time updates with everyone and they feel more connected to Alfie because of this too."

CART Cell Innovative Therapy

A patient's aggressive Lymphoma cancer has been successfully treated with CART cells in a clinical trial run at NHSGGC by principal investigator Dr David Irvine: A Single Arm, Open-Label, Multi-Centre, Phase I/II Study Evaluating the Safety and Clinical Activity of AUTO4, a CAR T Cell Treatment Targeting TRBC1, in Patients with Relapsed or Refractory TRBC1 positive selected T Cell Non-Hodgkin Lymphoma.

Jim, 76, said:

> "After that first shock of diagnosis I tried never to get too high about progress or too low about the lack of progress. I was just so glad they had a treatment I could try. And taking part in a trial has the potential to help others. It's all about gathering information."

Three years after the trial, Jim says: “They cannot find any trace of the cancer now”.

Innovation Heart Failure treatment at Home

A newly-developed heart failure device and medication combination, which has been shown to be safe and effective to use, is now being used to treat patients in the comfort of their own home. The new device and drug combination was developed by SQ Innovation Inc and is being evaluated in a multi-centre study led by Professor Mark Petrie on behalf of the heart failure team. The study is co-sponsored by NHSGGC and University of Glasgow.

Lorraine was diagnosed suddenly with heart failure in April 2023, and was asked to participate on the trial to administer the novel drug and device combination at home. She said:

> “It was so easy to do and very simple to use, you didn’t even know you had it on. At the time, I worked seven days a week, so by being able to use this treatment at home, it meant I didn’t miss any work, I could avoid a stay in hospital and wasn’t restricted by what I could do.”

11. Research and Innovation, Resilience and Growth in 2024

In 2023, the R&I phase II recovery plan aimed to ensure not only the restoration of clinical research activity that was underway pre-COVID but to improve on our processes. It is reassuring to note that the number of researchers, studies and overall recruitment is now back to the level seen prior to the pandemic.

In 2024 R&I will focus on ways that we can further overcome challenges, build on our strengths and take advantage of opportunities to become even better at high quality experimental and world leading translational innovative medicine. In this difficult financial climate, it is crucial that measures are in place to maximize income generation and cost-recovery, enabling a sustainable and supported R&I workforce. These will include processes to increase grant income as well as expansion and further development of collaborative models with industry.

R&I will ensure effective and efficient use of resources whilst working to the highest standards to enable NHSGGC's Research and Innovation ambitions to be realised. In order to achieve this, we need to offer opportunities for our patients to take part in research and innovation at every point in their journey. This will be enabled in NHSGGC through the development and deployment of Hub and spoke models. We will also further enable clinical trials by the facilitated use of data via the Safe Haven for feasibility assessments, recruitment, follow-up and generation of routinely collected data outcomes.

In 2024, the vision is for NHSGGC to play its part in making the NHS the country's most powerful driver of innovation through the development, testing and adoption of novel devices, treatments and technologies. R&I will continue to work collaboratively with our partners in academia and industry to advance our knowledge and practices. The focus is on delivering Research and Innovation which impacts significantly on patients' care and experiences, addresses national public health priorities and results in cost-savings and greater efficiencies in the NHS.