HOUSE OF LORDS

# Science and Technology Committee

## Corrected oral evidence: Innovation in the NHS: personalised medicine and AI

Tuesday 24 March 2026

10.15 am

Watch the meeting

Members present: Lord Mair (The Chair); Lord Berkeley; Lord Booth; Lord Duncan of Springbank; Baroness Jones of Whitchurch; Baroness Nicholson of Winterbourne; Lord Patel; Lord Ranger of Northwood; Lord Willis of Knaresborough; Lord Verjee; Lord Winston.

Evidence Session No. 5 Heard in Public Questions 45 - 61

Witnesses

I: Matthew Durdy, CEO, Cell and Gene Therapy Catapult; Chris Molloy, CEO, Medicines Discovery Catapult.

USE OF THE TRANSCRIPT

1. This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

Matthew Durdy and Chris Molloy.

Q45 **The Chair:** Good morning and welcome to this session of the Science and Technology Select Committee. We are undertaking our inquiry on innovation in the NHS, personalised medicine and AI. We are pleased to have as our two witnesses this morning Matthew Durdy, CEO of the Cell and Gene Therapy Catapult, and Professor Chris Molloy, CEO of the Medicines Discovery Catapult. Could you each briefly introduce your catapults and explain where they sit in the pipeline from research to patient? We are interested in understanding how the catapult model works in these sectors. We would like to know what you feel you have practically achieved in helping to bridge the gaps between research, the life sciences industry and the NHS. What is your role in scaling up the availability of treatments and life sciences companies?

***Matthew Durdy:*** Thank you. Our vision at the Cell and Gene Therapy Catapult is for UK companies to globally lead in the supply of transformative medicines to the world, which says quite a lot around aspects of this inquiry. In order for that to happen, we see four key conditions, all of which need to be met, and we work on those conditions. The first is that there needs to be a steady flow of high-quality new technology emerging from the research sector. To achieve that, we spend our time going around universities helping companies think about commercialisation, getting them access to funding and getting them to spin out or join with others.

The second condition is that the cost of goods needs to come down. We have a team of about 150 people in laboratory spaces across the UK who are working on new technologies for improving the development of therapeutics. We work in collaboration with other catapult-like organisations such as MDC and CPI up in the north-east but also with industry and academics to take down the barriers to the growth of the industry.

**Lord Patel:** Can we please not use acronyms?

***Matthew Durdy:*** Sorry. The CPI is the Centre for Process Innovation.

**The Chair:** The MDC is the Medicines Discovery Catapult.

***Matthew Durdy:*** The third condition is that there needs to be capacity within the industry to supply these therapeutics as they are taken up. We have a team of about 100 people focused on

manufacturing innovation, particularly around robotics, digitisation and the use of data to improve manufacturing scalability and supply.

The fourth area, which is critical, is the uptake and adoption of therapeutics. We have a team who work on the interface between the therapeutics and the healthcare system to work out what is needed to increase uptake. That includes working with the regulators and the price regulators.

In terms of achievements, since we started, employment in the sector has grown about twelvefold and there are about three times as many companies in the space. About £5.4 billion worth of investment has come in. There are about 17 licensed therapeutics in use within the NHS, which when we started was almost inconceivable. I will finish with what I guess is the neatest example, which will probably be referenced later—a company called Autolus, which exemplifies the whole thing. We started with it back in 2012-13, when it was still in the academic sector. We helped it spin out and worked with it. It came into our manufacturing centre in Stevenage, raised considerable amounts of money and built a new manufacturing centre right next to that, also in Stevenage. It employs about 350 people now and exports CAR-Ts to the United States and, since the end of last year, supplies them to the NHS. We would like to see it continue to grow, thrive and deliver throughout the world.

**Lord Willis of Knaresborough:** You have talked about investment. What percentage of that investment is made by the UK? Is most of it coming from the United States, China or somewhere else?

***Matthew Durdy:*** I cannot tell you the exact percentage, but you are right: the greater investment in this space at the moment in the companies that we work with tends to come from the United States. In the sector as a whole, it is the United States and China—we may come back to China later—that have taken the initiative with regard to cell and gene therapy.

Q46 **The Chair:** Following on from your very helpful introduction, would you say that manufacturing is the bottleneck? If that is the case, what can be done about that?

***Matthew Durdy:*** I deliberately mentioned four different conditions, and I think they are all bottlenecks. Manufacturing is a bottleneck but, without demand and pull, those manufacturing problems will not be solved, because it is the volume that goes through and recycles investment back into the system that will lead

to the solving of the manufacturing problems. The manufacturing problems specifically, if you were to describe them in a static moment today, relate to the fact that it is new as an industry, the fact that the infrastructure is not fully developed and the fact that they are often live agents and therefore the supply chain issues are different. However, I honestly think we have made huge strides in the last 10 years on manufacturing. There is more investment to go in, but that can be driven by the pull from users.

***Chris Molloy:*** The Medicines Discovery Catapult shares all the concepts that Matthew has talked about in terms of making the UK industry fit to fund and fit to grow—the idea that UK companies can serve the world from the UK with the right tools, technologies, market access, regulatory access and so on. We do this in three essential ways. First, we de-risk and drive the adoption of new productive tools and technologies for the medicines discovery sector: complex cell models—so-called advanced models or non-animal models—means by which to measure them, biomarkers, imaging and so on, all creating a wealth of data that is the feedstock for AI systems. Secondly, we work with young companies in every area of our nation to make them fit to fund by giving them strong R&D plans, access to scarce technologies and access to network and nurture and, in some cases, seed funding. Thirdly, we run a range of national and global R&D collaborations that help the sector prove their principle and address those areas that industry believes are high risk, but also reach through into the NHS. An example of that is the National PET Imaging Platform, which we are directing, alongside the MRC, to roll out total body PET imaging across the NHS, in concert with industry and researchers, to provide the new tools and technologies that make patient care better, make trials more attractive here in the UK and help to deepen our bench of research.

Then there are our collaborations in antimicrobial resistance worldwide and our launch, alongside the Office for Life Sciences, of the national dementia goals programme, which again binds industry together with the NHS, with trial systems from biomarker to bedside. These three basic approaches are designed to make the UK science and business environment the very best that we can for biotechs to create the fit-to-fund pipeline.

We measure our impact from how much money we can make move. Good money follows good science, with a good plan and good people who can carry it off. In our time, just coming up to 10 years now, we have leveraged around £1.8 billion of investment into the sector. Just over £1 billion of that is into SME companies—direct investment from around the world that leads our companies

to be able to grow. That is the mission of the Medicines Discovery Catapult. It is our ethos to partner not just with cell and gene therapy at the Centre for Process Innovation but with 50 universities around the country, 12 medical research charities, 12 government departments and multiple organisations and incubators around the nation, where we plug in our expertise to give access nationwide to those capabilities.

Q47 **Lord Duncan of Springbank:** I want to understand that substantial investment in the SME world. What is the success rate of the investment in the SMEs themselves? How do you measure that success, and what is the quantity of those that succeed?

***Chris Molloy:*** So far, from the data that we have and hold from the last eight years since we have been up and fully running, around two-thirds of SMEs that work with us end up being financially successful, about half get direct investment and the others find non-dilutive sources of money. We also work with the service industry.

I want to make a big call-out to the service industry here in front of your Lordships today, because the service industries are not the second-class citizens of this community. They are where intellectual property is put into companies. They have agency to do work. They provide jobs, they provide money and they provide profits, and they should be celebrated. They can produce global P&Ls that actually make money. They can go on to financial success by taking UK intellectual property and turning it into services—maybe not medicines—that make money and impact worldwide. Around two-thirds of companies are financially successful, which is a highly enriched rate over the background.

**Lord Duncan of Springbank:** That is impressive. Are those companies then retained as independent, so that they are continuous independent companies, or are they quickly swallowed up by larger enterprises elsewhere?

***Chris Molloy:*** There has been a tradition that they are acquired relatively early. That median point needs to shift. As a national pipeline, we must have a range of different outcomes from this portfolio. Some may be acquired early, and that is the right thing for their technology—to give it to a partner that can progress it at pace. Some will produce global P&Ls from the UK, and some will survive for a longer time, but we live in an extremely acquisitive sector, where all the big pharma have been amalgamated, acquired and so on. This is not an environment where a single company often persists for 20 years or more without that acquisition. So

there is a range, but we need to give our companies options to stay independent for longer.

**The Chair:** Can you clarify what you mean by service companies in this context?

***Chris Molloy:*** They are contract research organisations and companies that provide research services, pre-clinically and clinically, to our biotech companies. The average UK biotech company has around five people in it, and those people own the plan and the concept. They have the commitment and the drive, but they use others to get their physical work done. The UK has an exceptionally rich fabric of specialised service companies, which take intellectual property out of universities, turn them into services and provide those services worldwide. It is an extremely successful sector.

Q48 **Lord Patel:** It all sounds very interesting, but I am not sure that I am that impressed, because you were set up to develop medicines. You were a Medicines Discovery Catapult. So what medicines have been discovered that are used in the NHS today?

***Chris Molloy:*** Lord Patel, with respect, we were not set up to discover medicines. We were set up to enable others to do so.

**Lord Patel:** You are a Medicines Discovery Catapult.

***Chris Molloy:*** We are there to support the industry. Catapults are there to support the industry—not to invent but to translate. We are the national translational gearboxes of the nation, not inventors.

**Lord Patel:** What industry have you supported that has developed drugs that are used in the NHS?

***Chris Molloy:*** So far, none of the medicines that our partner companies have moved forward has finished clinical trials yet. Our stage is relatively early, moving from idea to proof of concept in humans, but that proof of concept is still eight to 10 years away from the market. However, technologies that we are working on with UK and global companies—for example, the national PET imaging platform—are being used by NHS patients today. This may not be a medicine, but it is a technology that we have helped to prove both pre-clinically and clinically. That is having a real patient impact today, as well as having a real research impact and attracting international industry to do trials here, because we have the right technologies that give them the data they want.

**Baroness Nicholson of Winterbourne:** Thank you, both, for

such an interesting exposition of your work. My question really relates to the commercialisation of your findings. I am tempted to remind you that it was the medical adviser to Napoleon who declared that Britain was a nation of shopkeepers—it was not Napoleon himself—as, in a sense, we are one step behind. This is a bit of a façade, is it not?

You are inventing things and then they are disappearing. Do you think it is possible that we are missing a trick somewhere in this line? Why are we missing the commercialisation of good opportunities, whether or not you have fulfilled them to completion? As we know, Britain has been very slow. All our inquiries have shown that so far. Where is the gap? What is the matter? Is it the recruitment in universities? Should you be going for more commercialised undergraduates, for example? Are we concentrating too much on pure research and too little on what we do with it? Or is it that the inhibition is the NHS in the middle, which you cannot get through or round with associated funding from Governments?

***Matthew Durdy:*** I cited the example of Autolus earlier, which is the exception to the rule. We have already had conversations about where funding comes from and where it goes. The key factor in all this in terms of the stickiness of businesses to the UK is the three key factors of market, market and market. First, that is market in respect of the size of the market opportunity and the connectivity of the UK market to others. That needs to be thought about, whether it is to the EU or to an aggregation of other similar nations with similar regulatory regimes. The second market concept is ease and speed of access to the NHS. We have a tremendous resource there that is not accessible to companies, and so many things could be done to improve that.

The third area is the sophistication of that interface; the UK will never be the biggest market in the world and probably not even be connected to the biggest market in the world. The US and China will dominate, but the UK can be better and smarter. Making it an environment where companies can commercialise their products and develop new relationships and new ways of working with the healthcare system will make them come here and stay here to work. That is the environment we need to make. Once you have the market incentive to stay and work with this environment, the investment follows. That is what is happening at the moment. The investment is following the market out to the US, and it will start going out to China as well.

**Baroness Nicholson of Winterbourne:** But, as we know, the

NHS is a market almost begging for consumer help for the patient—in other words, cure rather than prevention. How can you break through that and change the attitude of the NHS?

***Matthew Durdy:*** We produced a report relatively recently with the Office of Health Economics where we tried to look at and develop a greater understanding of the value of transformative medicines in society. There are two parts to this value. One is the immediate healthcare impact, which is well quantified within the healthcare system; at the moment, the healthcare system is struggling to deliver all of that. But there are enormous economic benefits outside the immediate healthcare environment. We used the Treasury Green Book rules to develop a method of analysis of the economic value; it is roughly the same size outside the healthcare system as it is within the healthcare system of transformative medicines. That opens up a discussion not about how the NHS changes itself to facilitate this, because there are resource constraints, but about how the rest of government facilitates the changes around the NHS to allow this dynamic to change.

Q49 **Lord Ranger of Northwood:** Thank you both; this is a very interesting start to the session. I am hearing some mixed messaging: fit to fund and fit to grow in the work you are focused on, but the market and investment are moving away and it is not directly coming here. Last year in our financing and scaling in UK science inquiry we heard evidence from Sir John Bell, who was concerned about whether major pharmaceutical companies such as AstraZeneca and GSK will invest in the UK or even stay here. That is the other end of the spectrum—those big anchors that probably help the ecosystem grow. Can you set out the relationship the catapults have with those big organisations which could play such a big part in the market? How can the Government ensure that those relationships are better and we make the most of them?

***Chris Molloy:*** We work with both of those major pharma companies in a range of development technology-proving collaborations. We have translated a drug discovery technology. It has then found a home in those larger pharma companies for validation as well as use. That helps us license that technology more broadly. We are also working with those companies on programmes such as the national dementia goals programme, engaging large pharma in that biomarker-to-bedside acceleration of access to novel drugs for dementias.

There is a collaborative element to this and a technology element, as well as another important thing that large pharma does—demand signalling. That is, they are seeking tools, technologies and drugs that look like "this". That is a really clear thing for our

biotech community to follow. It is vital. Otherwise, you end up with a lot of technology-driven companies rather than market-led companies, so it is vital to have that development partner and that demand signal within big pharma. There is also a training and development activity that large pharma does to provide that next generation of scientists.

However, I also again call out the service sector as a group that has increasingly, over the last generation, been where young talent learns as the number of other seats has declined. Big pharma is a vital partner and a vital part of our fabric. Also, there is international pharma working with us in our psychiatry consortium worldwide, which are focused on the UK as a way of being able to invent, translate, validate and prove.

Picking up on the previous question, the NHS is a perfect sandbox for those tools and technologies to be proven. Trials are a vitally important part of that—to be able to anchor companies here in the UK because they are trialling here. However, we must also remember that the UK is 3% of the world market. While we can and should use all the best of our public sector and pharma colleagues to prove in the UK, we have to sell worldwide if we are to be truly commercially successful.

***Matthew Durdy:*** We work closely with AstraZeneca, providing advice. We work on a number of its scientific committees and help develop some of the technologies that will go into its business and some of the emerging companies it is in partnership with at the moment. We were in a deep relationship with GSK, helping develop its manufacturing technologies in our Stevenage site, but it made a global decision to withdraw from the cell and gene therapy market, so that came to an end.

The catapults are set up to be at the other end of the spectrum. Their sweet spot for intervention is with the smaller companies, but where we are most interactive with them is around the policy and engagement with the healthcare system side of things. We can help them have a voice, among others, with both the NHS and government.

Q50 **Baroness Nicholson of Winterbourne:** Mr Durdy, you mentioned the need for bigger markets and commented on the European Union. The European Union has always seemed to me to be a vastly underexploited market for medical advances, which are very much single-country centred. Although there have been efforts to streamline and get in the middle somewhere, they have been a failure. I foresee that this could change. Could the UK lead on this?

It could be a separate initiative outside the EU, but that is not unnatural. We would be doing that, as you know, with defence. Do you see an opportunity for the UK in this vast and interesting market where there are wonderful pockets of unique excellence, such as in Germany and one or two others, but also a hugely underexploited market?

***Matthew Durdy:*** I sit on the Alliance for Regenerative Medicine, a global lobby body around regulation and market development which operates in the US and mainland Europe. This is a fantastic opportunity for my sector, cell and gene therapy. There are some residual barriers from Brexit that get in the way of us moving drugs freely from the UK into Europe. They need to be resolved. There needs to be free market of product. Companies will not come here to manufacture for supply to Europe if there are barriers to supplying Europe from here. They will go to Holland or wherever it might be. Those structural barriers need to be removed.

If we could have the best of both worlds, we would maintain the brilliance and the flexibility we have in our regulatory and development systems to allow people to come here, develop world-leading drugs and export them into the European market. The European market needs that. They are working on it. There is a new biotech Act coming out, but there is definitely some opportunity in market development there and we should take it.

**The Chair:** We are going to come on to regulation a bit later.

Q51 **Lord Duncan of Springbank:** You were saying that the NHS is a perfect sandbox. Is it? The next session after you depart is on the ethical questions. Are we the perfect sandbox for these developments or is the perfect sandbox perhaps in the US or elsewhere?

***Chris Molloy:*** Breadth of patient types—our phenotypes and genotypes and the breadth of our population—is an extremely good way to test whether a new intervention is going to work across a wide range of people. There are certain nations in the world with very siloed and specific populations. We have a greater breadth.

We have a strong national ability to see patients. We have the CPRD, for example, a nationwide database of primary care to access patients across the nation in a more joined-up way than some other nations, which might be quite siloed, small, local or regional. We can also fit some of those techniques and new tools into a pathway that can then be exportable. Finally, the UK is close to unique in being able to do implementation-based trials. This is not necessarily finding out whether a drug works, but how you

deploy it so that it has maximum impact as soon as possible. It is the right patient at the right time and ultimately at the right dose. We can do that in the UK. Implementation trials are one of our special sources that we need to manufacture more of.

Q52 **Lord Patel:** I am going to combine my main question, which relates to AI, with what you have already talked about around the conventional way of developing medicines. First, there is a lot of hype or truth that AI will help us to develop drugs, treatments or technologies and that the Government have ambitions, through their AI strategy, to have by 2030 the first drugs on trial using AI technology. Do you think AI will deliver that?

Secondly, Mr Durdy quite rightly mentioned some of the therapeutic agents that you have developed and gene therapies that the catapult has helped develop and that are now used. But they are not widely used. Why are gene therapies not more widely used across the NHS? Part of our remit for this inquiry is how to get innovations into practice widely and not just into highly specialised places.

Thirdly, we already have evidence that we will invest a lot of money in genomic medicine, using genes to identify the probability of developing diseases. That has implications for drugs, as mutations could be treated, but also in developing gene therapy, once we have identified the genes through genomic sequencing. Are you geared up, either through AI or in the conventional way, to face this challenge and deliver?

***Matthew Durdy:*** I am going to focus on the rarest end of disease, and I think Chris will deal with some of the more common things. The way that we see AI is that it has access to all the information in the world, good and bad, and the ability to make decisions from it quickly, reliably and cheaply. That does not quite exist at the moment because we cannot quite differentiate between true information and false information. We also do not yet have the mechanisms by which we can determine that the decisions that we have made are validating our decision-making process, such that we are confident in those decisions. But imagine a world where we had overcome those things—we will talk later about regulation, in terms of the implications of that.

In rare disease, it is never going to be as economic as it is today. You are not going to be able to go through the rare disease development pathway of doing development, non-clinical work, clinical work and so on, because the scale of the market is not big enough. So you need to approach that in a different way.

**Lord Patel:** Just for the record, we are talking of something like 6,000 to 8,000 rare diseases.

***Matthew Durdy:*** Yes, collectively they are very common, and that is our point: you can use the advantages of AI to aggregate information that you have learned in other places to develop platforms for developing and making decisions about the safety of the use of drugs in rare disease cases, potentially removing the need for non-clinical work or animal work in future and removing the need for clinical trials. You get to a stage where you have such good understanding of what you have done in the past that you are able to analyse the changes that you are making for a particular patient, with all the access to data that AI gives you, and you can make a well-informed decision about whether or not you can treat that patient with a new therapeutic.

That would reduce the cost of goods for therapeutics in the rare disease space probably by a factor of 10, and it would open up both an industrial opportunity that we could export all over the world and amazing opportunities for the treatment of patients with rare diseases. So AI holds enormous promise, but it requires enormous amounts of investment to get to the point at which the decisions that you are relying on are reliable.

Q53 **Baroness Jones of Whitchurch:** It would be helpful to get a measure of how transformational you think the applications of AI really are. You are talking about rare diseases but, as we have already heard, that is a very specialist area of work. Its broader applications are in their infancy, but, if you are ambitious and looking forward five or 10 years into the future, how transformative do you think it is going to be? And where does that leave us? Are we going to create a whole new generation of exciting opportunities that then get stuck in the usual bottleneck of clinical trials, regulation and so on and never really come to market in a way that they can be applied? How excited are you about it and, if there are huge opportunities, how can we unpick some of the bottlenecks so that we can speed up its application more widely? I do not mind which of you has a go at that first.

***Chris Molloy:*** I will have a go at that and pick up some of Lord Patel's points. It is as disruptive as the printing press and, as with the printing press, not everything that comes off it is what you need to read and learn from. AI is a disruptive technology that will accelerate and is accelerating our industry to a pace that we have never seen before. It may be possible, with a me-too concept, for AI to accelerate to 100 days to identify a clinical candidate, but, in areas that AI does not have the data to learn from, it cannot at the

moment jump into those new areas with the same level of confidence and predictability that it can into areas such as kinases, for example, where there is an exquisite amount of data already.

That is in the early drug discovery bit, but the AI in clinical development piece is also vital for understanding that, by improving the design, simulation, feasibility and recruitment of patients into trials, you accelerate the entire pipeline, and that provides capacity for more to come through. We do not want a wheelbarrow full of unsophisticated drug candidates to be pulled through into clinical development. We want validated, differentiated ones with novel biology to come through. AI may be able to enrich that supply, but it will most certainly revolutionise clinical development and speed it up to the point where we can start to catch up with our global competitors, which is completely necessary in the next five years. We need to be AI native in clinical trials and move on from where we are now.

We are hugely excited about its potential. We have had many of these sorts of exciting technologies before in drug discovery; combinatorial chemistry was going to change the world, as were other tools. Now they are part of a toolbox, and AI will become normal too. It already is in many large pharmaceutical companies that spend significant amounts of money in discovery, but also in clinical development. The application and adoption of AI systems will pull this through at pace. It is about a stack of technologies, some coming in and some coming out, some new, some old and some yet to be developed, that will speed up this entire pipeline. It has to happen in that way, otherwise you will end up with blockages.

**Baroness Jones of Whitchurch:** You have said in the past that you think there is too much failure in clinical trials. Obviously there is a very good reason in human biology that we do clinical trials. Do you think machines will be able to break through that? How can they ever replicate the learning that we get from a clinical trial if they are just crunching numbers, for want of a better description?

***Chris Molloy:*** They are learning from data, and they need to go to school, or indeed to university, on data. It has always been the mission of the Medicines Discovery Catapult to provide datasets to train AI systems so they become predictable in the areas that they need to learn from. There are existing datasets and emerging datasets of both patient data and biomolecular data—genetic, genomic, transcriptomic and all the other omics. It is important that AI systems are effectively trained on data that is unbiased and well curated, otherwise they will not learn and cannot learn

effectively. Once AI does that, it may be able to help us break through into some of these newer areas of endeavour as it learns faster than humans can from the same data. However, unless we get the data in front of it then it will be searching at the edges of its capability. The novel biology and the understanding of that biology may be AI assisted, but at the moment it is not AI native. We cannot just launch straight into new areas of biology from where we are. We need to help it learn.

***Matthew Durdy:*** Can I commit medical heresy? Clinical trials are a mechanism to reduce data gathering, developed in a world where there is a lot of noise and it is expensive to gather and analyse data. Everything is therefore reduced to the one thing that you are looking at in the space of that clinical trial. As a consequence, you lose loads of data in the process, and you do not go looking for it because it is not part of the question that it has narrowed down to. A lot of drugs, when they get out into the wider world, have odd performances in phase 4 clinical trials; you see things going awry. We need to change the mindset from reducing data to increasing data and giving greater access to it. The randomised controlled clinical trial, of which I am a big fan in the right circumstances, is therefore not the answer to everything. We need to think about this. There is definitely a blockage in the development process, and there are going to be circumstances where it is not appropriate to use it.

**Baroness Jones of Whitchurch:** Are you suggesting that AI can predict how human biology will work?

***Matthew Durdy:*** Yes. We need to be open to that concept and think about the infrastructure of the way that we approach science. There will absolutely be circumstances where it is appropriate. If you allow me to put a "big vision" hat on for a minute, you could think of a world where we had full access to information. Drugs today are developed in cohorts, for cohorts of people. If you took an approach to medicine that was mass personalisation—in other words, you used all the information available to develop the right drug at the right time in the right dose for a patient—it would be very hard to clinically trial that. You would end up with a different approach where you rely on the data that you have from the past. We are not ready for that yet, but I hope that discussions such as this open up the preparations for that world.

***Chris Molloy:*** In the pre-clinical environment, you look for as much data as you possibly can and then try to pull the patterns from it. We do not do that in clinical development.

Q54 **Lord Patel:** I get what you are saying, but they are trying to get into the next phase of using AI on other data, such as genomic data. Both of you and I know that, for every drug that goes through clinical trial, is successful and gets into practice to treat patients, there are a hundred others of a similar molecule that do not get there. The advantage of AI in drug discovery would be that you feed all this information into it and it will come up with the answer that you already have a drug, which you have tested, that fits the bill.

Secondly, now we require a power calculation for any clinical trial, in which you work out on how many thousands of patients you will need to test that drug. AI will deliver that within a few hundred patients and, looking at the wider data of clinical trials which you just mentioned, Mr Durdy, it will say that it is possible that this drug will be effective, but it will also identify the complications it will produce. It will change the whole ethos of how clinical trials are delivered and designed. That is the question we are asking. Do you think it is possible to design such clinical trials in the light of AI developments?

***Chris Molloy:*** Yes, with natural caveats. We have done personalised medicine sort of the wrong way round. We have gone through to phase 3, there has been some messy data and it has taken a while to identify one cohort of patients within that wider group. Herceptin is a great example of this—understanding the very small number of patients for whom that was revolutionary among a wider group of phenotypes and genotypes for which the result was not highly powered and therefore clear.

If we turn that around, which is your proposition, and start off with a smaller group of well-defined patients on whom the drug is likely to work because we have foreseen that connection between genotype, phenotype and pathology, then you can stratify from phase 1. The future cohort up in Liverpool a number of years ago did exactly that. It was putting stratified volunteers into phase 1. That really turns the whole thing on its head. It is possible when you are venturing into very new areas where we do not have that population data. I am not convinced that at the moment we have the seed corn to do that, but could it theoretically do it? Yes. We have to collect the data and things such as Our Future Health are giving us an additional insight into that, but there is much more to be done.

**Lord Patel:** Now we are going to have health research data centres. How will that help you?

***Chris Molloy:*** Access to health data and real-world evidence data is vital, but access to biomolecular data is equally important. Health data will tell us the outcomes and perhaps a little bit of the medical context, but it does not always give us that depth of biomolecular data, which the AI can try to identify some biological rationale for. That is a critical piece here. Biomolecular and health combined will enable AI to work. The most successful AI-based drug discovery and early development companies in the world at the moment are combining proprietary biomolecular datasets with health data at the petabyte scale to try to do this, and they still feel that they are at the early stages. There is much more to do, to collect and to educate these systems on.

***Matthew Durdy:*** Coming back to Lord Patel's point about clinical trials, I absolutely agree. We should be going to a place where we use all the knowledge we have to reduce the amount of clinical trialling that we need to do, but we still might need clinical trials to answer the questions where we do not have the knowledge. But that is a whole discipline and approach—effectively, the combination of real-world data with clinical trials—that we need to get a lot better at. The world needs to get a lot better at that. It all comes down to data and how we increase access and sharing of data. All data is absolutely a fundamental underlying foundation for AI.

**The Chair:** We are coming on to data a little later, but that is very interesting.

Q55 **Lord Duncan of Springbank:** This may be something you might want to reflect on and write to us about, so I will not prolong this. The direction of travel within the EU is towards a much more centralised and regulated clinical trial approach. Our next section is on dealing with the ethical questions. Is there a risk that, if we follow the EU model, we will become less attractive for the trials that you have described?

***Matthew Durdy:*** I would like to reflect on that, if I may. We might be combining two different concepts there, but let me answer that separately.

Q56 **Lord Booth:** My question is about access for patients to these cutting-edge treatments in the NHS. We have heard evidence about the cost of sickle cell treatment being £1.6 million. I have been told it is £280,000 to £500,000 for CAR-T treatment. As the panel knows, I am particularly interested as my husband is about to start his CAR-T treatment for non-Hodgkin lymphoma. The process by which he got access to that treatment, and the current NICE appraisal and NHS commissioning models, are quite traumatic

for patients. It was a couple of weeks before we knew whether he was going to be able to have access to CAR-T treatment. Luckily, he has. What needs to change to make sure that patients who would benefit from these treatments can actually access them?

***Matthew Durdy:*** There is a lot in that question, but let me try to cover a number of different topics. First, there needs to be a good supply—the ability to access these therapeutics in larger volumes. Secondly, the industry needs to mature such that high volumes of these products are being used and there is competition between their suppliers. That will deal with the price question over time. On the point about cost effectiveness, because the product is supplied within the NHS system, by definition under the current system it is cost effective. That needs to be appreciated. The issue arises in that the budget for it is not there. The budgetary discussion is separate from the NICE analysis.

The work I referred to earlier from the Office of Health Economics, where we looked at the broader benefits of the application of these types of technologies—we are expanding that to the wider grouping industry—clearly shows that there is much more economic value on the table from these therapeutics than is appreciated within the narrower healthcare setting. The question then becomes: how do the UK and the global community stimulate the increased use of the therapeutics so that you get to a competitive environment where large volumes are being used competitively, and that leads to investment in the sector? You need to reduce the cost of manufacturing because it is quite high today, but that will come down. Once the cost of manufacturing has come down and you have a competitive environment, you have room for the price to come down and then there will be greater access. We think about this a lot because ultimately it is not just about the developed nations of the world that should have access to these therapeutics, particularly gene therapies. There should be global access, but that will come over time.

**The Chair:** You mentioned the NHS budgetary issue, and that is a key point. We have these very expensive treatments at the moment, and there has to be some careful thinking from the NHS as to whether or not its budget can accommodate these very high costs. Is that right?

***Matthew Durdy:*** That is correct, and that is people within the NHS following their role and their mandate, but it comes back to the point that there are many benefits outside the NHS that come from people returning to the workforce, including carers. There needs to be some stimulus to increase the use of the therapeutics within the

NHS system, but that cannot come out of the NHS budget because it is maxed out—it is completely used at the moment.

**Lord Patel:** Did I understand correctly that you suggested—for instance, for CAR-T cell therapy—that the costs are mostly in manufacturing?

***Matthew Durdy:*** No. There are three big buckets of cost in cell and gene therapy. One is development. It costs a lot to get through the clinical trial processes, as it does with all drugs. Another one is in the hospital use. They are novel and complex, they require more handling, the systems are not there, there is no standardisation and so on. The third is in manufacturing, and that is in two parts. First, they are quite complicated to manufacture—more complex than normal drugs. Secondly, there has not been the movement towards manufacturing platforms that would enable a large-scale reduction in the cost of goods. So that is both a technology and a regulatory question.

**Lord Patel:** That suggests that personalised medicine, whether that be cell gene therapy, immunotherapy like CAR-T cell therapies or others, will not be available on the NHS, which is the Government's ambition for personalised medicine, until the cost issue can be addressed.

***Matthew Durdy:*** Am I allowed to bring out a prop?

**The Chair:** Yes.

***Matthew Durdy:*** First, here is my first mobile phone. It cost about £10,000 and $1,000-odd a month to run, and everyone looked at it and thought, "That'll never take off. It's far too expensive. No one's ever going to use that". Now, here is my current mobile phone. We are at that first stage in cell and gene therapy right now. We got to the second stage with our phones because of state interventions in access to the technology. People got together and said, "You know what? This has enormous promise for the world. Let's think about whether we can have common platforms under which things are manufactured. Let's think about the competitive environment in the way that cell phone manufacturers compete with each other, not on the basis of infrastructure and phone masts but on the basis of the service they provide". Those are the lessons we learned from mobile phones, and I would argue that the impact of mobile telephony was even greater in the developing world than it was in the developed world. I lived in Africa for a while, where I saw people getting access to technology. All those things can happen in the cell and gene therapy space.

**The Chair:** That leads into your question, Lord Willis.

Q57 **Lord Willis of Knaresborough:** Most of it has been answered. What I am really interested in with this particular piece of work is that patients in most hospitals across the country will be able to get access to some of the emerging strategies that are coming forward. When I talk to my chief executive, who is a great friend of mine, she basically says to me, "Listen, there's not a cat in hell's chance of us being able to get any of this because the costs are so great, so we just ignore them". I wonder what the Government should be doing to ensure that throughout the country there is access to emerging technologies, rather than simply waiting until the cost goes down somewhere.

***Matthew Durdy:*** I partly answered that in what I said before. I believe that high-volume use has a dramatic impact upon the cost of goods, first, at the development stage, because more products are being sold from that development process; secondly, at the hospital use stage, where costs come down within the hospital for use because it becomes much more standardised; and, thirdly, in the middle with the manufacturing phase, because it is fixed infrastructure. To build a manufacturing plant costs at least $100 million and a significantly scaled plant might cost $1 billion, so you need volume to go through that. Governments need to decide whether they are going to hold back and be a price taker with respect to novel technologies or whether they are going to stimulate a competitive market and therefore stimulate greater access for patients through increased use.

**Lord Willis of Knaresborough:** What do you think this committee should be saying to the Government that would improve that?

***Matthew Durdy:*** The mindset needs to be: how do we increase access for patients, and how do we explain or justify it? This comes back to the Office of Health Economics work. You can see that there is value in increased productivity within the economy from the use of these therapeutics that is not taken into account in the decision to use the therapeutics in the NHS setting. Those factors need to be brought together so that someone says, "We will stimulate and make the changes to the system that are necessary to drive volume and earlier access and get benefit for patients".

**Lord Willis of Knaresborough:** When the committee spoke to Professor Mark Caulfield, he set out that a major factor behind the success of the 100,000 Genomes project was embedding researchers and participants into the NHS who felt ownership of that project. What can you do at the catapults with regard to things like clinical trials and research in the NHS to give the NHS more of

a sense of ownership of research, life sciences and industrial development? What more can we do?

***Chris Molloy:*** I shall use the example of the national PET imaging platform. We are working with the Medical Research Council to deliver tools and technologies, these total-body PET images, through to the NHS. That is embedding new technologies inside that system for patient care, for research and for industrial use. That is a completely bound-together programme. The second one is the dementia goals programme, where we are working with NHS and NIHR colleagues to help to get that biomarker-to-bedside flow of new trials, new biomarkers and new drugs into clinical use. That is absolutely bound with clinicians; it has to be.

Those combined and collaborative programmes, which enable industry but are delivered with the health system, have a co-dependency between industry and the NHS, which is an interface that is sometimes really challenging. We have to design programmes that force that issue, saying, "This will absolutely deliver better patient care but you have to involve industry". We can be the catalyst of more of those. The same is true reciprocally, too: my catapult now has some medics on secondment inside the catapult, and they are sort of infecting us in the Medicines Discovery Catapult with their insights, knowledge, drive and patient insight. So it is not just one way. It is not just us doing things to the NHS, which any organisation might quite naturally repel.

It is about working with a set of combined purposes and principles as we did during Covid. The Cell and Gene Therapy Catapult and mine worked extremely hard and extremely well with NHS colleagues during Covid, with that singularity of purpose. Create that singularity of purpose around something and you can get those three groups—NHS, industry and academia—working effectively.

**The Chair:** Thank you. We now come on to regulatory issues.

Q58 **Lord Patel:** We have already covered quite a lot of this in our discussions, but I would like your comment on whether NICE and the MHRA, both regulatory agencies, as they currently function, are appropriate for the developing environment of gene and cell therapies for normal drugs—particularly those targeted at rare diseases? Also, how are other countries' regulatory regimes addressing the regulation of designer drugs?

***Matthew Durdy:*** We work closely with the MHRA in particular. We sit on a number of its committees and are helping it design regulation around rare disease and near-patient manufacturing.

Our experience is that the MHRA is extremely open, intelligent and well meaning with respect to developing new regulations. It is very much focused on today and tomorrow, because that is what it has to be.

I would encourage the MHRA to have more resources regarding some of the questions that we have raised in this discussion. Look at the world of AI. I can see a world where AI designs a therapeutic intervention for a particular patient. That needs to be regulated in some way, shape or form. The regulators need to be developing AI bots to regulate the development of drugs. They need to be thinking that far forward. I am sure that it is not happening today because they have not got the resources to do it. They need to be mandated to look at the future and start investing in it.

I will give an example of where it worked really well. About 10 years ago, I went into NICE with a colleague and said, "Cell and gene therapies are coming. You need to be ready for them". I fully expected to get thrown out. Actually, they said: "Oh, this is really interesting. I am not sure how our system would work for this". We then ran a project with them. We supplied data and they applied their techniques to cell and gene therapy and worked out where they worked and where they did not. That was ahead of need, as a consequence of which, when CAR-Ts were available on the market, the UK was one of the first places in the world as a national payer to adopt them. Our regulators are very capable of doing it provided that they are resourced and mandated to do so.

**The Chair:** Do you think they are not well enough resourced?

***Matthew Durdy:*** You would have to ask them, in terms of the expectation. The messages we get from the MHRA are sometimes different. There have been periods where the problem has not been the budget and periods when it just has not had the human capacity to do all these things. That is also a resource question.

***Chris Molloy:*** I certainly agree with that point around bandwidth, whether that be resources or skills. Things such as innovation passports are a new intervention by the regulators to bring people forward at an earlier stage. That early engagement helps to pull people through. Young companies are frightened of regulators, quite reasonably. They often do not have the skills or the experience of dealing with them. A friendly face, an innovation office within the MHRA, can help young companies make themselves fit to be regulated. That concierge service is very important. The FDA traditionally has done that very well and the MHRA has that intent too.

There is no doubt that we have to accelerate the pace of regulation up to the global standard, which has vastly accelerated from where it was. The data systems, whether they be digital therapeutics or AI-enhanced therapeutics, are moving faster than ever. We need to increase the pace at which we review. The idea of bots regulating the information generated for them by bots is important, but we should also have more regulatory sandboxes. To Lord Duncan's point, we should have a regulatory set of doses, or whatever it might be, that define a safe area in which you can perform clinical experimentation. Anywhere in that dose spectrum, you should be able to go to trial rather than having to go back and ask if you can go to trial again.

Lipid nanoparticles are a delivery mechanism for precision drugs. A regulatory sandbox around certain dimensions of lipid nanoparticles would allow us to do very rapid iterative clinical development without having to go back and ask for permission for each tweak and change. That will revolutionise what we can do there and the speed at which we can do it. I hope that we can think about doing those regulatory sandboxes in other areas of endeavour too. That will help move us forward.

**The Chair:** Lord Patel asked about other countries' regulatory approaches. Can you both comment briefly on that?

***Matthew Durdy:*** Before I do, can I just add a rider to my points? If you are to enter the world of rare disease medicines—individualised or mass personalisation—you cannot do cohort-based payment systems, by definition. You have to start investigating methods of paying for therapeutic interventions that can be individualised and paying on results. That is another area of research.

The two big markets to look at are the United States and China. There is a lot to learn from them, and it is not all good. The thing is to look at them and see. As I mentioned earlier, I sit on the Alliance for Regenerative Medicine. A couple of times a year we go into the organs of the US Government and lobby and talk to them. In the States, we are undergoing an experiment in deregulation and then re-regulation.

There has been this pullback from the FDA in terms of how it regulates cell and gene therapy. Importantly, there has been a stimulus from it as well, saying: "We believe in cell and gene therapy, that having a curative intent is absolutely the future of medicine, and therefore we want to support it". On the one hand it is being totally supportive, and on the other pulling back the

resources from regulation. That has left a bit of a void that allows for an excessive influence of personal opinion within the regulatory system. Those are things to learn from and examine about getting the right balance in deregulation.

China, at the other end of the spectrum, has a much lower regulatory environment. The Chinese have made a decision, just like the decisions that they made in consumer electronics, cars and solar panels, that this is going to be an industry that they will have. They therefore use their regulatory environment to develop that industry. We should think the same way. I am not saying that we should go to the same regulatory system as they have in China. I think it is about learning.

***Chris Molloy:*** We all know that the USA and South Korea approved the pioneer Alzheimer's drugs first. We can learn from the concierge service that helped that to move forward. From a regulatory perspective, we have the Access Consortium of regulators—the UK, Canada, Switzerland, Singapore and Australia—covering 152 million people that we can and should leverage. That gives us a competitive block over which we can perform clinical trials and approvals, and there is a lot we can do with that access consortium that gives the UK an additional competitive edge.

In relation to adoption and so on, I am hearing from the sector more broadly that they are feeling and hearing a decreased risk tolerance within the clinical community that is obviously feeding back up through into approval. The willingness to take clinical risk appears to be reducing, and that has a slightly chilling effect on the willingness to adopt new things, to do things in a different way or to take a little bit of risk that maybe would have been taken 20 or 25 years ago but now will not be. Obviously that affects panels of experts and so on, and it is having a slightly chilling effect on our willingness to do the new and very different.

**The Chair:** What do you think lies behind that?

***Chris Molloy:*** I am not a member of the clinical community so that is outside my own competence, but maybe the reason is litigious, maybe it comes from experience, or maybe this generation of medics takes a slightly different view from the generation before it. There are learned colleagues on this committee who might have a similar view, or a different one, but I am certainly hearing it, and it is becoming more of a consistent noise.

**The Chair:** That is interesting. Lord Verjee, do you want to come in briefly?

**Lord Verjee:** Actually, my question has been covered, thank you.

Q59 **Baroness Nicholson of Winterbourne:** The Government are a custodian, through the NHS, of most health data in the UK. How could this enormous body of data be better accessed and better used for you? Should we think of a different system of data ownership or custodianship, for example? With AI, might it be possible for the individual patient to give their consent to a limited or full-scale use of their data, particularly in the light of the fact that the Government inevitably—given what Governments are there for—cannot really control the use of data? Although the offer is made by the Government clearly in good faith, none the less every day and every week there are inevitably leaks of personal data. How would you like to address that in order to use it for your benefit, which is in the end our benefit?

***Chris Molloy:*** The use of health data for both research and commercial use has been an issue for a generation, and I have been involved in it for almost that long. It is a complex set of consents, contracts, intellectual property and past investment—a mare's nest of things that get in the way of being able to allow data to be used ethically for the benefit of researchers and to those commercial companies that will be producing new medicines, diagnostics and treatments that will then benefit the community. Patient engagement is vital here, and if you do deliberative patient engagement then you will almost always come to the question, "Why aren't you using this? Why aren't you making the best use of me and my medical history? As long as it is pseudonymised and so on, please use me". That has challenge from certain areas of the community, and I understand why, but the default answer should be that it is used rather than that it is not, and then we have to find some sort of special permissions. We need to improve consenting, so that perhaps we can go back and reconsent people more effectively for something that we did not consent them for before. A lot of the data were not collected at a time when AI existed, so is it consented for use by an AI model? No, because no one ever asked the question, and therefore it is not consented.

There are mechanisms—perhaps by using some of the NHS apps and other ways in which we engage the community—by which we can ask people to donate, but we must have a feedback cycle that is meaningful to patients, rather than a possible new drug in 20 to 25 years. There has to be a value flow back in short order, in order to give people the confidence that, "My data built that cancer ward", or "My relative's data bought that fleet of ambulances". That is really important. The National Lottery did that very effectively by literally putting signs on things that said, "The National Lottery built

this or did this", and you got the community nudge that is really important to do this and overcome some of the issues that are contractual but also personal. People have risk aversion to sharing, and it is sometimes easier to say no than to say yes.

I have to declare that I am the independent chair of a grouping of four university hospitals here in London called Faros AI, which is trying to develop datasets and sample sets around cancer that will be used by researchers and commercial organisations, and all these issues are patent and we are unpicking them. It is a pathfinder project that I am sure the HDRS will be looking at.

**Baroness Nicholson of Winterbourne:** There is greater ease of access to commercially available health data in the USA, yet there are some pretty awful ethical examples of how that is misused. How would you manage that imbalance? Would you go straight to the consumer? Also, why do you think people mind so much? They seem to mind more about their medical data than about their bank accounts, their intellectual data or what they have done. Why do people care so much? Is it of any consequence? Should we try to explode that?

***Chris Molloy:*** It is clearly of consequence because people care and it matters very much. Maybe it is a generational issue, in that one generation really minds but maybe the younger generation, who are used to sharing so much these days, almost 24 hours a day, may have a higher tolerance for that risk. They say that old ideas never die; only the people who have them do. Perhaps it is a generational thing and people will mind less in the future, but that does not mean for a minute that we should be fast and loose. We absolutely cannot. This has to be the equivalent of Swiss banking, but it has to be available without nine to 12 months of form filling, peer reviewing and so forth, which is what we have now, because that flow will never be sufficient to keep pace with what biotech and pharma require and what is available elsewhere in the world, which is where folks will go. We have an exceptional bank, but at the moment it looks more like a museum.

***Matthew Durdy:*** I agree with a lot of what Chris is saying. I will make some brief points. First, it is not just about patient data. There are wheelbarrows of non-clinical data all over the place, all of which we will need access to to feed these engines of decision-making that we are going to design.

Secondly, let us not let the future get stuck in the past. Let us make a dividing line and work out how we are going to organise

data in future and get that set up quickly, and then we can also look at the historical data and sort that out as well.

Thirdly, please let us not blame the patients in all this. I do not think they are holding it up; we are all holding it up by getting bound up and everything.

**Lord Ranger of Northwood:** It is a question of trust. We have had the comparison here with financial data. It is about personal privacy. People are rightly concerned because the future is going to be powered by their personal data, and decisions could be made on that data. I am not hearing the conversation about what you are going to do to develop trust models to reassure people, if they give their data, how it will be used. Right now, people do not put pictures of their young children up on social media because they do not want their faces to be seen. That is the concern that people have. I do not think this is a generational thing; it is going to be an ongoing concern about trust and usage of personal individual data, and what ramifications that might have for them.

***Chris Molloy:*** That is perfectly fair. Patient engagement and deliberative engagement, as I said earlier, is vital for this, as is engaging the clinical community, who are the first receivers and often the generators of much of those data. It is important to have everyone in a circle of trust. Maybe even the data systems sit in a trust. There have been examples, for example in the Channel Islands, of data trusts being put together. It is a matter of trust and we need to be clear that this is pseudonymised data—the use of one's data in a population, rather than the use of one's name, address and identifying characteristics. This is not about trying to identify you as an individual. This is you contributing to the nation, almost in a national health service, to say: "Use me—use what you can, and others may benefit". It is a population effort and maybe needs some more political support as a national health endeavour than it has had before. It is not just about the medical research charities, important as they are in this discussion. This is about research and ethical access to commercial companies which will make good products and good services that will give us health.

**The Chair:** We are going to hear more about trusts and the ethical side in our next session, with Professor Lucassen.

Q60 **Lord Duncan of Springbank:** You both appeared before this committee's inquiry into catapults in 2020. One of the recommendations from that was simply: "that the Government prioritises scaling up the Catapult Network, without which it is unlikely that sufficient private sector investment will be committed and unlikely that the Government's R&D spending target will be

met". Do you think this recommendation was properly implemented? How would you assess progress since that inquiry, some five and a bit years ago? Are we in a better place now?

***Chris Molloy:*** Yes.

***Matthew Durdy:*** I have been working on the catapult programme for 15 years. That inquiry marks a turning point for me personally, because I went from endlessly having to defend everything we did, from the concept of the catapults and effectively being continuously undermined by continuous inquiry and review, et cetera, to an almost overnight change in the attitude of Government and its organs towards the catapult programme. They became supportive. I am just delighted to have the opportunity to say thank you. The result was that we had refreshed funding, a refreshed mandate and refreshed support. Thank you. I think I can track all that back to that event. On the specific point as described there, we have modestly increased funding. There are no new catapults. There is an opportunity to do more, but there was definitely a response to the report.

***Chris Molloy:*** Building on that, some incentive schemes were put in to try to encourage catapults towards scaling, but it kept up with inflation so there was no real-terms growth in that model. However, I see in the new UKRI strategy and the Innovate UK prospectus a plan built upon the foundations of catapult success. That establishment which your report in 2020 helped create has allowed us as catapults to deliver and be able to show what we do with confidence, and the incoming leadership to see it and place some really strong plans on that foundation for how the most promising thereof will support the UK industry to success.

From the catapults' perspective, that is strong and gives opportunity, but they have also had to look to themselves in the last five or six years and develop new streams of funding and new ways to access private sector investment—leveraging money from others and developing new commercial services to generate more of their own income to be able to grow. Growth has been the issue for catapults. If you do a really good job and generate lots of positive impact, do you grow at the end of every year? No. You go back and start again. We need to find different ways in which we can grow to have more impact, because that is at the soul of a catapult.

**The Chair:** That is very interesting to hear. I am pleased that our 2020 inquiry has had a good effect on both your catapults.

Q61 **Lord Verjee:** Thank you both for a very interesting session. Our

inquiry will ultimately make recommendations to the Government on how to accelerate innovation in AI and personalised medicine in the NHS and the life sciences sector more widely. We have covered a lot today, but what are your key priorities and what would be your key recommendations for the Government to get this right? As a follow-up, where are we on the risk profile? Should we be taking more risk or less risk in the regulatory environment, which we talked about, and the financial environment? Where are we on the risk scale?

**The Chair:** That is a difficult question. We are asking just for what you think our key recommendations should be.

***Chris Molloy:*** We will try to do that. Matthew talked about the concept of mass personalisation. The two of us feel very strongly about this. Our ask of you would be to encourage a programme of mass personalisation. That would mean a new market for healthcare interventions in the home, the high street and the hospital, delivering more personalised and more precision prevention and care. That opens up a new set of industrial markets and providers—public-private combinations that will deliver the right intervention and right dose to the right patient in the right place at the right time. We must turn our nation towards that to avoid the continual increase in cost burden. We must open it up to a public-private sector combination to deliver that.

That will need additional resources—for example, for the Regulatory Innovation Office to help it boost areas of regulation that are critical in delivering the digital regulation and the AI-native nature of it. We also need to be really clear that data access is critical to our AI economy. We have exceptional data in this United Kingdom, not just health data but the biomolecular and research data that sits underneath it.

My final plea is that we can, as a nation, be the place where everyone sends their AI systems to learn. The very best AI systems in the world should come to the UK to learn from our data and tutelage. We have a model for that; it is called universities. We do it very well and we can take our tithe from that. We can do that if we create the datasets that AI systems need, tutor around them and become the place where the world comes to learn.

***Matthew Durdy:*** I will try to be quick. On the risk question, I do not think the system appreciates the opportunity fully, and therefore the balance is not right. I do not think we are taking enough risk. There is much more opportunity for society in going headlong into these therapeutics.

The evolution of this industry, particularly in personalised medicine and rare disease, will not be a passive process. It needs to be a planned process and to be supported in that plan. The market points I made earlier are extremely important; sucking innovation through, scale of market, ease of access to market and sophistication of market will make the UK an attractive place to develop and use therapeutics. On data and AI, you absolutely have to have the data and access to it. The differentiation that Chris made on this testing ground that people come to includes making sure that we work on the regulatory structures—how we regulate, test and validate AI in future in the medical field. Finally, I would make a plea for a pilot in the rare disease space where we can take all these brilliant things in an area where there is an enormous unmet need and use them to develop an industry and change people's lives.

**The Chair:** Professor Molloy and Mr Durdy, you have been terrific in answering our many questions. We have learned a great deal. Thank you very much for appearing as witnesses.