Future Care Capital

Report

Enterprise in Health

Exploring Involvement of Clinicians and Academics

Dr. Josefine Magnusson, March 2021

About FCC

Future Care Capital is a charity which undertakes research to advance ideas that will help shape future health and social care policy and deliver better outcomes for individuals living in the UK.

Beginning life as the National Nursery Examination Board in 1945, the charity has evolved throughout its 70-year history and we continue to have Her Majesty the Queen as our Royal Patron.

About the Author

Dr Josefine Magnusson is Senior Research Officer at Future Care Capital. She has long-standing experience of public health research within higher education and holds a PhD in health service research.

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Executive Summary

In 2020, the UK Chancellor of the Exchequer announced plans to increase R&D investment[1] in the UK to £22bn per annum by 2024-5. This pledge reflects the Government's commitment, set out in its Research and Development Roadmap, to make the UK a 'science superpower' and a more attractive place for entrepreneurs to invest and operate[2]. To achieve this, the Academic Health Science Network has stressed the importance of collaboration between different aspects of the innovation landscape including industry, academic institutions and the NHS.[3]

In previous reports, Future Care Capital (FCC) has explored the potential to leverage NHS data for the purposes of research and innovation in healthcare[4], in particular, in relation to medical imaging data[5] and the development of next generation medical devices[6]. This report builds upon that work and examines the extent to which a subset of academics and clinicians are involved in enterprise activity. A novel and explorative approach was deployed which used publicly available data to better understand the contribution that academics and clinicians who work for universities and NHS Trusts deemed likely to be involved in healthcare innovation currently make.

Overall, we found:

- Identifying which clinicians and academics are involved in health innovation enterprises is extremely challenging using publicly available data, and this limits our understanding of the extent of such involvement.
- The health innovation landscape is heavily male dominated, with 80-90% of the companies we found being linked to men.
- Companies operating in data and technology appeared to be more readily identified using our methodology than companies linked to pharmaceutical discovery and manufacture.
- Echoing findings from our previous work; among NHS Trusts, Acute Trusts appear to be linked to significantly greater involvement in health enterprise than Mental Health, Community or Ambulance Trusts.
- We could identify only very limited geographical overlap between the two sectors (Universities and NHS Trusts), despite the highlighted need for collaboration between different aspects of the R&D ecosystem.

In light of these findings, we recommend:

- That there be means for an appropriate body to have access to information about the financial interests of clinicians from the point of view of patient safety, even if that information isn't made publicly available in order to protect privacy. This information could be linked to the General Medical Council register.
- That the AHSN extends its current focus on diversity in innovation to put greater emphasis on what can be done to encourage and support women. For universities this may also be considered under the Athena Swan charter[7].
- That further work is undertaken to compare our findings against enterprising activities in less prolific and research intense Trusts and universities, to assess the performance of support for enterprise and innovation for the Government's levelling up agenda.

Introduction

Innovation and enterprise in the healthcare sector in the UK is a priority of the current and recent Governments. The Life Sciences Industrial Strategy[8] described life sciences as a key sector for consolidating UK economic success post-Brexit, which is reflected in the fact that UK investment in health R&D is internationally leading, behind only the US globally (Office for Life Sciences, 2020)[9].

In order to encourage innovation and facilitate growth in the sector, a range of initiatives and strategies have been put in place, including the establishment of the Academic Health Science Network (AHSN)[3], the associated Innovation Exchange[10]; the Accelerated Access Collaborative[11], as well as the Life Sciences Industrial Strategy[8] and subsequent update[12]. The aim of the AHSNs is to bring together health services with academics and industry in order to encourage innovation that will bring tangible benefits to both the economy and patients. The Innovation Exchange is assisting that process by identifying innovations with the greatest potential to improve practice and patient outcomes, and the Accelerated Access Collaborative provides further support in getting the best products to market quickly through regulatory approvals.

Clinical involvement in innovation is an effective way of identifying need from practical experience and helps ensure that new products and services in healthcare are designed to respond to real and pressing needs, rather than falling foul of 'solutionism'. It can assist in getting new technologies adopted by the health service more quickly and efficiently, since clinicians can act as important ambassadors and drivers of change. It may also contribute towards the aims outlined in the Topol Review[13] of upskilling the NHS workforce to adapt to increasingly innovative and technology-focused ways of working. In the context of delivering patient benefits, innovation in products and treatments is an important and necessary aspect of improving services and increasing patient safety, so encouraging clinician involvement in such endeavours is logical. From an economic standpoint, innovative businesses provide job opportunities and investment in the areas where they are located, and are important drivers for successful local economies, as well as contributing to the economy more broadly (Centre for Cities, 2020)[14].

The remit of the AHSNs was renewed in 2019 and funding guaranteed until 2023 provided success is achieved in "spreading proven innovation across England" (NHS Long Term Plan, 2019)[15]. This points to another goal in nurturing healthcare innovation: to ensure that benefits are spread across the country rather than being concentrated in certain locations with strong traditions in this space, such as the areas hosting top ranking universities. This commitment is also highlighted in the R&D Roadmap[2] which promises to "*take greater account of place-based outcomes in how [Government] make decisions on R&D in the UK, ensuring that our R&D systems make their fullest contribution to our levelling up agenda*". In a similar vein, an R&D Place Strategy[16] is expected in the near future.

In Taking Next Steps to Harness the Value of Health and Care Data[4], we investigated demand for healthcare data held by NHS Trusts in England, for research and commercial purposes. We found that such demand tended to be greater for data held by Acute Trusts and Trusts located in proximity to a Russell Group university, and that the largest number of requests for data came from Higher Education Institutions (HEIs) themselves. Since a proportion of data requests result in commercial agreements between NHS Trusts and third parties, the benefits that flow from such agreements may therefore not be evenly distributed across the country but concentrated in areas linked to research intensive universities. Notably, in our previous research we received only very limited information from the Shelford Group Trusts, which comprises ten of the largest teaching and research hospitals

in England. Theses trusts tend to rank among the highest in the NIHR Research Activity League Table[17], which ranks NHS Trusts and Clinical Commissioning Groups (CCGs) by the amount of clinical research they are involved in. Consequently, our understanding of the extent to which larger Trusts linked to academic centres of excellence engage in data-driven research and innovation is limited. Since the strategies, programmes and organisations described above aim to foster greater links between industry and the NHS, it would be useful to know the extent to which clinicians are directly involved with resulting enterprises (as opposed to, say, in an advisory or purely research capacity).

There are other reasons why gaining a better understanding of the extent to which clinicians are involved in health enterprises is important. As the Cumberlege Review[18] of avoidable harm from medicines and medical devices made plain, patients have a right to know whether their care providers have financial interests in the products or treatments they recommend. This was something found to be a concern for many of the people interviewed for the Review, such that the current lack of transparency in this area is problematic, and a key recommendation of the Review is for this information to be included in the General Medical Council (GMC) register of clinicians operating in the UK. At this point in time, there is no other way in which to readily ascertain the financial stakes of clinicians involved in companies that develop and/or provide healthcare products and services.

Methodology

In this report, we focus on the enterprise activities of clinicians working at a Shelford Group or other NHS Trust with links to Russell Group Universities as well as academics working in those universities. In our previous work we discussed demand for health data but, here, we look at health innovation and enterprise more broadly by investigating the extent to which GMC registered practitioners and academics in pertinent departments at Russell Group universities are involved in companies registered with Companies House – specifically, where such practitioners are registered as a "Person with Significant Control" (PSC).

A PSC is likely to be someone who holds:

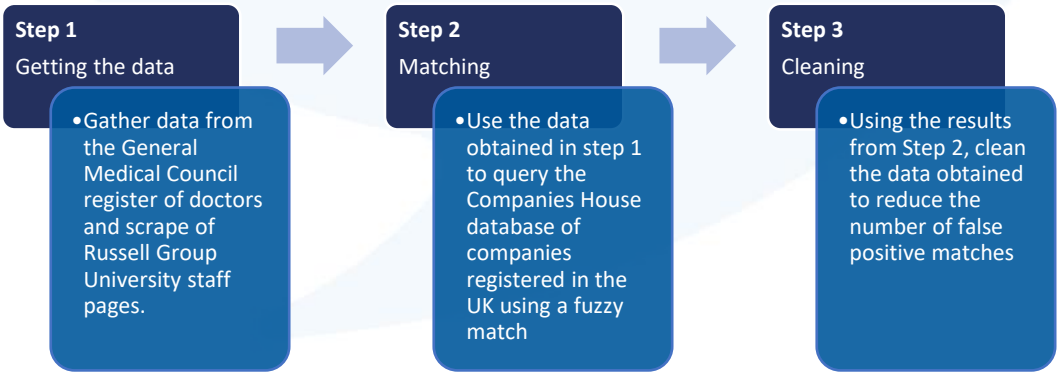
- more than 25% of shares in the company
- more than 25% of voting rights in the company
- the right to appoint or remove the majority of the board of directors

(Companies House)[19]

This method was used in order to identify clinicians and academics most likely to have a financial stake in the company they are registered with, or who have been involved to a significant extent in the development of a company.

To identify the clinicians whose involvement in enterprise activity we sought to better understand, we used the list of practitioners registered with the General Medical Council (GMC) in the UK. The list was manually cleaned to contain only practitioners working in non-private practice in England and GPs were excluded - as were practitioners working in NHS Trusts other than Shelford Group Trusts or Trusts associated with Russell Group universities. This resulted in a list comprising of 32,978 clinicians. For academics, we obtained the names of pertinent staff from the university web pages of relevant academic institutions and associated research centres and we focused on staff working in relevant departments (i.e. life sciences, medical sciences, data science, statistics, engineering, computer science, and some maths departments if they had research related to AI). This resulted in a list of 18,825 university staff.

Both lists were compared against Companies House records using machine learning algorithms and matched based on names. The matched lists were subjected to cleaning to (as far as possible) remove duplicates, non-healthcare companies and private medical practices. We were left with 1,135 companies linked to 1,055 clinicians and 143 companies linked to 140 academics; see Appendix for further information about our methodology.



Findings

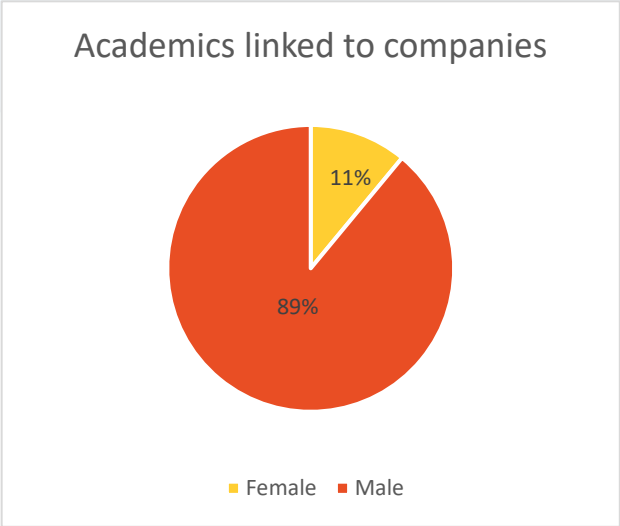
The vast majority of clinicians that we identified were linked to just one company. Six per cent of clinicians in the sample had two or more companies registered to their name. The maximum number of companies registered to a clinician in the sample was 4. Among academics 7% of the cohort we examined were linked to two or more companies, with just one academic registered with three companies. We also looked for overlap between the two lists and found only one company that appeared in both samples and one individual. Hence, overlap was virtually non-existent.

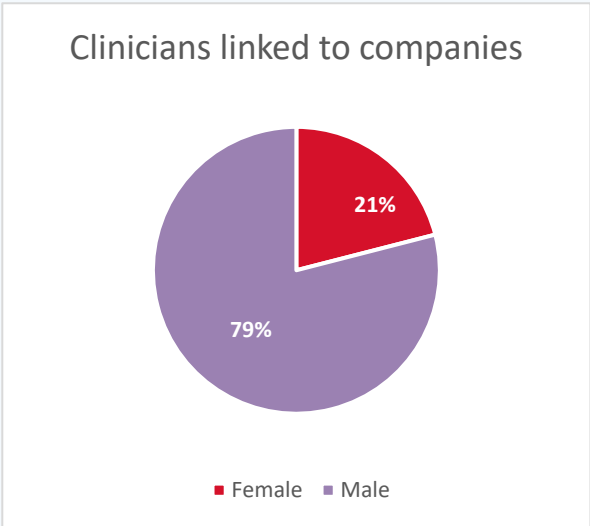
Gender

In both samples, significantly more of the individuals linked to companies were male than female (Figure 1). The gender split for General Medical Council registered clinicians in our sample overall was 58% (19,221) male and 42% (13,757) female. Among the clinicians with companies registered to their names, however, just 21% were female, meaning that only 1.6% of female clinicians were registered with a company compared to 4.3% of male clinicians. The gender divide was even more pronounced among academics, with circa 10% of the sample linked to companies being female.

The original list of academics drawn from university websites did not contain information about gender, so we are unable to say anything with confidence about the gender split in that sample overall. However, the latest (2018/19) data from the Higher Education Statistics Agency (HESA)[20] shows that for the disciplines included in our sample - namely, Medicine, Dentistry & Health; Biological, Mathematical & Physical Sciences; and Engineering & Technology - 43% of academic staff were female. This strongly suggests a significant underrepresentation of women in enterprise activities also in our academic sample.

Figure 1: Gender





Age

In both samples, the average age of an individual registered as a PSC was 49 years. However, the spread across ages was more even among academics than clinicians, with more academics in both the lowest and highest age brackets (see: Table 1). This may reflect the lengthier time it takes to become qualified as a clinician and the tendency of academics to continue roles in universities as

associate, visiting or emeritus staff beyond the point of retirement.

The average age in our sample is somewhat higher than that observed in other pertinent research, which tends to peg the average age of company directors and founders in their early '40s (see, for example, figures published by the Institute of Directors[21] and Enterprise Nation[22]). Our findings perhaps reflect the demographic of individuals whose entrepreneurship grows out of a first or primary career, as compared to those for whom founding a business or businesses is a career in itself.

Table 1: Proportion of individuals linked to companies by age

Age group	Clinicians	Academics
<30 years	<1%	2%
30-39 years	10%	20%
40-49 years	45%	29%
50-59 years	35%	29%
60-65 years	7%	9%
>65 years	2%	10%

Location

Geographically, there did not appear to be great variation between different NHS Trusts in our sample where the proportion of clinicians registered as a PSC is concerned; this figure ranged from 0-5%, with 80% of Trusts having between 2-5% of clinicians registered as a PSC. Looking at the universities, on the other hand, between 0-2.4% of academics within each institution was registered as a PSC but entrepreneurship was concentrated among staff at six of the Russell Group universities we examined: the University of Birmingham, Imperial College London, the London Centre for Nanotechnology[1], University of Cambridge, University of Manchester, and Queen Mary University of London.

The concentration of people acting as a PSC within companies may be more spread out across organisations in the NHS than in higher education, but due to the nature of our methodology some caution in interpretation is warranted. For example, when checking known university spin-out companies, we found several cases where the university itself, rather than an individual, was listed as the PSC, and such companies would not be captured through our methodology. It is possible that this practice is more common in some universities than others, although we are not aware of any data to either support or refute this hypothesis. In earlier work, we found that the proportion of the profit generated by a spin-out company that is awarded to an individual varies significantly between

[1] The London Centre for Nanotechnology is a research institute and collaboration between Imperial College London, University College London, and Kings College London

Trusts[4], and it is not infeasible that the same holds true for universities. This is almost certain to be replicated in some shape or form in the way that universities approach intellectual property in the context of employment contracts. By extension, this could also suggest variation in the amount of control that individual organisations take over spin-outs on the whole. However, some pattern was noted when looking at the types of NHS Trusts (see: Appendix - Table 4). The majority of Trusts in our sample (34/ 49) were Acute Trusts, 11 were mental health Trusts, 3 community Trusts, and one an ambulance Trust. All of the top 25 Trusts by the proportion of clinicians within them that were registered as a PSC were Acute Trusts. Although our sample is relatively small and should be interpreted with caution, this nonetheless suggests that clinicians at Acute Trusts are involved in more enterprising activities than clinicians working in other types of Trusts.

Types of companies

Companies House categorizes companies using SIC codes (Standard Industrial Classification of Economic Activities) which should provide some information on types of activities the companies in our samples engage in; for example 'Manufacture of pharmaceutical preparations' or 'Manufacture of medical and dental instruments or supplies. However, the most frequently occurring SIC codes in our analysis were the generic 'Specialist medical practice activities', 'General medical practice activities', and 'Other human health activities' which accounted for three quarters of the companies, so this provides us with very little information about actual company activities.

In a subsample of companies linked to academics that we looked at in more depth, we found a number of companies operating in the space of health tech and medical devices and, as such, it would appear that these types of companies are more readily identified with our methodology than companies in the pharmaceutical space.

Company example:

Wearable medical devices

Acurable creates accurate and user-friendly medical devices intended to be used by people at home.

Their products include devices for diagnosing obstructive sleep apnoea, and monitoring breathing and cardiac biosignals for research.

Company example:

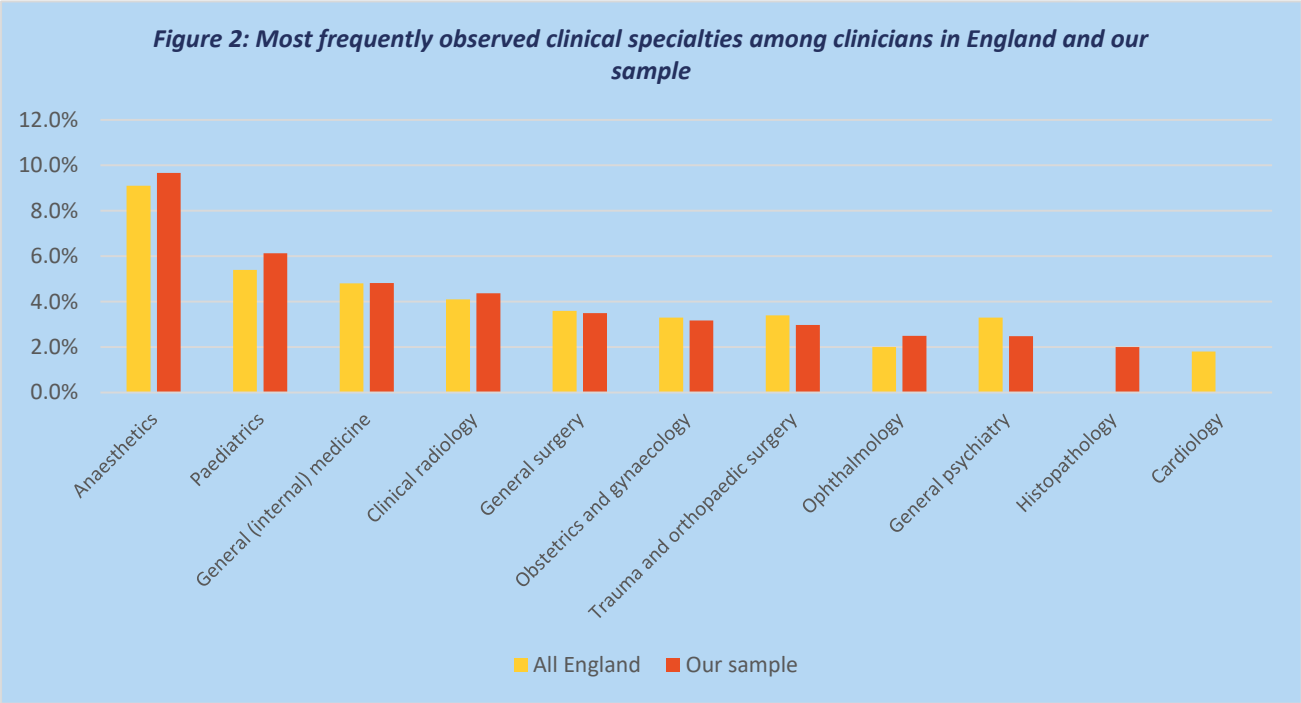
Analysis software

Miakat provides a suite of analysis tools for PET neuroimaging data, enabling imaging scientists to efficiently and accurately analyse their data.

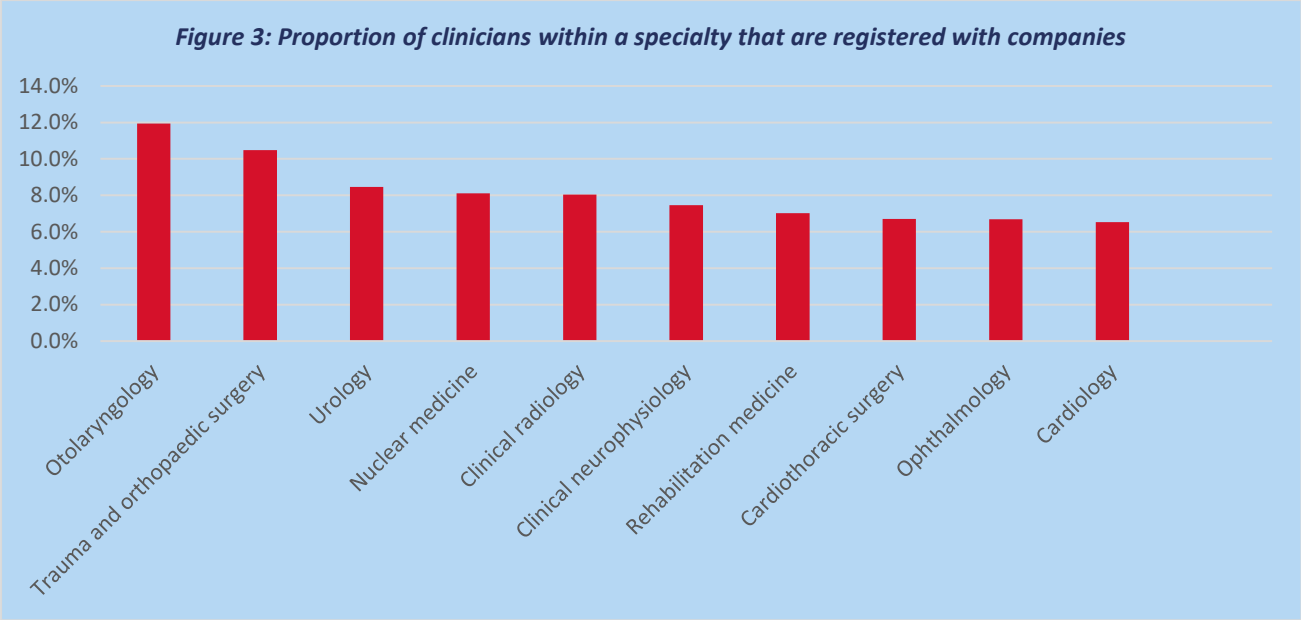
Area of specialty

Clinical speciality

Figure 2 illustrates the medical specialty of clinicians in England overall and in our subsample of specific Trusts. It indicates that the clinicians in our sample were broadly representative of the specialties observed among clinicians in England.

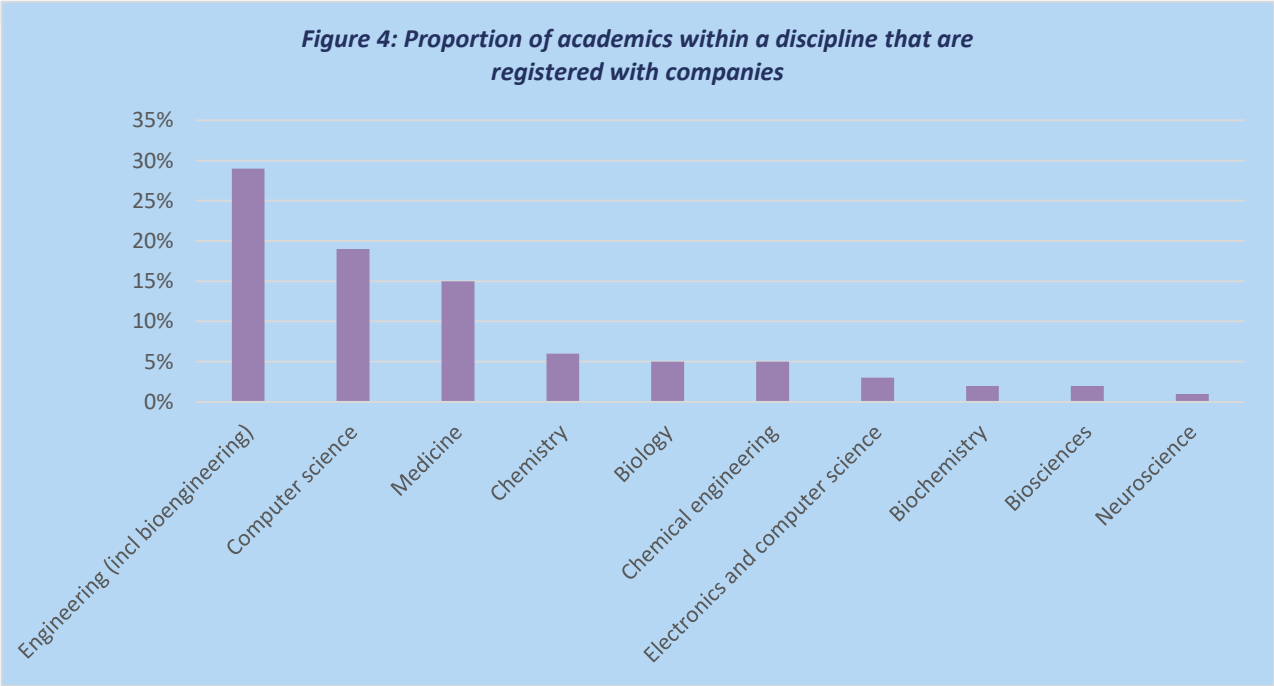


The highest proportion of companies within our dataset were registered to clinicians whose stated specialism was anaesthesia (16%), which is unsurprising since anaesthetics was also the most frequently occurring specialty within the sample as a whole (Figure 2). However, looking within individual specialties, Figure 3 demonstrates that the specialties that proportionally gave rise to the largest number of companies in our sample were otolaryngology, trauma & orthopaedic surgery, and urology. In fact, many of the specialties noted in Figure 3 were less frequently occurring in the overall sample and are more narrow or specialised; otolaryngology and urology represented only 1% of our overall sample respectively, while nuclear medicine was less than one percent. Again, this may point towards our methodology being more likely to identify technology and medical device centred companies rather than those concerned with drugs and pharmaceuticals.



Academic discipline

Our sample for academics was drawn from a subsample of universities and departments in England and, as a result, we cannot say anything about how representative our sample is of academics across the country as a whole with regards to the spread of academic disciplines. Within individual disciplines, the largest proportion of companies were linked to academics working in engineering (including bioengineering), computer sciences and medicine (Figure 4) which together accounted for nearly two thirds of all academics linked to companies. Again, this points towards companies focused in the technology and medical device space.



Assessing financial value

Our methodology allowed us to extract information from the Companies House database about companies with machine readable accounts; in our sample this was the case for 54% of companies linked to clinicians and 61% for companies linked to academics.[2] Where accounts were accessible, we used equity as an indicator of the value of individual companies, as this was the most widely recorded information in the accounts we retrieved. Few companies in either sample had equity of more than £250,000, and considerably more of the companies linked to academics than clinicians were in negative equity at the time of analysis (see: Table 2).

Table 2: Proportion of companies linked to clinicians and academics within each equity bracket

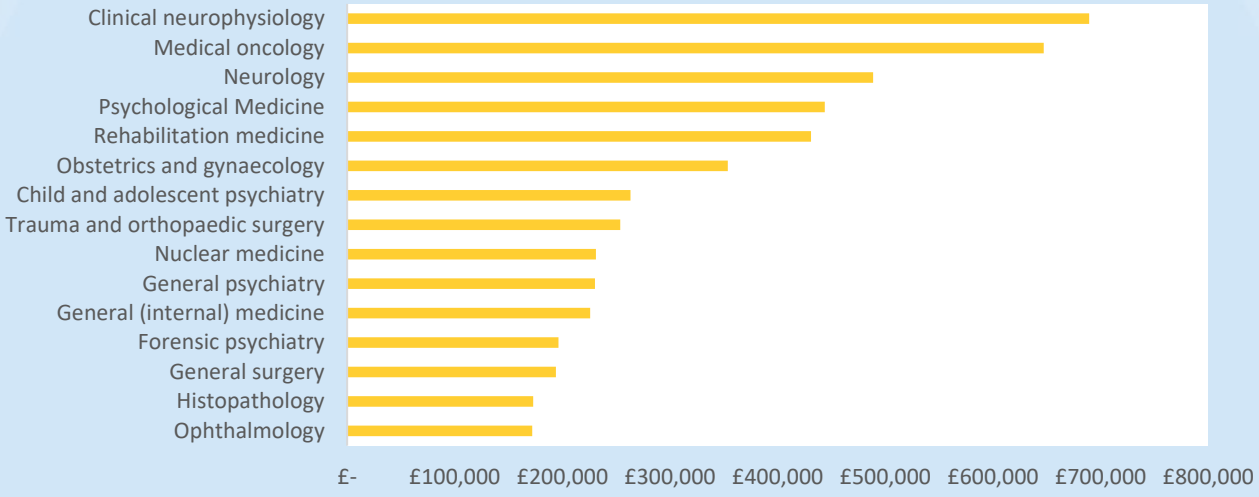
Average equity of companies	Companies associated with clinicians	Companies associated with academics
>£1,000,000	1%	2%
£500,000-999,999	3%	2%
£250,000-499,999	5%	1%
£100,000-249,999	7%	8%
£50,000-99,999	8%	3%
£1-49,999	27%	31%
Negative equity	3%	14%
No record of equity	46%	39%

[2] There are different reasons why some companies submit machine readable accounts and others do not – for example, larger companies often submit accounts in PDF format which limits its utility for this type of analysis. At the other end, smaller companies are not required to submit the same level of detailed accounts as larger companies are. Therefore, both very large and very small companies may be underrepresented in our financial analysis.

Financial value of companies linked to clinicians

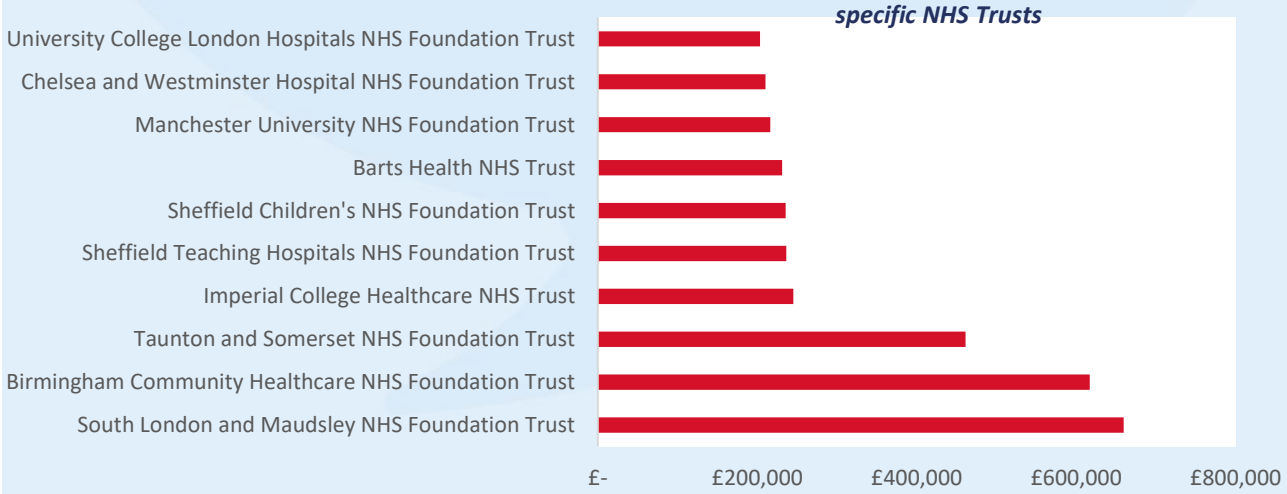
Companies with the highest average equity were registered to clinicians specialising in clinical neurophysiology, medical oncology, and neurology (see: Figure 5). This may provide some indication of those clinical specialties that are most likely to benefit financially from the companies they are involved with, however caution should be observed as these specialties were associated with relatively few companies. Thus, one high equity account from a single company could push the average up significantly. By contrast, other specialties like Obstetrics & Gynaecology, or Trauma & Orthopaedic surgery, are linked to many more companies with a larger number of accounts to draw on, so are less vulnerable to large outliers.

Figure 5: Average equity of companies linked to clinicians within specific clinical specialties



The average equity of companies associated with individual NHS Trusts are shown in Figure 6. Once again, caution should be observed when looking at the Trusts associated with the highest equity companies: Taunton & Somerset NHS Trust, Birmingham Community Healthcare Trust and South London and Maudsley NHS Trust all have relatively few companies with accounts linked to them which could account for the high average equity.

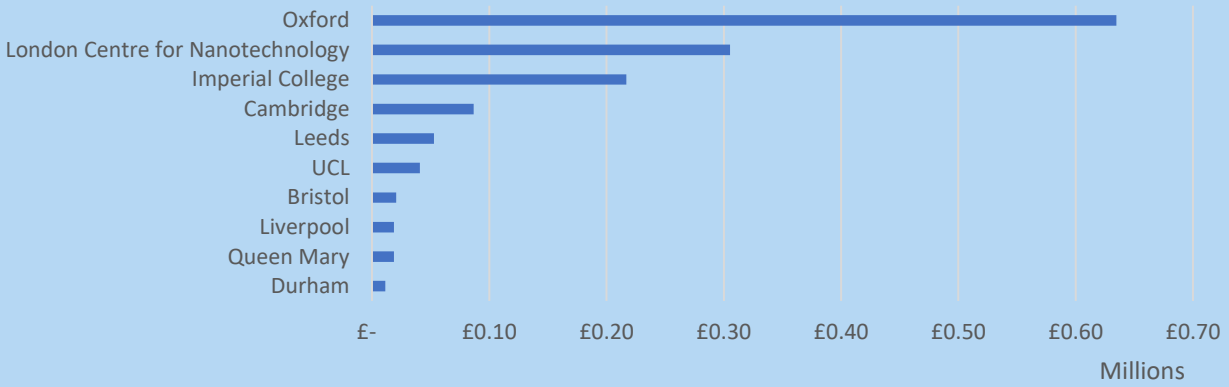
Figure 6: Average equity of companies linked to clinicians within specific NHS Trusts



Financial value of companies linked to academics

The companies in our sample with academic involvement had an average equity above £100,000 in three locations: University of Oxford, Imperial College London, and London Centre for Nanotechnology (Figure 7). It might be the case that the value of companies is more evenly spread across NHS Trusts than across academic institutions. However, both Oxford and Imperial were linked to a small number of companies with very high equity (in excess of £1,000,000) and, once again, this drives up the average value of companies linked to these universities in our sample, while the spread of equity amongst companies linked to the London Centre for Nanotechnology is much more even.

Figure 7: Average equity of companies linked to academics within the 10 universities and research centres associated with the highest value companies



Overlap between NHS Trusts and Universities

The value (equity) of companies in both samples was compared to see whether there was a correlation between Universities and associated NHS Trusts – i.e. whether an NHS Trust linked to a particular university would perform similarly to the university in terms of company value. However, the only institution for which this held true was Imperial College; both the university and the associated NHS Trust were associated with some of the highest average company equity in their respective samples.

Whilst we didn't undertake an assessment of good practice, it's clear throughout our research that Imperial lends itself to entrepreneurial activity, whether amongst clinicians or academics.

This is perhaps a reflection of some key tenets in the university's publicly available Intellectual Property policy which state that "[The] College is committed to encouraging the commercialisation of College IP by licensing its technologies to companies that would maximise the societal impact of College's research outputs."

Conclusion and recommendations

To deliver the ambition set out in the Life Sciences Industrial Strategy[8] of making the sector a key driver of post-Brexit economic success in the UK, investment in the innovation and enterprise ecosystem is essential. For enterprise in health and medicine this necessitates a clear understanding of the extent to which clinicians and academics working in this space are actively able to translate innovative research into commercially viable companies that can create jobs and benefit the wider economy.

We attempted to gain a better understanding of the current landscape by using a novel approach of linking clinicians and academics working in or in proximity to Russell Group universities to Companies House records, and found:

- Identifying which clinicians and academics are involved in health innovation enterprises is extremely challenging using publicly available data, and this limits our understanding of the extent of such involvement.
- The health innovation landscape is heavily male dominated, with 80-90% of the companies we found being linked to men.
- Companies operating in data and technology appeared to be more readily identified using our methodology than companies linked to pharmaceutical discovery and manufacture.
- Echoing findings from our previous work; among NHS Trusts, Acute Trusts appear to be linked to significantly greater involvement in health enterprise than Mental Health, Community or Ambulance Trusts.
- We could identify only very limited geographical overlap between the two sectors (Universities and NHS Trusts), despite the highlighted need for collaboration between different aspects of the R&D ecosystem.

1

The lack of transparency with regards to involvement in health enterprise activities among clinicians and academics is problematic not just because of the implications for understanding innovation as a dynamo for economic growth. It also points to an inability to easily identify which individuals stand to benefit from implementation and use of treatments and technologies in the NHS, and as such potential conflicts of interests are not readily discernible. In light of the Cumberlege Review[18], this may be particularly problematic when assessing the involvement of clinicians in profit-making companies as lack of transparency in this area could jeopardise trust among patients. As we experienced time and again, it is often difficult to match clinicians to companies with certainty using publicly available records and doing so would require significant effort on the part of individuals.

We recommend that there be means for an appropriate body to have access to information about the financial interests of clinicians from the point of view of patient safety, even if that information isn't made publicly available in order to protect privacy. This information could be linked to the General Medical Council register.

2

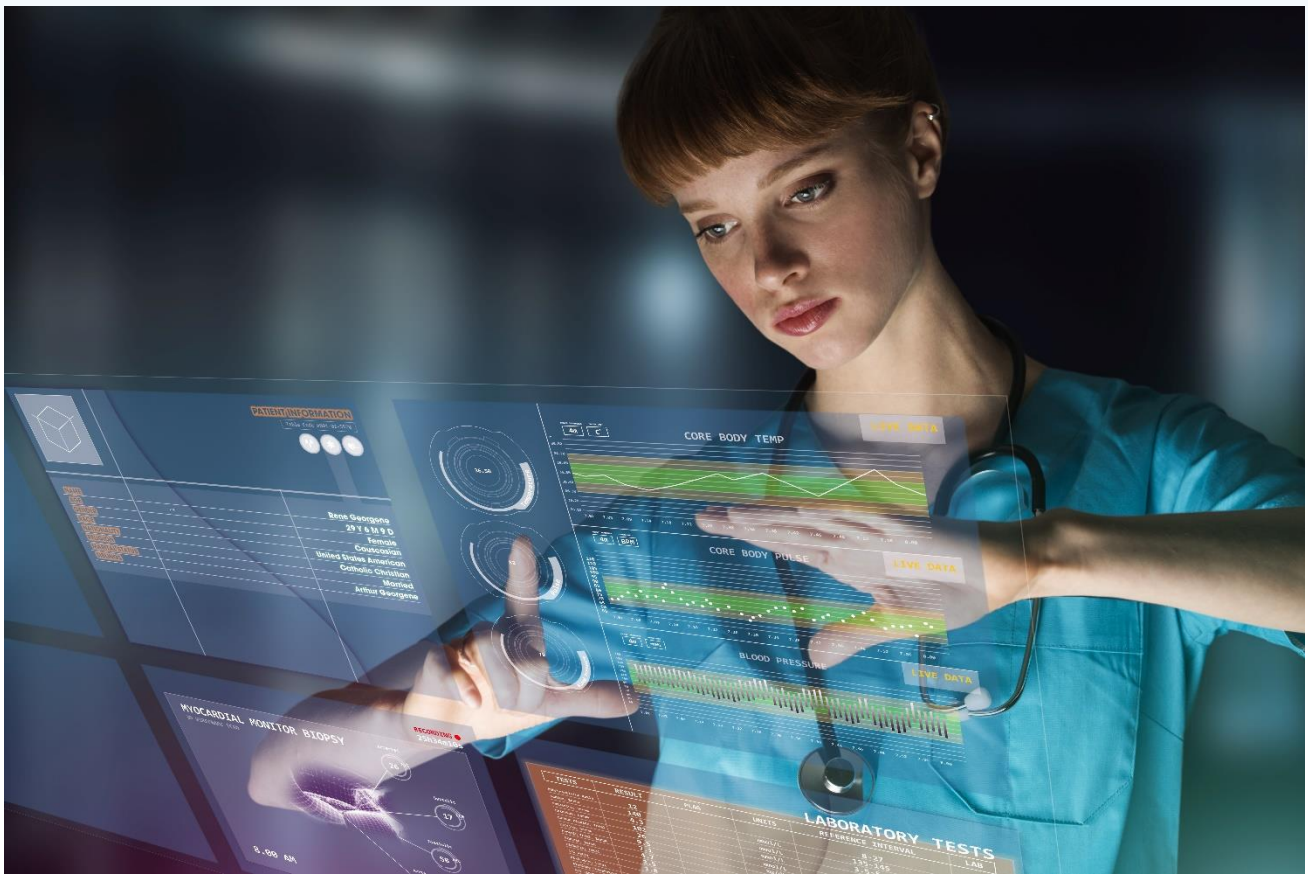
We also found that female clinicians and academics were significantly less likely to be registered as a Person with Significant Control in the companies identified than their male counterparts, something that goes against the AHSN's stated objective of inclusivity and diversity in innovation and enterprise[10]. According to Innovate UK[23], women are half as likely to start a new business as men, and greater equality in this space has the potential to significantly increase GDP. A lack of female innovators in health may also exacerbate gender biases in treatments and technologies, with resulting poorer outcomes for female patients[24]. The Women in Business awards[25] operated by Innovate UK are a good initiative in this space, but are aimed towards women that are already involved in businesses. More needs to be done to encourage them getting there in the first place.

We recommend that the AHSN extends is current focus on diversity in innovation to put greater emphasis on what can be done to encourage and support women. For universities this may also be considered under the Athena Swan charter.

3

The AHSN has stressed the importance of collaboration between the NHS, universities and industry for effective innovation, but we found only very limited evidence of overlapping involvement between universities and NHS Trusts in the companies we identified. The fact that companies linked to academics were heavily concentrated to a small subsample of the universities included in our analysis may be indicative of variation between different institutions in policies regarding ownership over intellectual property. This limits our ability to draw conclusions about collaborations in universities where academics could not be readily linked to companies. Nevertheless, the only instance where we found a correlation in the value of companies between a university and an associated Trust was for Imperial College London, suggesting that the value of spin-out companies cannot be predicted straightforwardly by their location. More broadly, the locations of the organisations included in our research do link up with the geographical spread of Biopharma and MedTech companies as noted in the Biosciences and Health Technology Sector Statistics[9], confirming that this is where most health innovation is concentrated. To some extent this goes against the ambitions set out in the NHS Long-term Plan of ensuring that innovation activities are spread equally across the country to minimize inequalities. We reiterate our previous concern that not all NHS trusts are able to benefit equally from demand for data or involvement in research and enterprise activities, which has implications both for the trusts themselves and, not the least, the populations that stand to benefit from such innovation.

We recommend that further work is undertaken to compare our findings against enterprising activities in less prolific and research intense Trusts and universities, to assess the performance of support for enterprise and innovation for the Government's levelling up agenda.


PATIENT INFORMATION
CORE BODY TEMP
LIVE DATA
CORE BODY PULSE
LIVE DATA
BLOOD PRESSURE
LIVE DATA
MYOCARDIAL MONITOR BIOPSY
LABORATORY TESTS

References and Appendices

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Appendix

The analysis presented in this paper is from the matching of datasets: (1) a sample of the General Medical Council registry and (2) academic staff working at Russell Group Universities and associated research centres; against data from Companies House.

General Medical Council data
We used data for consultants that were tied to a Russell Group University Hospital or an NHS Digital Exemplar. We also included hospitals where Russell Group Universities have research projects and agreements with them such as the Royal Free and Alder Hayes.

Academic data
We identified academics via a scrape of staff pages of Russell Group Universities, of staff working in specific departments (life sciences, medical sciences, data science, statistics, engineering, computer science, and some maths departments if they had research related to AI).

Data cleaning
We deleted all companies where the query did not retrieve the SIC code (eliminated 200 companies). We deleted all companies that were not part of the 41 preselected SIC codes we were interested in. We deleted all companies that weren't classified as being 'active'. This means we got rid of companies in liquidation or dissolved.

We then deleted 28 SIC codes of the ones that we had initially selected as we realised that they added too much noise to the data. We were left with the following SIC codes in the dataset (n.b. some companies were listed under more than one SIC code, hence there are more SIC codes than total number of companies in our analysis):

Table 1: SIC codes of included companies

Description	Freq.	Percent
Specialists medical practice activities	1,145	45%
General medical practice activities	420	17%
Other human health activities	319	13%
Other professional, scientific and tech	184	7%
Other information technology service ac	135	5%
Hospital Activities	132	5%
Other information service activities n.	69	3%
Research and experimental development o	54	2%
Other research and experimental develop	37	1%
Manufacture of medical and dental instr	13	1%
Data processing, hosting and related ac	11	0%
Medical nursing home activities	6	0%
Manufacture of basic pharmaceutical pro	4	0%
Total	**2,529**	**100**

We then focused on ID verification techniques to reduce the amount of false positive matches. In the companies House database individuals can register their occupation (which is different from the role they might have in the company they are registering). We determined that there were about 176 occupation that would clearly signal a false match, so we deleted those. These included occupations like “marketing consultant” or “Software analyst” as these clearly would signal that the individual main activity would not be related to the medical and therefore meaning that the likelihood of them being a GMC registered doctor would be quite low.

We went a step further in identity verification and did various permutations of if this job title and in the SIC code then delete or if in this sic code and there is no occupation reported.

We also tried to identify patterns in the data for company names that would allow us to identify what would be a private practice rather than a data-driven company. We identified several patterns like company names with the words “private” or “centre” or “associates”.

We supplemented this with several manual checks for people who had more than three companies registered to their name.

We retrieved individual’s date of birth from the companies house database and could create an estimated year of birth from the GMC database by using the year of qualification minus 26 which would be the earliest age at which someone could graduate from medical school. We then deleted all observations where the difference between the estimate year of birth and actual year of birth was too big.

Table 4: List of included NHS Trusts and proportion of clinicians at each Trust registered as a PSC with Companies House

Trust	Proportion registered as a PSC	Type of Trust
Liverpool Women's NHS Foundation Trust	5.3%	Acute
North Bristol NHS Trust	5.2%	Acute
Chelsea and Westminster Hospital NHS Foundation Trust	4.9%	Acute
Wirral University Teaching Hospital NHS Foundation Trust	4.9%	Acute
Imperial College Healthcare NHS Trust	4.8%	Acute
Taunton and Somerset NHS Foundation Trust	4.8%	Acute
Salford Royal NHS Foundation Trust	4.2%	Acute
Moorfields Eye Hospital NHS Foundation Trust	4.0%	Acute
Nottingham University Hospitals NHS Trust	4.0%	Acute
Royal Devon and Exeter NHS Foundation Trust	3.9%	Acute
Sheffield Teaching Hospitals NHS Foundation Trust	3.8%	Acute
Manchester University NHS Foundation Trust	3.8%	Acute
County Durham and Darlington NHS Foundation Trust	3.8%	Acute
University Hospitals Coventry and Warwickshire NHS Trust	3.7%	Acute
University College London Hospitals NHS Foundation Trust	3.7%	Acute
Guy's and St Thomas' NHS Foundation Trust	3.7%	Acute
University Hospitals Birmingham NHS Foundation Trust	3.6%	Acute
Leeds Teaching Hospitals NHS Trust	3.5%	Acute
Oxford University Hospitals NHS Trust	3.5%	Acute
University Hospital Southampton NHS Foundation Trust	3.4%	Acute
South Warwickshire NHS Foundation Trust	3.4%	Acute
Liverpool University Hospitals NHS Trust	3.3%	Acute
Royal Free London NHS Foundation Trust	3.2%	Acute
Liverpool Heart and Chest NHS Foundation Trust	3.2%	Acute
The Newcastle upon Tyne Hospitals NHS Foundation Trust	3.0%	Acute
King's College Hospital NHS Foundation Trust	3.0%	Acute
Berkshire Healthcare NHS Foundation Trust	3.0%	Mental Health
Cambridge University Hospitals NHS Foundation Trust	2.9%	Acute
Greater Manchester Mental Health NHS Foundation Trust	2.9%	Mental Health
South London and Maudsley NHS Foundation Trust	2.9%	Mental Health
Sheffield Children's NHS Foundation Trust	2.7%	Acute
Barts Health NHS Trust	2.7%	Acute
Sheffield Health and Social Care NHS Foundation Trust	2.6%	Mental Health
Birmingham and Solihull Mental Health NHS Foundation Trust	2.5%	Mental Health
University Hospitals Bristol and Weston NHS Foundation Trust	2.4%	Acute
York Teaching Hospitals NHS Foundation Trust	2.4%	Acute
Oxford Health NHS Foundation Trust	2.2%	Mental Health
Worcestershire Health and Care NHS Trust	2.1%	Community
Mersey Care NHS Trust	2.0%	Mental Health
Birmingham Community Healthcare NHS Foundation Trust	1.9%	Community
Leeds and York Partnership NHS Foundation Trust	1.8%	Mental Health
Coventry and Warwickshire Partnership NHS Trust	1.8%	Mental Health
West Suffolk Hospital NHS Foundation Trust	1.5%	Acute

Alder Hey Children's NHS Foundation Trust	1.5%	Acute
Nottinghamshire Healthcare NHS Trust	1.1%	Mental Health
Birmingham Women's and Children's NHS Foundation Trust	1.0%	Acute
Cambridgeshire and Peterborough NHS Foundation Trust	0.7%	Mental Health
Leeds Community Healthcare NHS Trust	0.0%	Community
Yorkshire Ambulance Service NHS Trust	0.0%	Ambulance

Table 5: List of included universities and associated research institutes and proportion of academics in our sample at each university registered as a PSC with Companies House

University	Proportion registered as PSC
Birmingham	2.4%
Imperial	1.9%
London Centre for Nanotechnology	1.4%
Manchester	1.1%
Cambridge	1%
Queen Mary	1%
UK Quantum Technology Hub	0.9%
Warwick	0.9%
Southampton	0.8%
Liverpool	0.8%
Bristol	0.7%
Leeds	0.6%
Durham	0.5%
Nottingham	0.4%
UCL	0.4%
Exeter	0.3%
Oxford	0.2%
Sheffield	0.1%
Hull & York Medical School	0
CIMA	0
KCL	0
LSE	0
Newcastle	0
Sainsbury Wellcome	0
Barts	0
York	0

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Future Care Capital is a charity which undertakes research to advance ideas that will help shape future health and social care policy and deliver better outcomes for individuals living in the UK.

Beginning life as the National Nursery Examination Board in 1945, the charity has evolved throughout its 70-year history and we continue to have Her Majesty the Queen as our Royal Patron.

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