abpi
Bringing medicines to *life*

Clinical trials

How the UK is researching medicines of the future

Autumn 2019

Foreword

I'm delighted that the ABPI is publishing the first of our annual reports looking at the clinical trials environment in the UK.

Clinical research and clinical trials are an absolutely vital part of the medicines research and development process and we're extremely proud of the UK's heritage and history in this area.

We've been at the forefront of delivering innovation in medicines and vaccines since the 1940s. We know that patients treated in hospitals where research is ongoing will have better outcomes and today there are hundreds of trials taking place in NHS hospitals across the UK, with tens of thousands of patients.

The commitment of patients to medical research in the UK is fantastic and we are grateful to every single patient and carer who makes this possible.

Together with world-class research funders, the NHS, research charities and global pharmaceutical companies, the UK strives to continue to be a leader in research. This report tracks exactly how we're doing in the UK and looks at trends in research and comparisons with other nations, including up and coming power houses like China.

Amongst these global changes is the UK's exit from the European Union. This study provides an important benchmark, with the figures relating to the period shortly after the referendum result. The data, from 2017, is the most recent available.

As we look ahead, the ABPI and our members continue to work to ensure the UK is at the forefront of developing medicines globally for patients.

Dr Sheuli Porkess
Executive Director, Research, Medical and Innovation
The Association of the British Pharmaceutical Industry

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Executive summary

Clinical trials are important for patients, they are beneficial to the NHS and they are good for the UK economy.

Figures from the NIHR show that in England, clinical research is worth £2.7 billion a year – including £1.5 billion from commercial sources – and supports more than 47,000 jobs[1]. Additional revenues and cost savings, such as provision of medicines to patients in trials, provided approximately £28.6million of savings to the NHS, with an estimated total of £335 million from commercial income[1].

The UK's success in early science has been built on attracting investment and research activity from global pharmaceutical companies to our world-famous universities and research centres. The industry runs thousands of trials around the world at any one time and invests significantly into UK R&D. At £4.3 billion a year[2], the industry invests far in excess of any other sector.

This report looks at how the UK has built on its legacy of medical innovation to become one of the most competitive global hubs for clinical research and how we compare against Europe and the rest of the world.

The ABPI annually commissions data collection on the number of clinical trials initiated, by country, phase and disease area. Data is reported for the UK compared to global comparators, including a selection of EU and other countries, including the USA and Canada.

For the first time this analysis also includes data on China, Brazil, South Africa and Switzerland (from 2016), in order to better reflect the global nature of the clinical research landscape and give us a clearer view on where the UK stands internationally.

The data provides clinical trial activity in the period after the EU referendum and acts as a benchmark for the UK's position in this globally competitive arena at that time.

Commercial clinical research trends, in the UK, have remained stable over the last few years. The UK leads Europe in early clinical research but falls behind other European countries in Phase III clinical trials.

Whilst European countries continue to invest heavily in science and healthcare, nations like China and Brazil are emerging as the new hubs of global medicines discovery.

If we are to continue attracting international pharmaceutical companies, we must maintain and strengthen the UK offer for clinical research.

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The UK Government has already committed to increasing the share of GDP spent on R&D to 2.4% by 2027 (the average of OECD countries[3]) and to 3% by 2030. The Government should also encourage investment in late phase clinical trials – those where the science is closer to finding new medicines for NHS patients – the area where the UK does the least well and where we start to drop behind other nations.

The NHS has massive potential as a driver for global investment, with our health service offering a great opportunity to trial new medicines and vaccines, with its wealth of expertise and access to health data.

To keep pace with global competitors and remain at the cutting edge of innovative drug development, the UK must embrace new technology and build a workforce that is highly skilled and meets the needs of new R&D approaches.

How the UK continues to perform in this evolving landscape, will be a clear guide as to the impact of Brexit on UK medicines research and development and the effectiveness of policies to support clinical research.

What does the data tell us?

The data provides a comprehensive view of the UK's domestic landscape and how it compares internationally and shows:

- The MHRA received 955 requests for clinical trial authorisations (CTA) in 2018, with an average of 977 CTA applications per year since 2016[4].
- Over the last decade, an average of 28% of EU clinical trial applications have come from the UK[5].
- The UK ranks first in Europe for the number of early clinical trials, with 147 Phase I and 253 Phase II clinical trials started in 2017.
- For Phase III clinical trials, 243 trials were initiated in the UK in 2017 – ranking the UK third in Europe behind Germany and Spain.
- Oncology remains the UK's strongest area for clinical research, with an average of 201 commercial clinical trials started per year since 2012 – reaching 210 in 2017. The UK ranks 5th jointly with Japan, falling behind the USA, China, Spain and France.
- The UK performs strongly in immune, nervous and cardio-metabolic diseases clinical research, with 79, 61 and 83 clinical trials started in 2017, respectively. Globally, the UK ranked second in Europe across these disease areas, behind Germany with 97, 66 and 100, respectively.
- UK clinical trial activity has remained strong following the Brexit referendum result, with these figures gathered shortly thereafter. However, continued uncertainty about the future UK-EU relationship undermines the attractiveness of the UK as a destination for clinical research.

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Recommendations: How do we retain and strengthen the UK's position as a global hub for clinical trials?

Maintaining the UK's position as an attractive destination for global investment – and building a UK fit for the future of clinical research – relies on increasing investment in clinical research to enhance the UK's global clinical research offer. This will attract further investment from global pharmaceutical companies and help build on intersectoral collaborations with industry.

The UK can build an ecosystem fit for the future of clinical research by:

1. **Increasing investment in clinical research** through funding of NIHR and other organisations that facilitate and drive clinical research.
2. **Simplifying the processes for setting up and running clinical trials** by a combination of continuous improvement of existing processes and implementation of new systems and ways-of-working for use by commercial sponsors.
3. **Building a workforce fit for the future** by plugging skill-gaps and investing in training programmes to develop a workforce skilled in innovative clinical approaches.
4. **Harnessing the UK's data infrastructure for medicines R&D** through having well-governed data with appropriate access to health data for industry, supported by a suitably skilled bioinformatics workforce.
5. **Embedding patient involvement in clinical research,** working across the sector and with Government, to develop a system-wide approach to embedding patient involvement in clinical research.
6. **Ensuring continuing high standards for transparency** which are consistent with other regions and practical to implement.
7. **Securing a future UK-EU relationship on medicines and research** that ensures the UK's clinical research environment remains stable during this period of Brexit uncertainty and that there is a strong future relationship with the EU with regulatory and research alignment.

Introduction: An opportunity for growth

Medicines and vaccines save lives around the world – and are only available because of intense research, development and scrutiny as part of the medicine development process.

Clinical trials have always been a vital part of this, establishing safety and efficacy of potential new treatments. With a competitive and collaborative research base, healthcare data assets and significant capabilities in clinical research and NHS translation, the UK is an attractive environment for clinical trials and pioneering research.

This research is vital for many patients; providing people with greater control over their treatment options while offering access to experimental new medicines where there may be no other alternative. This paves the way for the rapid introduction of innovative new treatments into the NHS and promotes the delivery of high-quality care.

Clinical trials also carry enormous benefits and opportunities for the economy. In 2018/2019, the annual economic value of clinical research in

In 2017, there were

24,000 jobs

in the UK across research and development.

England was £2.7 billion, supporting more than 47,000 jobs[1]. Additional revenues and cost savings, such as provision of medicines to patients in trials, provided approximately £28.6million of savings to the NHS, with an estimated total of £335 million from commercial income[1].

Clinical trials also generate jobs in the private sector: within pharmaceutical companies and within service providers such as clinical research organisations. In 2017, there were 24,000 jobs in the UK across research and development[2].

An attractive research environment also brings investment from international pharmaceutical companies – the industry is predicted to invest £213 billion a year on R&D worldwide by 2024[6].

The pharmaceutical industry invests more in R&D in the UK than any other sector. In 2017, pharmaceutical firms spent £4.3 billion on UK R&D – nearly 20% of the country's commercial R&D expenditure[2], supported by the UK's Life Sciences Industrial Strategy and the significant competitive advantages offered by the UK.

The UK has historically set itself apart from other countries with its enviable early stage research offering. It has consistently led Europe and holds its own against the USA and China in early stage clinical trials, however, it runs the risk of losing out to existing and emerging competitors – and failing to carry research through to later stages of research and healthcare delivery.

Disinvestment would be detrimental to the UK economy and to NHS patients, with benefits of clinical research, as outlined above, lost and patients missing out on access to new and innovative medicines.

Clinical trials are good for patients, good for the NHS and great for the UK economy. But there's plenty more to be done to make the UK the best place in the world to research, develop and deliver new medicines.

A benchmark for global clinical research

Research drives the development of new medicines. Increasingly the research process has become global, with alignment of standards and the emergence of different countries as places to carry out high quality research. The UK has been a significant leader in clinical research in terms of thought leadership as well as numbers of trials.

Clinical trials at home: What the data shows us for the UK

Commercial clinical research trends, in the UK, have remained stable over the last few years (Figure 1). Since 2012, the total number of clinical trials starting every year in the UK has averaged at 631 clinical trials, with over 70% in Phase II/III. This trend is not exclusive to the UK with clinical research in many other countries mostly comprised of Phase II/III clinical trials (Table 1).

In addition to this data, we can also look to other sources as a barometer for how strong the UK's clinical research is.

Patient recruitment metrics show an increasing number of clinical trials are taking place, with the latest figures from the National Institute for Health Research (NIHR), showing that 870, 250 people took part in commercial and non-commercial clinical research across England in 2018/19 – a record-breaking number that equates to over 2,300 a day[7].

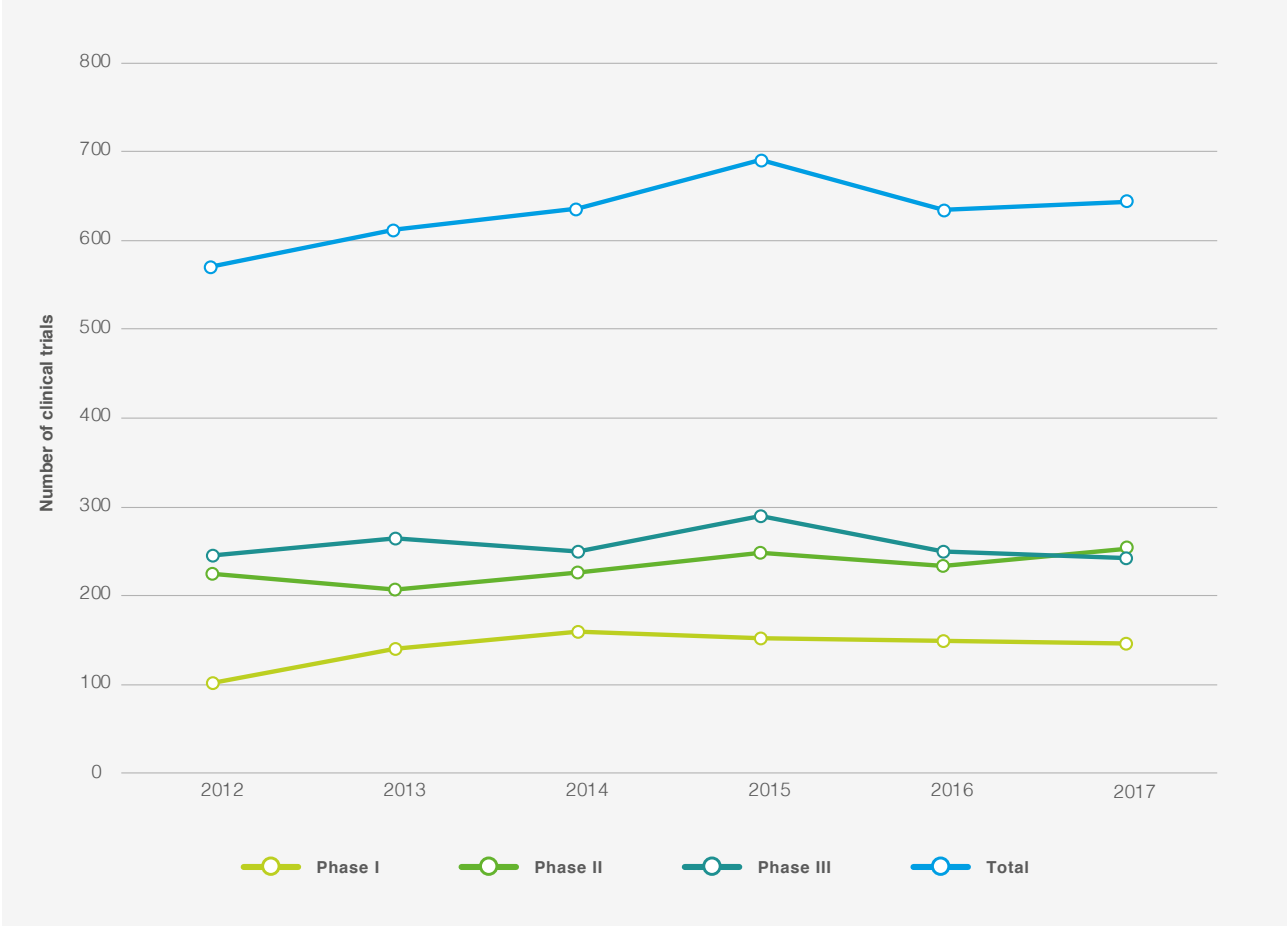
Data from the Medicines and Healthcare Products Regulatory Agency (MHRA) shows the UK continues to attract applications for clinical trial authorisation (CTA) – that is, the number of applications it receives by research organisations such as companies or charities to undertake a clinical trial.

Applications for clinical trials are relatively stable, with the MHRA receiving a total of 955 CTA applications in 2018[4], with 136 Phase I, 708 Phase II/III and 111 Phase IV applications. 798 of these were commercial and 157 non-commercial, showing the significant role that pharmaceutical companies have in driving UK clinical research.

As this total is unchanged relative to the average number of applications over the past few years (average of 977 CTA applications per year since 2016), this data demonstrates that despite political instability, the UK continues to attract interest and investment in clinical research.

The number of CTA applications, therefore, suggests that in subsequent data collections, we can expect the number of clinical trials started per year to remain stable in the short term. However, continued uncertainty about the future UK-EU relationship undermines the attractiveness of the UK as a destination for clinical research as companies make longer term plans.

Figure 1. Number of commercial clinical trials started in the UK, by year and phase



Year	Phase I	Phase II	Phase III	Total
2012	102	224	245	571
2013	141	207	265	613
2014	160	226	250	636
2015	152	248	290	690
2016	150	234	250	634
2017	147	253	243	643

International competition: How the UK compares on the world stage

In terms of global comparisons, the latest figures for the number of commercial clinical trials started in the UK in 2017 (Table 1), show a relatively strong performance versus global competitors.

The UK leads Europe in early clinical research, with 147 Phase I and 253 Phase II clinical trials started in 2017 but falls behind other European countries in Phase III clinical trials, with 243 started in 2017. This is in comparison to countries such as Germany and Spain, with 276 and 258 Phase III clinical trials, respectively.

The UK also ranks 4th behind the USA, Germany and Spain in terms of patients recruited globally (across all phases), according to the latest Life Sciences Competitiveness Indicators[8], with under 3% of the global share.

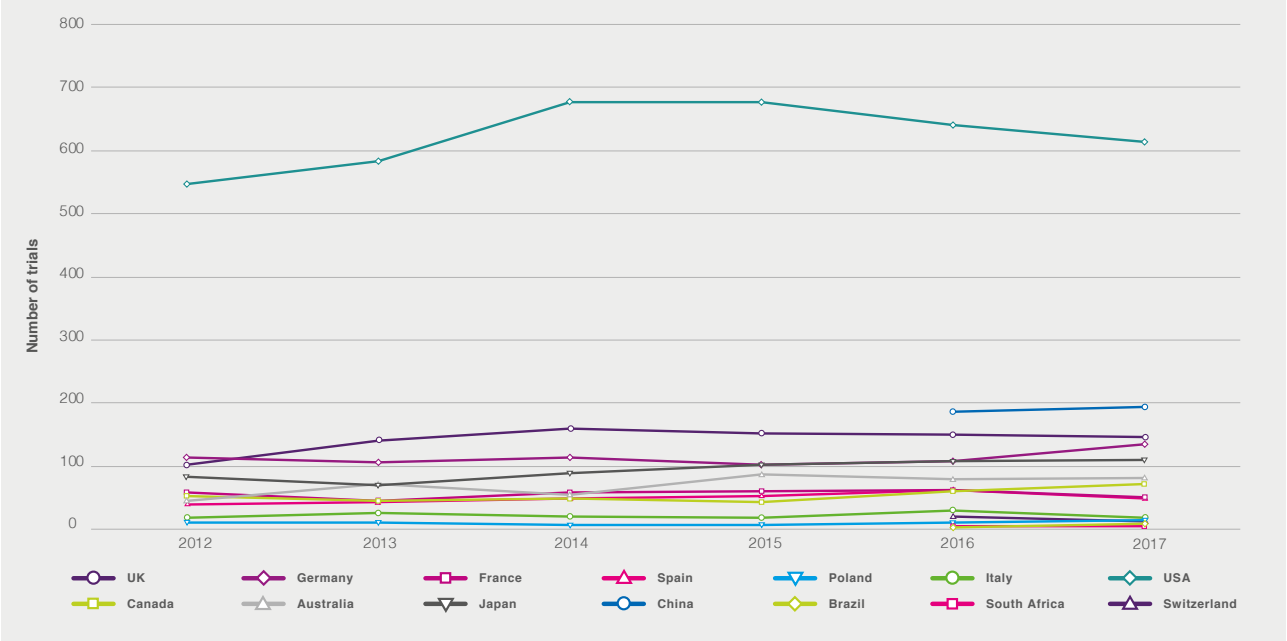
Table 1. Number of commercial clinical trials started in 2017, by phase and country

Rank	Country	Phase I	Country	Phase II	Country	Phase III
1	USA	614	USA	970	USA	528
2	China	194	**UK**	**253**	Germany	276
3	**UK**	**147**	Germany	232	Canada	259
4	Germany	136	Japan	227	Spain	258
5	Japan	111	Spain	204	**UK**	**243**
6	Australia	82	France	176	Poland	243
7	Canada	72	Canada	176	Italy	235
8	France	52	Italy	141	Japan	235
9	Spain	49	China	122	France	210
10	Italy	19	Australia	112	Australia	180
11	Poland	15	Poland	98	China	146
12	Switzerland	14	Switzerland	30	Brazil	116
13	Brazil	10	Brazil	23	South Africa	72
14	South Africa	5	South Africa	17	Switzerland	65

China has been investing heavily in R&D[9]. This new data on clinical research activity in China places the country as a strong global 2nd in Phase I clinical trials, with the UK in 3rd place in 2016 and 2017. In 2017, 194 Phase I clinical trials started in China, in comparison to 614 in the USA and 147 in the UK.

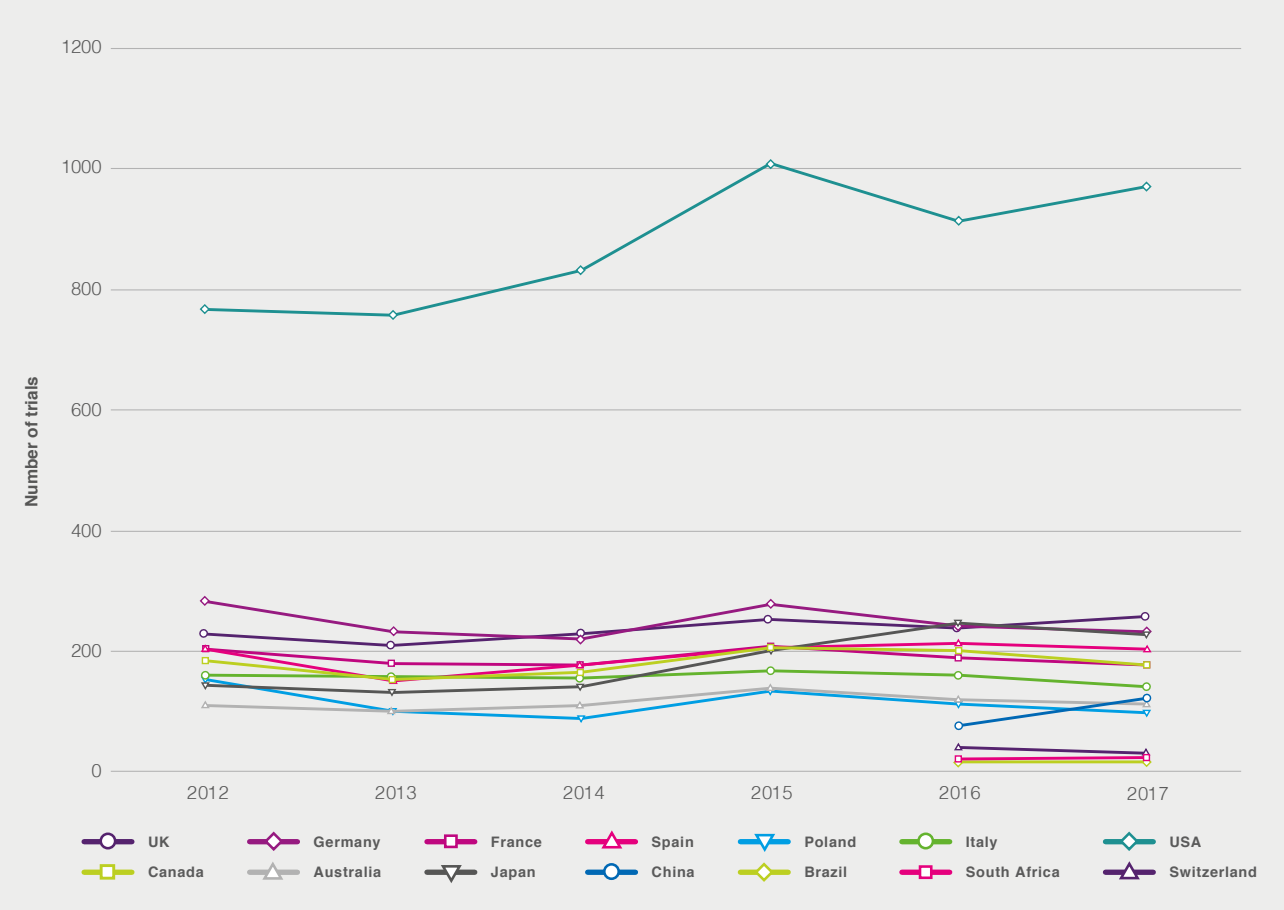
Comparing trends over time (Figure 2), the UK has maintained a leading position in clinical research, ranking consistently 1st in Europe and 2nd globally in the number of Phase I clinical trials started per year and 2nd in Europe and 3rd globally in Phase II.

Figure 2. Number of commercial clinical trials started by country, Phase I (2012-2017)



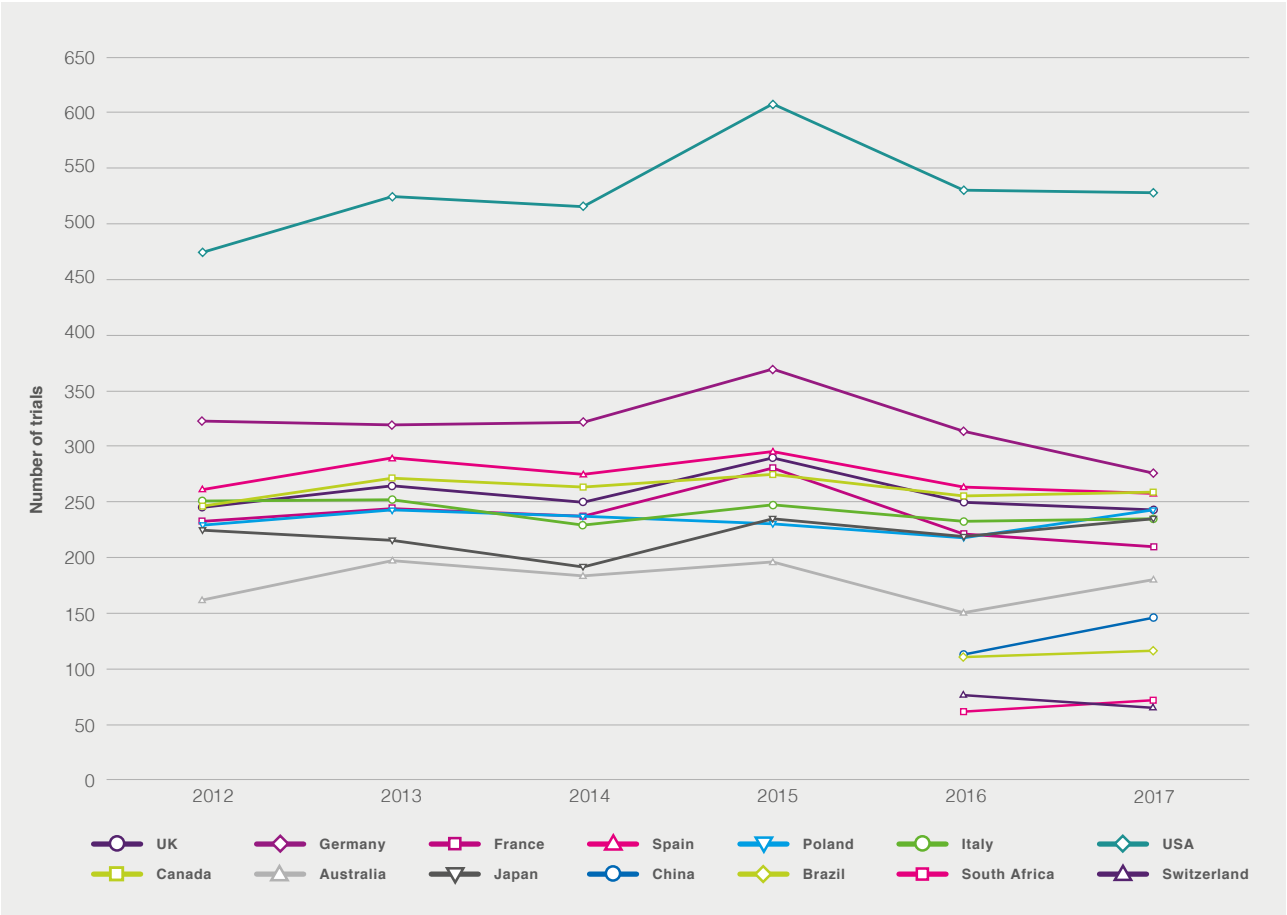
	UK	Germany	France	Spain	Poland	Italy	USA	Canada	Australia	Japan	China	Brazil	South Africa	Switzerland
2012	102	114	59	40	12	19	547	54	45	83				
2013	141	106	45	43	12	27	583	45	73	70				
2014	160	115	59	50	8	20	676	49	56	90				
2015	152	103	60	53	7	18	677	43	87	102				
2016	150	108	62	63	12	31	641	60	79	108	187	3	5	20
2017	147	136	52	49	15	19	614	72	82	111	194	10	5	14

Figure 3. Number of commercial clinical trials started by country, Phase II (2012-2017)



	UK	Germany	France	Spain	Poland	Italy	USA	Canada	Australia	Japan	China	Brazil	South Africa	Switzerland
2012	224	283	203	203	152	161	767	185	111	143				
2013	207	232	180	150	101	157	757	153	100	132				
2014	226	221	177	176	88	156	833	166	110	141				
2015	248	278	209	206	135	168	1010	206	138	201				
2016	234	243	188	212	113	160	913	201	119	247	76	22	17	40
2017	253	232	176	204	98	141	970	176	112	227	122	23	17	30

Figure 4. Number of commercial clinical trials started by country, Phase III (2012-2017)



	UK	Germany	France	Spain	Poland	Italy	USA	Canada	Australia	Japan	China	Brazil	South Africa	Switzerland
2012	245	323	233	261	229	251	474	246	162	225				
2013	265	319	244	290	243	252	525	271	197	215				
2014	250	322	237	275	237	229	516	263	183	192				
2015	290	370	281	295	230	248	608	275	196	235				
2016	250	314	221	263	218	233	530	255	151	219	113	110	61	76
2017	243	276	210	258	243	235	528	259	180	235	146	116	72	65

These trends and rankings are affected by regulatory conditions, relevant expertise, infrastructure and political, social and economic factors.

As clinical research absorbs the greatest proportion of R&D investment, relative to other phases of the drug discovery and development pipeline[10], investment is also a key factor in determining clinical research activity.

Germany for example, which performs highly in early and late phase clinical research and Phase III clinical trials, with €6.9 billion of pharmaceutical industry investment for research and development in 2017[11]. Germany ranks 5th overall in the Global Competitiveness Index 2017-2018[12], investing over 3% of its GDP on R&D[13].

Comparatively, the UK invests just over 1.5% of GDP on R&D[13], and ranks 8th overall in competitiveness. Leveraging further R&D investment could support the clinical research environment in the UK and help it overcome the challenges identified in the UK's Sector Deal 2[14] and NHS Long Term Plan[15].

Beyond Europe, China is swiftly becoming a global leader in clinical research. With 20% of the world's population, China has huge potential for recruiting patients to clinical trials. China has also invested in infrastructure, setting up 32 national centres for clinical medicine research, across a network of more than 2100 medical institutions and training[16].

Matched with competitive R&D expenditure (as a share of its GDP), set to outperform the EU, and more PhDs in the sciences than the USA[9], China presents an attractive environment for private investment.

Currently, China is being held back by slow registration and regulation, insufficient workforce training and lack of experience in running high quality trials[16]. With a lead in Phase I clinical research, it is likely that China will address these challenges and continue to attract further global investment across the clinical research pipeline.

These rankings very much reflect the global share of pharmaceutical companies in 2017[17]. In 2017, the USA had the largest share, with 47% of companies worldwide based in the USA, followed by 28% in Europe. China and Japan collectively had an 8% share of companies, with the UK ranking 1st in Europe, with 6%. With global shares of companies appearing unchanged in 2018 and 2019[18], the global rankings for clinical research, can be expected to remain relatively unchanged.

To remain globally competitive, the UK must continue to invest in R&D and support the evolving clinical research environment. Similarly, to China and Germany, the UK should invest in healthcare system infrastructure, workforce and innovation to ensure speedy set-up of clinical trials, competitive patient recruitment and uptake of innovation in clinical research delivery.

Global R&D by disease area: Where does the UK do best?

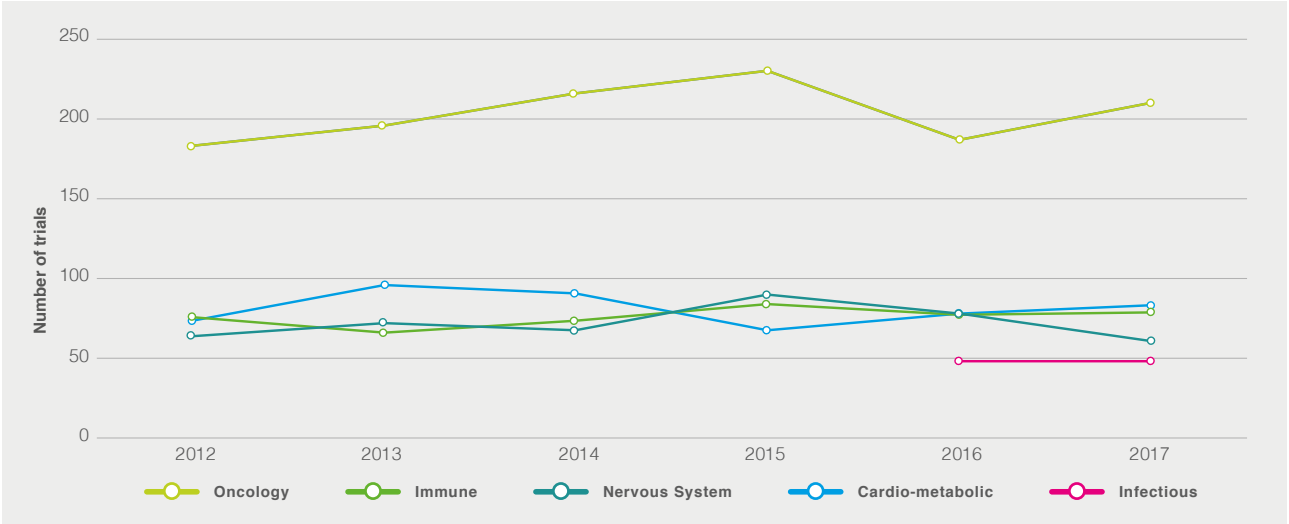
The UK is competitive across many areas, including oncology, diseases of the nervous system and diseases of the immune system (Figure 5), illustrating the breadth of its strengths in clinical research. Globally, the UK ranks second in Europe across these disease areas, behind Germany and the USA.

Oncology is the UK's strongest area for clinical research, with an average of 201 commercial clinical trials started per year since 2012, and 210 in 2017. This is reflective of trends across global comparators (Figure 7), with cancer medicine spending reaching $133 billion, across 700 active organisations and companies, in 2017 globally[19].

With almost half of the oncology clinical trials started in 2017, trials associated with immune, nervous and cardio-metabolic diseases, have remained constant with between 50-100 trials starting every year since 2012 (Figure 5).

Data shows that the pharmaceutical industry is active in trials for infectious diseases. In 2016 and 2017, 96 clinical trials in infectious diseases started in the UK (Figure 5).

Figure 5. Number of commercial clinical trials started in the UK, by disease area



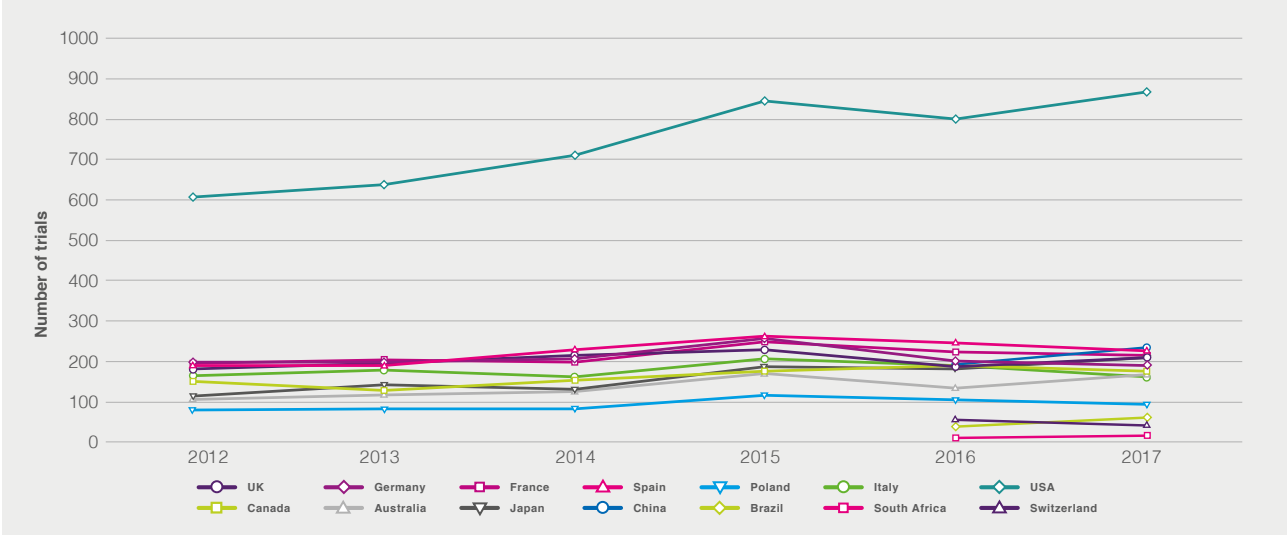
Year	Oncology	Immune	Nervous System	Cardio-metabolic	Infectious
2012	183	76	64	74	
2013	196	66	72	96	
2014	216	74	68	91	
2015	230	84	90	68	
2016	187	77	78	78	48
2017	210	79	61	83	48

Oncology

A gradual rise in oncology commercial clinical trials in the USA has been observed since 2014, reaching a global high of 866 in 2017. This trend is seen across global comparators and likely attributable to the large share of R&D investment cancer receives. Comparatively, the UK ranks 5th – jointly with Japan – with 210 oncology commercial clinical trials started in 2017. The NHS Long Term Plan aims to improve genomic services in the UK, supporting a more personalised approach to healthcare delivery.

As genomics is a key tool in stratifying patients, especially in oncology, both routine delivery and clinical research could benefit from such investment. This presents a prime opportunity for the UK to lead in personalised cancer research and care.

Figure 6. Number of commercial clinical trials started in oncology, by country



	UK	Germany	France	Italy	Spain	Poland	Australia	Japan	Canada	USA	China	Brazil	South Africa	Switzerland
2012	183	198	195	166	190	81	107	115	152	607				
2013	196	199	203	178	189	83	117	143	129	639				
2014	216	206	199	161	229	84	126	131	154	711				
2015	230	258	248	207	263	116	171	188	177	846				
2016	187	200	225	189	245	105	134	181	189	801	192	39	10	55
2017	210	189	216	161	226	96	167	210	177	866	236	61	17	43

Cardio-metabolic diseases

Cardio-metabolic diseases include diseases/ disorders such as diabetes and coronary heart disease. The number of commercial clinical trials in such areas has been on the decline since 2014.

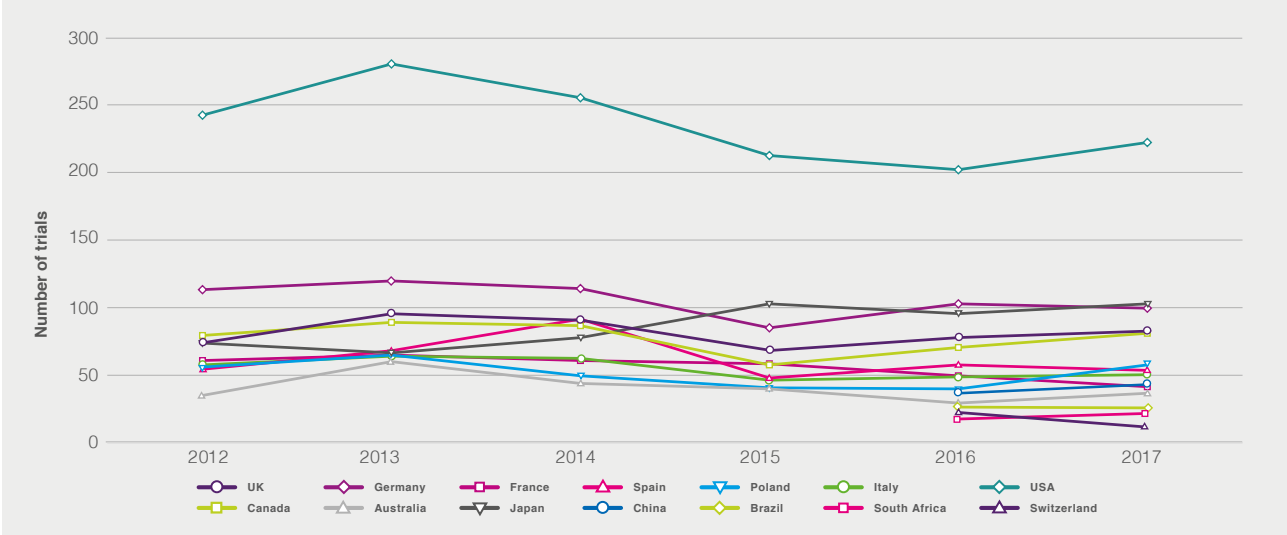
Across the USA, UK and Germany, there has been an average reduction of 13.1% between 2014 and 2017 (from 466 trials to 405). Japan and China also remain active in cardio-metabolic research, with a collective total of 146 clinical trials started in 2017 (Japan – 103; China – 43).

As this data combines cardiovascular and metabolic clinical research, under the same parameter, it is important to note that the individual trends for cardiovascular and metabolic research cannot be deduced from this data.

Over 1500 clinical trials are ongoing globally, with metabolic disorders the 2nd largest therapeutic area for clinical research, with over 2000 products in the pipeline in 2017[17].

With such substantial research in these therapeutic areas, the UK should continue to actively contribute to R&D efforts and retain its share of new and ongoing clinical trials in cardio-metabolic diseases.

Figure 7. Number of commercial clinical trials started in cardio-metabolic diseases, by country



	UK	Germany	France	Italy	Spain	Poland	Australia	Japan	Canada	USA	China	Brazil	South Africa	Switzerland
2012	74	113	61	58	55	56	35	74	80	242				
2013	96	120	65	64	68	65	60	67	89	280				
2014	91	114	61	63	92	50	44	78	87	255				
2015	68	85	59	47	48	41	40	103	58	212				
2016	78	103	50	49	58	40	30	96	71	202	37	26	17	22
2017	83	100	42	51	54	58	37	103	81	222	43	25	21	12

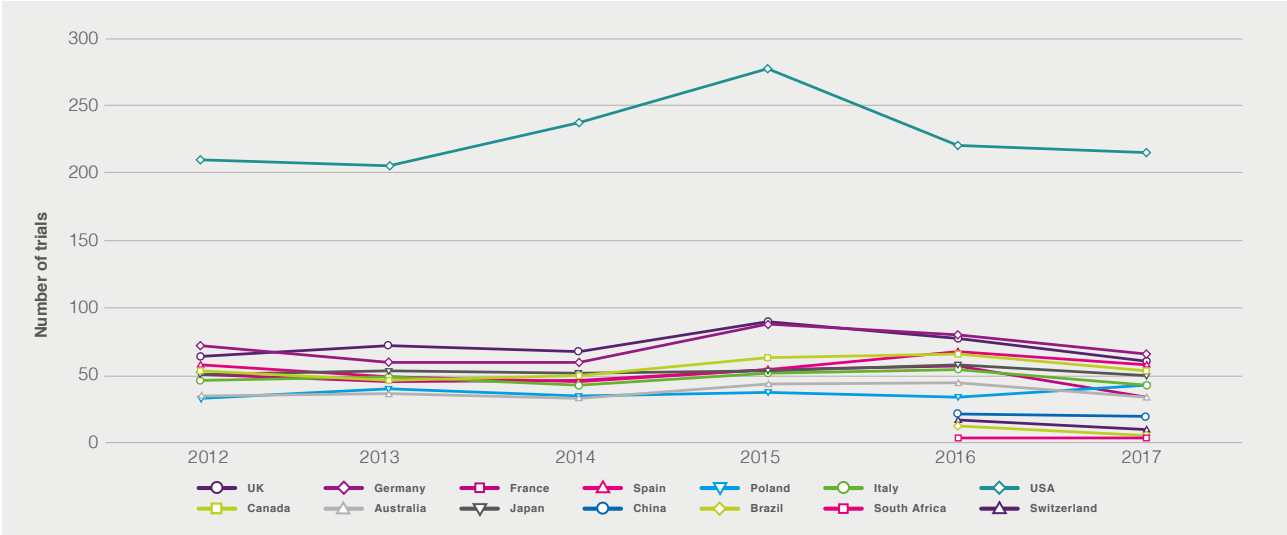
Nervous system diseases

The third largest area of commercial clinical research in 2017 globally is in nervous system diseases. Excluding a flurry of clinical trials which started in this therapeutic area in 2015, the number of clinical trials started every year since 2012, has been fairly stable.

The UK, alongside Germany, ranks 2nd in comparison to the USA, with 61 clinical trials started in 2017. The UK has however seen a decline in activity in this area since 2015 (from 90 trials to 61).

There is a global effort to better understand and treat diseases such as dementia, which currently affects an estimated 850,000 people in the UK[20]. New UK and international initiatives are accelerating research, with charities supporting patient recruitment to an increasing number of clinical trials[21].

Figure 8. Number of commercial clinical trials started in nervous system diseases, by country



	UK	Germany	France	Spain	Poland	Italy	Australia	Japan	Canada	USA	China	Brazil	South Africa	Switzerland
2012	64	72	51	58	33	47	35	51	54	210				
2013	72	60	46	49	40	49	37	54	47	205				
2014	68	60	47	46	35	43	33	52	50	237				
2015	90	88	55	55	38	52	44	54	63	277				
2016	78	80	57	68	34	55	45	58	66	220	22	13	4	17
2017	61	66	34	58	43	43	34	50	54	215	20	6	4	10

Immune disorders

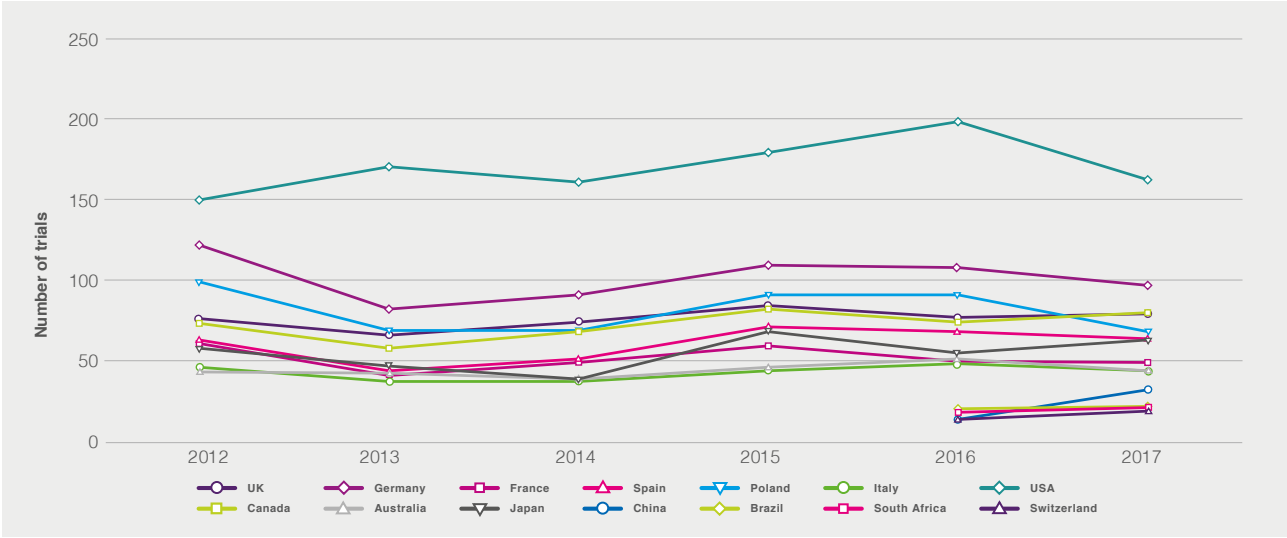
With over 800 commercial clinical trials started in 2017 in immune disorders, this therapeutic area remains a consistent priority for pharmaceutical drug discovery and development.

Nearly 30% of these trials were started in the USA and Canada (242 in 2017), with over 20% started in the UK and Germany (176 in 2017).

The UK is a world leader in immunology early research, with a strong SME base developing new drugs in this area[22], and significant advances seen both in our understanding of how the immune system works and how we improve diagnosis and treatment.

The UK must build on this strong foundation, to attract further investment to grow its clinical research base and remain a global competitor in this therapeutic area.

Figure 9. Number of commercial clinical trials started in immune disorders, by country



	UK	Germany	France	Spain	Poland	Italy	Australia	Japan	Canada	USA	China	Brazil	South Africa	Switzerland
2012	76	122	61	63	99	46	43	58	73	150				
2013	66	82	41	44	69	37	42	47	58	170				
2014	74	91	49	51	69	37	39	39	68	161				
2015	84	109	59	71	91	44	46	68	82	179				
2016	77	108	50	68	91	48	51	55	74	198	14	20	18	14
2017	79	97	49	64	68	44	44	63	80	162	32	22	21	19

Infectious diseases

Currently, a critical area for infectious disease research is antimicrobial resistance (AMR) which threatens the effective treatment of a range of infections.

AMR-related infections are estimated to cause 700,000 deaths each year globally[23], presenting a concerning threat for global public health. Industry play an important role in helping to tackle this global health threat, with companies around the world investing in the research and development of new antibiotics.

In 2016, companies invested $2 billion into AMR research and development[23], with around 40 new antimicrobials in late-phase clinical development[24]. However, due to the fundamental problem at the heart of antibiotics development – that companies must research new antimicrobials that may never be used – many of these will never reach patients.

In an effort to fix this problem, the UK is pioneering a new initiative to encourage companies sustain investment in R&D into antimicrobials. In 2019, the UK Government announced a pilot of a new economic model to help address this global issue[25].

AMR-related infections are estimated to cause

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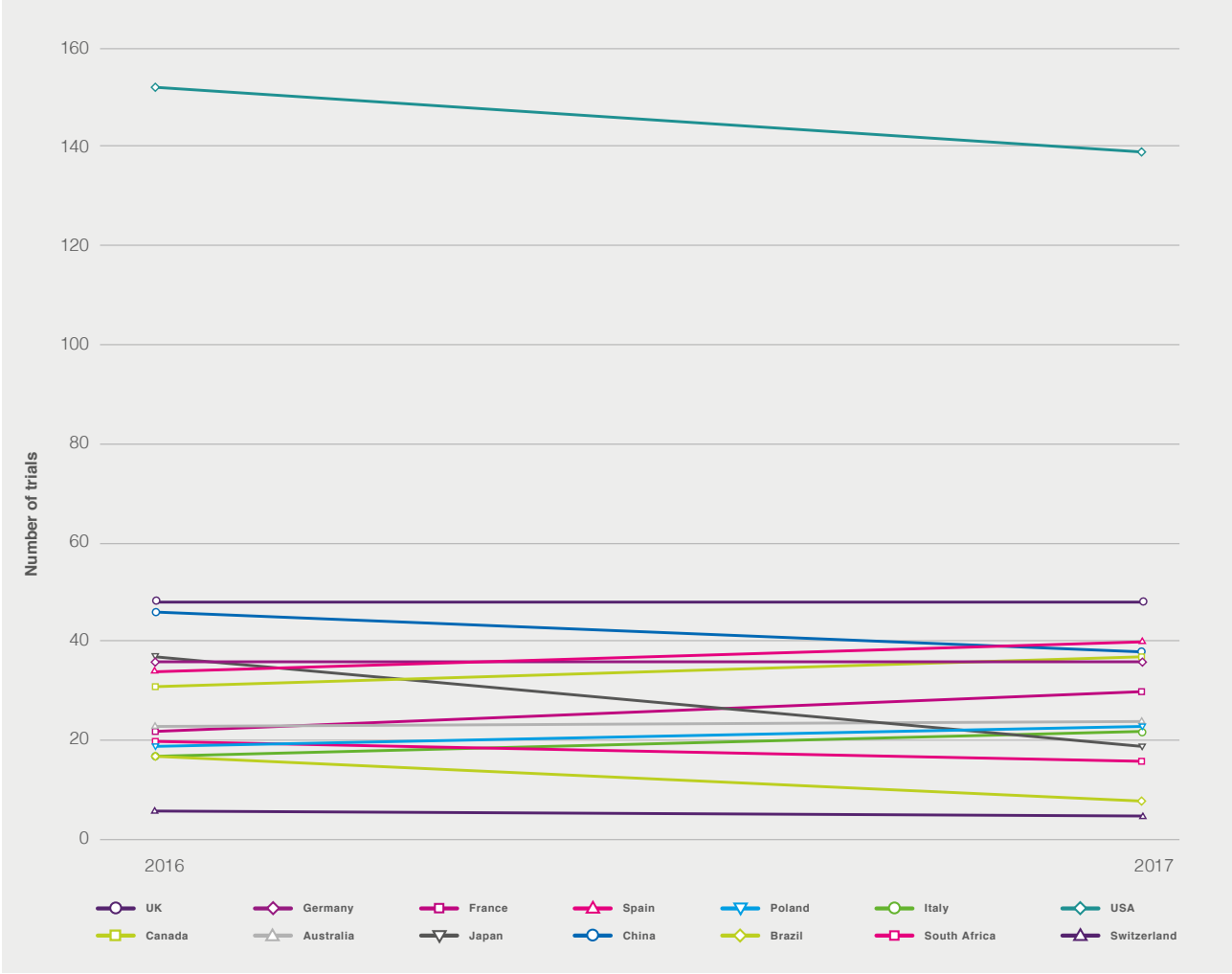
each year globally.

Figure 10. Number of commercial clinical trials started in infectious diseases, by country



	UK	Germany	France	Italy	Spain	USA	Canada	Australia	Japan	China	Brazil	South Africa	Switzer-land	Poland
2016	48	36	22	17	34	152	31	23	37	46	17	20	6	19
2017	48	36	30	22	40	139	37	24	19	38	8	16	5	23

Reflecting this commitment, the number of infectious disease commercial clinical trials started in 2016 and 2017 remained constant, with the top 5 countries averaging 60 clinical trials between them (USA, China, UK, Spain and Germany.
The UK ranks 1st in Europe, with 48 clinical trials started in 2017, demonstrating an attractive environment for infectious disease clinical research.

Recommendations for building a UK fit for the future of clinical research

What is clear from the data in this report is; the UK has turned its strengths for early phase clinical research into a globally competitive asset. While the UK has many attractive features, it faces two challenges: stiff international competition and a weakness in later phase research.

Meeting these challenges and taking opportunities will need to see both the private and public sectors working collaboratively to maintain the stability seen over the past several years and strengthen the UK's life sciences ecosystem.

With this in mind – and against the backdrop of commitments made by the Government and the pharmaceutical industry as part of the Life Sciences Industrial Strategy and Sector Deals – the UK can build an ecosystem fit for the future of clinical research by:

1. Increasing investment in clinical research

The UK continues to rank highly in Phase I and Phase II clinical trials but falls behind other countries in late-phase clinical trials. With countries including China and Japan increasing R&D investment in life sciences research, it is important the UK maintains its world-leading position. Further opportunities exist to strengthen national capacity and enhance interactions between industry, academia and the NHS.

Commitments in the NHS Long Term Plan and Sector Deal 2 are an important sign of the Government's commitment to providing a supportive environment.

Additionally, the commitment to increasing R&D investment to 2.4% of GDP and industry investment is key to achieving this.

Evidence shows that existing investment in clinical research can improve NHS performance[26] and patient outcomes[27,28], increase patient involvement in research and promote economic growth and productivity in the UK[29].

The impact of increased NHS investment in the UK's clinical research environment would be significant with the following potential benefits.

- Greater equity in funding allocation to clinical research sites across the UK.
- Higher NHS performance and delivery of care to patients.
- Boosted opportunities for patient recruitment to clinical trials and involvement in research.
- An enhanced innovation-ready workforce.
- An improved UK research offer which welcomes highly skilled professionals, promotes collaborations and attracts private investment from around the globe.

Failure to invest in clinical research will ultimately jeopardise patient access to improved healthcare delivery and innovative approaches. This will diminish the UK's current strength in clinical research.

Policy recommendations

Critical for the delivery of these commitments, the UK must increase investment into clinical research, to enhance the UK's global clinical research offer and attract further investment from global pharmaceutical companies.

Continued investment in NIHR, Health Research Authority (HRA) and other organisations which drive and facilitate clinical research, is critical to sustaining and improving the UK's clinical research base.

The UK should also build on intersectoral collaborations with industry, clinicians, regulatory authorities, policymakers, the NHS, the public, to showcase best practice and align guidelines and regulations to enhance patient access to safe, effective and affordable treatments.

2. Simplifying the process for setting up and running clinical trials

It is essential that high-quality, ethically responsible trials and other clinical studies, including Complex Innovative Design (CID) trials, are as easy to initiate and conduct as possible.

Processes need to be transparent, simple, harmonised, consistent with global standards, and sensitive to the needs of clinical trial sponsors. Commitments in the NHS Long Term Plan and Sector Deal 2 are an important sign of the Government's commitment to improving the clinical trial landscape.

The HRA has a key role to play as the national governing body for health research in the UK and they are working with the MHRA on combined ways to speed up the approval process[30].

The NIHR provides the key governance and infrastructure for set-up of clinical trials, recruitment of patients and collection of data. Their work on building resources for commercial sponsors[31] and introducing a National Directive on commercial contract research studies[32] has been important for ensuring the UK remains attractive to commercial sponsors.

NHS England is crucial for ensuring that NHS bodies are committed to supporting clinical research, and that research is smoothly integrated into its day-to-day activities. Industry is well engaged with their ongoing work with NHS Improvement and NIHR on implementing a single contract review process[33] for commercial contract research. As the UK's devolved health model creates a risk of fragmentation, this single contract review process has the potential to provide consistency across the devolved nations.

Policy recommendations

The UK is moving in the right direction with improving efficiency of clinical trial set-up and should maintain its dialogue with industry to ensure continuous improvement of existing processes and implementation of new systems and ways-of-working for use by commercial sponsors. These improvements are welcome irrespective of the nature of a future UK-EU relationship.

The Clinical Research Working Group, comprised of stakeholders from across the sector, are ensuring delivery of these commitments and those in the Life Sciences Industrial Strategy and NHS Long Term Plan. This group must be maintained in order to ensure continuing progress on this.

There should be continued transparency on UK performance, to ensure a common understanding across stakeholders of that performance in a global context.

3. Building a workforce fit for the future

The design, delivery and management of clinical trials, as well as analysis of clinical trial data and meaningful patient involvement, all depend on a highly skilled workforce. These experts are the critical foundations for an attractive UK environment for clinical research. Collaborative working to ensure the necessary skills are supported and embedded across all NHS organisations is needed to improve the lives of patients in the short and long term.

If the UK is to deliver the clinical trials of tomorrow, it must act now to deliver a sustainable workforce. The current work of NIHR in supporting skills and training is valuable and we need to build on this. A sustainable workforce is one which is supported, in part, by opportunities for training on, and use of, innovative approaches and technologies. Alongside such opportunities: STEM education and skills need promoting at all levels; a robust forward-thinking skills system is required for major skills gaps in certain areas; multiple routes to meeting skills needs are required, including a skills-based immigration system which allows access to global talent.

The biennial ABPI Skills Survey has consistently identified recruitment challenges in areas such as clinical pharmacology. The 2019 survey[34] also showed the rapid emergence of high priority need for skills in immunology and genomics, driven by an equally rapidly evolving scientific environment.

In addition, data science emerged as a critical area, with skills in informatics, computational, mathematical and statistical areas in growing demand, particularly in interdisciplinary areas such as chemoinformatics.

These skills gaps must be addressed in order to fulfil our ambition to remain world-leaders in clinical trial performance, especially in therapeutic areas such as cancer and immunology.

The Clinical Pharmacology Skills Alliance[35], a collaboration between the ABPI, British Pharmacological Society, Health Education England and the Faculty of Pharmaceutical Medicine, is a prime example of a cross-sector initiative successfully addressing a specific skills gap.

The UK Government has recognised the importance of skills development, with commitments in the Life Sciences Industrial Strategy and Sector Deals. It is essential that ongoing and future initiatives address both current and anticipated future skills needs based on the changing nature of the development of medicines.

Policy recommendations

The UK Government should continue to work with industry and other key stakeholders to adopt a fully funded systematic approach to meeting the evolving skills needs in the industry, NHS and wider health and care system in order to enable innovative commercial clinical research.

The UK Government should ensure the proposed skills-based immigration system enhances access to the best global researchers and scientists.

The UK Government should ensure greater flexibility of the apprenticeship levy to address business realities, and to secure the UK's wider life science sector with effective transfer of the levy fund.

There should be a more strategic long-term collaborative and proactive approach to the skills needs of the life science ecosystem.

4. Harnessing the UK's data infrastructure for medicines R&D's

Healthcare data is key to clinical research. This includes the information on feasibility – the process of deciding if/how much the UK can contribute to specific trials – as well as the data being collected during the trial. Real-world evidence - patient data that are routinely collected outside trial situations - are also a potentially rich resource for understanding disease and the effects of treatment.

It is essential that there is clarity on the availability of health data in the UK to commercial bodies and on the uses to which they can be put in medicines development. The quality of the data and processes for accessing the data must be clear. This must be supported by appropriate governance, standards and regulations and a suitably skilled bioinformatics workforce.

Industry is engaged with Health Data Research UK which aims to facilitate partnership working across NHS organisations and other health data custodians within the Health Data Research Alliance and enable access to data through the Innovation Gateway and Health Data Research Hubs.

Policy recommendations

Government and key stakeholders should continue to work with industry in order to improve the scale, quality and interoperability of UK health data and provide appropriate access under consistent standards of governance for research in academia, industry and the NHS. This should be supported by a suitably skilled bioinformatics workforce.

Quality data and processes

supported by appropriate governance, standards and regulations.

5. Embedding patient involvement in clinical research

Patient involvement in clinical research is a key strength for the UK supported by an active patient charity sector and the NIHR. To embed this in clinical research, we need to ensure that there are practical tools available and that there is a systems-wide approach.

ABPI is working with the Association of Medical Research Charities (AMRC), NIHR and MHRA to provide leadership in this area.

Policy recommendations

Government, patient organisations, key stakeholders and industry need to co-develop a system-wide approach to embedding patient involvement in clinical research.

6. Ensuring continuing high standards for transparency

Clinical research conducted for the benefit of the public and patients globally, must be transparent – a key pillar of any research activity. As well as scientific rigor, transparency measures ensure trials are appropriately registered and findings communicated to the general public (including researchers, healthcare professionals, patients and regulators).

Historically, compliance around registration and reporting of clinical trials has been poor, but over the past decade, transparency in industry has dramatically improved[36]. However, there is still more to do.

ABPI has identified three key areas in which clinical transparency can be improved, believing that research needs to be made available, accessible and understandable.

A key element of research transparency is registration and reporting on international databases and registries, in a timely manner, as governed by UK and EU legislation. In the UK, the Health Research Authority (HRA) ensures that those conducting research across non-commercial, charity and commercial clinical trials, comply with these regulations.

To achieve greater clinical trial transparency, the HRA's draft strategy[37], proposes how it can improve registration and reporting in clinical research. ABPI supports this draft strategy and continues to work with the HRA to improve transparency in commercial clinical trials. Any UK specific initiatives should be practical to implement and not duplicate work for clinical trial sponsors. In addition, any UK initiatives should be in line with international standards such as the WHO standards for clinical trial registries[38].

Once made available, research should be accessible, through user-friendly registries and databases, and open access journals where research findings do not sit behind pay walls. ABPI is working with key stakeholders across the sector to explore the pharmaceutical industry's perspectives and policy needs relating to open science, with a focus on open access publishing.

Lay communication is an essential part of clinical research. Findings from clinical trials must be communicated in a way that is understandable to the general public – a process greatly improved by patient and public engagement.

The EU Clinical Trials Regulation 536/2014 (Article [37]) requires clinical trial sponsors to provide summary results of clinical trials in a format understandable to laypersons[39]. These layperson summaries will be made available in a Clinical Trials Information System. Although the Regulation was adopted and entered into force in 2014, the timing of its application depends on the development of this system.

Looking forward, the ABPI will be continuing efforts to promote the accessibility and understanding of clinical research, exploring issues such as open access publishing and preparing for the new requirements for lay summaries, under the EU Clinical Trials Regulation No 536/2014.

The UK Government acknowledges the need for change and has advocated for greater research, governance and ethics[40]. ABPI welcomes this commitment and will continue to work with industry and key stakeholders to improve clinical trial transparency.

Policy recommendations

Government should continue to improve standards on transparency and promote equity in compliance across the sector.

Industry and key stakeholders across the sector must work together ensure a sector-wide approach to improving research transparency.

7. Securing a future UK-EU relationship on medicines and research

UK clinical trial activity has remained strong following the Brexit referendum result, based on the figures in this report from shortly after the result.

However, continued uncertainty about the future UK-EU relationship undermines the attractiveness of the UK as a destination for clinical research. Because clinical trials are conducted over several years, any impact on activity will not be seen in datasets for another few years.

However, it is clear that continuing uncertainty threatens to undermine the UK's attractiveness to industry as a destination for clinical research. The UK's life sciences industry has identified four areas for the UK to secure for a future UK-EU relationship, to ensure the UK research environment continues to thrive[41].

These include, research stability; ability to trade; a common regulatory framework and access to the best talent – all of which impact the UK's clinical research environment.

As UK research is a complex ecosystem, it relies on a stable science and research environment, supported long-term by cross-sector global investment and collaboration. EU framework programmes, such as Horizon Europe, drive world-leading research, with the EU a global leader in life sciences R&D.

Currently the UK is highly influential in both the design and delivery of EU R&D programmes. Anything less than full participation and influence in EU programmes, would result in an unsatisfactory position for UK life science R&D and UK patients.

Without the ability to influence the design of research programmes, leading researchers are likely to move out of, or not move into, the UK and this loss of globally recognised and highly skilled researchers will drastically undermine the UK's research base.

If a diminishing ability to influence the design of EU R&D programmes remains after the UK leaves the EU, it will be critical for the UK Government to develop and deploy alternative and ambitious research and innovation programmes.

This will require significant change in the current R&D funding architecture and will be essential to reach the R&D investment target of 2.4% of GDP and retain its status as a world-leader in R&D.

The EU has provided much of the scientific, regulatory and trade infrastructure for the pharmaceutical industry in the UK through the European Medicines Agency (EMA).

Securing any continued international R&D investment and collaboration between the UK and the EU, will largely depend on the regulatory framework the UK has in the future.

In particular, participating in the EU regulatory framework for medicines and having continued access to the EU clinical trials database, are critical for ongoing future clinical trials in the UK.

Regulatory cooperation is essential for ensuring medicines continue to be researched, developed and delivered to patients in the UK and the EU.

To maintain a thriving UK research environment, particularly clinical research, industry need certainty in order to plan and decide where to invest.

As long as there is uncertainty regarding the timelines around Brexit and what the future relationship with the EU will look like, pharmaceutical companies will find it a challenge to make decisions to invest in the UK.

Policy recommendations

The UK Government should ensure the UK clinical research environment remains stable during this period of Brexit uncertainty, alongside securing a future relationship with the EU which ensures regulatory and research alignment.

Conclusion

At the forefront of innovations designed to accelerate the clinical evaluation of new medicines and the introduction of new treatments that benefit patients.

Clinical trials are good for patients, and great for the UK, generating millions of pounds in economic benefits every year and securing thousands of high-value jobs.

Nevertheless, the pharmaceutical sector is a global business, and companies will continue to carefully evaluate where they invest for clinical research.

Countries with well-established clinical trial infrastructures and capabilities, a skilled workforce and a competitive data offer are those which succeed, with emerging economies gearing up to provide alternative options.

The UK must keep pace with this rapidly shifting landscape and evolve with it, pioneering innovation and attracting investment in clinical research.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Appendix

Data Collection Methodology

Data was collected from Cortellis Clinical Trial Intelligence, Clarivate Analytics using the following criteria: trial start date (1st January 2012 – 31st December 2017), country (USA, UK, Germany, Japan, Australia, Canada, France, Spain, Italy, Poland, Switzerland, Brazil,); trial start date (1st January 2016 – 31st December 2017), country (China, South Africa, Switzerland and Brazil) and phase of study (Phase I, II or III) and disease area.

Only commercial trials related to pharmaceutical drug development and molecular/biological entities were included. Collaborative trials were only included if one or more partners were a commercial organisation.

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