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Changing the translational research landscape
a review of the impacts of Biomedical Research Units in England

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Prepared for the Department of Health
The research described in this report was prepared for the Department of Health.
Summary

Study context and findings: the highlights

BRUs have an important role to play in the emerging health research landscape following Best Research for Best Health

1) Biomedical Research Centres and Biomedical Research Units as flagships in initiatives of Best Research for Best Health: In January 2006, the Department of Health’s Best Research for Best Health\(^2\) strategy (BRfBH\(^2\)) set out to create a health research system in which the NHS supports outstanding individuals, working in world-class facilities, to conduct leading-edge research focused on the needs of patients and public. Two of the flagship initiatives of BRfBH were the establishment of Biomedical Research Centres (BRCs) and Biomedical Research Units (BRUs). These are both partnerships between an NHS trust and a university. They share a common goal to undertake translational research in priority areas of high disease burden and clinical need, and to provide a significant contribution towards realising the broader ambitions set out in BRfBH. While the BRCs are about “making the best even better”, the BRUs aim to be “building on the best”.\(^3\) The term ‘building’ refers to the ‘developmental role’ sought for BRUs – in developing new relationships, greater capacities and improved targeting, and an enhanced responsiveness in health research.

2) The specific goals of Biomedical Research Units: BRUs were established after BRCs. Through the BRU award, the NIHR aims specifically to assist the further development of NHS and university partnerships which are at the forefront of their field internationally (but relatively small and specialised in comparison to the larger BRCs), to achieve critical mass. The awards should enable the partnerships to further strengthen research capacity in a priority area so that they are capable of submitting a credible bid for BRC status in the future. The BRU scheme supports priority research areas which are under-represented in the BRC portfolios and in which the UK has recognised research strengths. They include


\(^3\) Department of Health (Research and Development Directorate), Best Research for Best Health Implementation Plan 5.5: NIHR Biomedical Research Units, version 4, London: Department of Health, August 2008, p. 2.
cardiovascular disease; deafness and hearing problems; gastrointestinal (including liver) disease; musculoskeletal disease; nutrition, diet and lifestyle, and respiratory disease. Twelve BRUs were awarded in April 2008, a further three in July 2008, and the final award was made in April 2009.

3) Remit of the study: This report describes a review of the BRU scheme, undertaken for the Department of Health. This review was a perceptions audit of senior executives involved in the scheme, and explored what impact they felt the scheme is having on the translational research landscape. More specifically, we investigated whether and how institutional relationships between NHS and academic partners, industry and other health research system players are changing because of the scheme; how the scheme is helping build critical mass in specific priority disease areas; and the effects of any changes on efforts to deliver the broader goals set out in Best Research for Best Health. The views presented in this report are those of study informants only.

4) Caveats of the study: It is important to understand that this review was conducted at an early stage of BRU existence: in most cases the BRUs are just over one year old. The BRUs are intended to be responsive and to evolve in the light of developing opportunities and therefore this report offers only a ‘snap-shot’ in time. This means it is too early to assess downstream outputs from BRU activity, such as research papers, new diagnostics, treatments or changes in health policy. In addition, we interviewed the most senior executives of BRUs and so it represents a snapshot from a particular (albeit very well-informed) viewpoint. A more detailed perceptions audit would benefit from investigating the views and experiences of other participants in the initiatives, including academic researchers and clinicians engaged in research projects, and NHS managers. We are also aware that interview-based evidence collection can be subject to deliberate or unintended biases resulting from the position and experiences of the interviewees. However, we consistently tried to get evidence and examples from interviewees, to support interviewees’ views and claims. The fact that there was a broad consistency in the accounts different stakeholders produced (i.e. university and trust representatives) gives us further confidence that on balance interviewees gave dispassionate and complete accounts of where BRUs stand, and how they have evolved since they were set up. Lastly, whereas our review gathered interviewee perceptions on the changes the scheme is bringing about, we did not have a counterfactual. Therefore, although we could explore the value of the BRU scheme, we could not assess the value added, in comparison to translational research efforts being pursued by trusts and academic organisations without BRU status. In summary, the broadly very favourable account of the developing role of BRUs which we were given, and report here, should not in itself be taken as compelling proof that the BRUs are delivering all that is hoped of them in relation to boosting patient health and national wealth. These caveats should be borne in mind when drawing conclusions from this report.

5) BRU impacts – key findings: The information obtained through our interviews suggests that the BRU scheme is significantly helping shape the health research system to pursue translational research and innovation, with the clear goal of realising patient benefit. The BRUs are already contributing to observable changes in institutional relationships between

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4 Twelve BRUs were 14 months old at the time of the interviews, three were 13 months old, and one was less than 3 months old.

5 We conducted 38 interviews in total, at 16 BRUs.
the NHS and academic partners: trusts and medical schools are collaborating more closely than in the past, have signed up to the same vision of translational research from bench to bedside, and are managing and governing targeted research resources more professionally and transparently than in the past. There is also a stronger emphasis on engaging industry and more strategic thinking about strengthening regional and national collaboration with other hospital trusts, PCTs, research organisations, networks and development agencies. The scheme is also transforming capacity building in the health research system. This includes (i) developing and modernising facilities and equipment for translation; (ii) building a critical mass of human resources through recruitment and training, as well as improving retention of existing expertise; and (iii) helping ensure a steady flow of funds needed to sustain research activity and accelerate movement through the innovation pipeline. A number of centres are also trying to recreate the BRU model in new disease areas, with their own resources.

6) Similarities and differences between the evolution of BRUs and BRCs – a high-level reflection: Many of the impacts and key messages we identified through this review of BRUs, also apply to the BRC scheme. However, the emphasis is somewhat different and related to the distinction between ‘building on the best’ and ‘making the best even better’. For example, staff in many BRU locations have never had access to translational research funding of this nature or scale in the past, and for them the experience has been transformative. BRU directors are also very enthusiastic about having their own translational research patches to grow, and this enthusiasm has spilt over into capacity building efforts, and their keenness and commitment to engage with industry and other partners (including PCTs).

We elaborate on these key impacts, based on the perceptions expressed by those we interviewed, and present examples that were given in support of their views in the following sections. Table 1 then illustrates some of the key impacts of the scheme, at each individual BRU.

**Reflecting on specific areas of impact**

**BRUs are contributing to positive changes in institutional relationships between the NHS, academia, industry and other stakeholders in the health research system**

7) NHS–academia relationships: The BRU scheme has placed the spotlight on translational research for patient benefit. Respondents noted that NHS and academic partners are collaborating more closely than in the past, to undertake research aimed at improving patient health and the general well-being of the public. The attitudes and mind-sets of NHS and academic staff towards mutual collaboration are changing, and there is both more interest in collaboration and more opportunities to jointly take research forward. New organisational structures, divisions and functions have been established to facilitate translational research and ensure the transparency and accountability in the management and governance of BRU funds. NHS and academic stakeholders are also improving their ICT infrastructure to facilitate more effective communications. These changes are all a reflection of a more
business-like approach to research and commitment to ensuring clear lines of responsibility and accountability for the initiatives. It is widely felt that there is a lot more professionalism in managing research as an integral and important business activity of the trust, and within academia–trust partnerships. The allocation of research resources is better targeted and matched to clinical needs than in the past. The process of applying for BRUs played an instrumental role in the establishment of better coordinated and more strategic approaches to translational research collaboration than existed in the past. (Overall, collaboration was seen to be historically less strategic and significantly more ad-hoc than it is today.)

8) **Engaging the private sector:** Our interviews showed that collaboration with industry is also higher up on the agenda of trusts and medical schools than in the past, and there is already some evidence of positive responses to the BRU initiatives from the private sector, and signs of new collaborations emerging. The NIHR expects BRUs to collaborate with industry to deliver health innovations, and central government is also promoting the importance of public–private sector relationships in biomedical and health R&D, for contributing to UK’s economic competitiveness. In addition, challenges to retaining industry in the UK (due to issues such as the costs and bureaucracy associated with clinical research, difficulties in recruiting patients into trials, and increased competition for private sector presence from emerging markets such as China and Eastern Europe) have led academic organisations and trusts to become more strategic about what they can do to establish a research, operational and regulatory infrastructure that can add value to industry for the long term (not in the least in terms of the quality and reliability of services offered).

9) **Regional and national linkage and exchange:** BRUs are also adopting a more strategic approach to engaging other regional and national organisations in efforts to move research from bench to bedside. This includes academic institutions, hospital trusts, PCTs, clinical research networks and other NIHR initiatives such as BRCs and Collaborations for Leadership in Applied Health Research and Care (CLAHRCs). In some cases, disciplines outside medical schools are also being included in BRU activities. Many hope this will enable more interdisciplinary and innovative approaches to addressing translational research challenges. Lastly, actions to increase patient and public involvement in translational research are central to all BRU strategies, and community outreach activities are gradually becoming more comprehensive.

**BRUs are supporting capacity building in health research**

10) **A holistic approach to capacity building:** One of the most significant impacts of the BRU scheme is seen in how it is transforming capacity building in the translational research landscape, through contributions to (i) improving the physical infrastructure required for moving research from bench to bedside, (ii) building up a critical mass of leading researchers capable of advancing translational research agendas over the long term, and (iii) ensuring a steady flow of funds needed to sustain research activity and accelerate movement through the innovation pipeline.

11) **Physical infrastructure:** A very significant contribution of the scheme has been the support it has provided for securing facilities and equipment. For example, BRU funding is enabling the establishment of clinical research labs, the development of imaging capacity, patient
databases, bio-repositories and tissue-retrieval banks. New physical space and equipment dedicated to translational research is bringing biomedical and clinical researchers much closer together than in the past, and facilitating more intensive communications that are expected to accelerate research translation.

12) **Building critical mass**: The status the BRU award provides, along with improved physical infrastructure, is increasing the attractiveness of BRU environments for people interested in translational research, and is helping recruit better expertise, both nationally and from overseas, than might have been possible without the scheme. Although many interviewees felt that it was too early to provide concrete evidence of the impacts of the scheme on staff retention, in two cases we were told that it is now easier to persuade people to stay at BRU locations because of the new and exciting prospects the units offer in terms of their career development. BRU funding is also being used to provide clinicians with designated research time in their job plans. We were also told that research experience and interest now weighs more heavily in decisions to hire NHS consultants.

13) **Training**: NIHR funding for BRUs is also enabling the training of future translational research leaders, and is making a particularly important contribution towards opening new opportunities for NHS clinicians to be trained in and/or engage in research activity, in a more structured manner than in the past. The training opportunities created via the scheme are complemented with support from other institutions nationally (e.g. research councils and charities). Some interviewees also felt that the take up of research training opportunities by clinicians is increasing, because the BRU has had a significant influence of elevating interest in translational research.

14) **Leveraging additional funding**: Many BRUs have also highlighted the positive effects of the initiative on obtaining funding from external sources (e.g. charities and industry). The scheme has also influenced trusts and universities to commit additional funds in support of BRU aims. In some cases, trusts are pursuing the development of BRU-like arrangements in new research areas which they wish to strengthen, supporting these from their own resources and with additional contributions from university partners.

**BRUs are part of improved resource targeting, management and governance in the health research system.**

15) **The BRU scheme has helped in transforming the way research resources are managed and governed in the NHS**: It is widely felt by those we spoke to that there is a lot more professionalism in managing research as an integral and important business activity of the trust, and within academia-trust partnerships. The allocation of research resources is better targeted and better matched to clinical needs than in the past. New structures such as joint research offices shared by academic and NHS partners and translational research steering committees are facilitating the pursuit of common agendas between universities and the NHS, and are ensuring greater transparency and probity in the allocation and monitoring of spending, and in the monitoring of progress and performance. Joint R&D offices are also providing administrative support to improve the efficiency and reduce the bureaucracy that accompanies translational research. BRU leaders feel that it is essential that individuals with administrative responsibilities are appropriately trained in business and administration.
processes, rather than being placed into such positions from a pure academic or clinical background.

**BRUs are still learning and adapting in the face of a changing environment**

16) **Learning and experimentation:** As is the case with most complex new initiatives, BRUs have been a learning experience for those involved. Integral to the learning process has been an effort to identify and implement the financial, administrative and regulatory arrangements for BRUs that are best fit for purpose. Trust and university stakeholders have devoted significant time and effort to find efficient ways of managing the flow of funds between partner organisations, establishing common science commercialisation principles, and finding creative ways to minimise the bureaucracy associated with research regulatory processes.

17) **Networks and platforms for interactive and collective learning:** The process of setting up BRUs has led NHS and university stakeholders to identify some areas where improved communication systems and infrastructures could help further increase the efficiency and long-term impact of the initiatives. Suggestions to establish an online forum to enable a more effective support network between BRUs throughout the country, as well as between BRUs and BRCs, were made. This would provide a platform for more frequent discussions, exchange of information and the sharing of best practice.

18) **Interactions with the NIHR:** Frequent engagement and transparent dialogue between the NIHR and those it funds was thought to be important for making optimal use of the resources and opportunities available in the health research system. There was widespread enthusiasm and support for the way the NIHR has supported and engaged with BRUs. Many trust chief executives, deans and directors emphasised the accessibility and open dialogue they have experienced with the NIHR. One area where further interaction would be beneficial revolves around achieving an improved clarity on different NIHR initiatives and their relationships, as well as funding streams and eligibility criteria. Although BRU leaders are aware that information on each of the new efforts is available in the public domain, many feel that it would be helpful if it could be presented in a somewhat more user-friendly and amalgamated format (such as a handbook or set of guidelines). Continued dialogue will also be important with respect to BRU renewal round criteria and specifications for the next round of BRC bids.

19) **The wider underpinnings of successful BRUs:** BRUs operate within a wider context that influences the supply of resources for research and the demand for research to inform policy and practice. Attending to their stability and sustainability, and mitigating some of their uncertainties, will also support the success of the BRUs. Interviewees identified a number of such broader policy-related issues regarding the future of the UK health research system and the evolution of their units. These included ensuring that the UK health research system is attractive to industry; planning for economic and political uncertainties; ensuring the most appropriate balance between concentration of resources and diversity; nurturing and strengthening opportunities for nurses and allied health professionals to be included in the health research system; and implementing and nurturing a fit for purpose performance evaluation framework.

20) **Lastly, BRUs are part of an ongoing and larger effort,** which includes other flagship NIHR initiatives such as BRCs and CLAHRCs, as well as other government initiatives such
as Academic Health Science Centres (AHSCs), to create a sustainable, effective health research system in which research is driven by the needs of patients and the public. The enthusiasm and commitment of leading figures within BRUs is evident from this report. There is a widespread agreement among interviewees that BRUs can make a positive contribution to the health research system in the UK and that they are already changing institutional relationships between the NHS, academia and industry. They are building capacity and are part of efforts to improve resource targeting and governance in health research.

Table 1 present some examples of the impact of the BRU scheme identified through interviews. We have shaded cells in which we present impacts that are common to more than one BRU in the same location.
Table 1. Some examples of the impact of the BRU scheme identified through interviews

<table>
<thead>
<tr>
<th>Biomedical Research Unit</th>
<th>A summary of the impact of the BRU scheme – examples at individual units</th>
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| University Hospital Birmingham NHS Foundation Trust and University of Birmingham  
Gastrointestinal disease (hepatology) | • Applying for the BRU helped strengthen the spirit of collaboration between NHS and university partners, and has led to a strong sense they can achieve better results in areas of patient benefit, through collaboration.  
• New opportunities for clinicians to engage in research have been created and are being taken up with enthusiasm (e.g. programmed activities for research in consultant job plans).  
• There is a stronger focus on the relevance of research for patients.  
• The scheme is also enabling more interdisciplinary research. There is a broad mixture of investigators involved in the BRU (e.g. endocrinologists, oncologists, immunologists).  
• Research is approached in a more business-like manner and there is an emphasis on establishing more rigorous management and governance structures to monitor research spend than in the past.  
• Establishing new relationships with industry and jointly pushing research advances through the pipeline is one of the explicit goals of the BRU Although it is difficult to provide evidence of direct attribution, interviewees felt that the BRU has already had an impact on attracting additional funding (e.g. from Novimmune and Novartis).  
• Community outreach work is improving.  
• BRU funding has been used to develop imaging capacity and to purchase an MRI scanner. The university and trust are also trying to leverage the potential of existing infrastructure (such as the Wellcome Clinical Research Facility) to contribute to advancing BRU research.  
• The BRU has successfully recruited some positions, including a researcher from industry, three clinical research fellows, and some research nurse placements.  
• There is BRU funding for three clinical research fellows. There is also additional funding for training from the trust and university sources. Training opportunities in translational research are also helpful in retaining some existing researchers. |
| United Bristol Healthcare NHS Trust and University of Bristol  
Cardiovascular | • The BRU has led to fundamental changes in the attitudes of the trust and university towards collaboration and translational research. NIHR funding is seen as something prestigious that clinical and academic researchers aspire to. There is a sense of opportunity to capitalise on the new translational research funding prospects. Research is much higher up on the trust’s agenda than in the past.  
• The BRU has re-enforced the focus of collaborative research on research for patient benefit.  
• There is a new, tailored governance structure in place. A level of flexibility in the use of BRU funding so that it can be channelled in the
| **disease**                                                                 | best possible direction has been supported by the NIHR, and is perceived to be very helpful.  
| • It is too soon to say how far the BRU had impacted on relationships with industry but a project involving the testing of a potential new drug should start very soon (with support from a company based in Oxford and in New Zealand).  
| • Talks are under way about developing a cardiovascular disease research strategy across Bristol, led by University Hospitals Bristol and the university. The BRU has had an impact on increasing the interest and momentum for this initiative.  
| • BRU funding has been used to develop imaging capacity and to create more research space for practising physicians. A dedicated cardiac imaging scanner is now being installed.  
| • Seven core researchers for the BRU have been appointed already.  
| • The Bristol BRU did not include any specific funding allocation for training; however, interviewees believe that the BRU will make them better placed to apply for grants involving PhD studentships and to secure other training awards.  
| • The funding provided by the NIHR for BRUs has been very important for Bristol's ability to take forward translational research in the current economic climate in which charities have less money. The trust and university have also committed additional resources to the BRU. |

| **Royal Brompton & Harefield NHS Trust and Imperial College London** | Common to the BRUs at Royal Brompton & Harefield NHS Trust and Imperial College:  
| • The purposes, management and governance of trust-based research have been revisited to ensure that all new research taking place in the NHS is relevant to clinical needs, and in line with the trust’s broader business strategy. The scheme is also leading to a much more joined-up and better coordinated collaborative research programme between the trust and medical school.  
| • Research governance and management is approached in a more business-like manner. The trust now has greater clarity in terms of how it allocates and monitors research spend.  
| • Most interviewees expect new collaborations with industry to be facilitated by the BRU scheme, and the BRUs have already received a number of informal expressions of interest. However, nothing that has been initiated has come to a stage where it is ready for industry to get actively engaged.  
| • There is quite a lot of magnetism associated with the BRUs, and outside researchers are expressing an interest in collaboration because of the infrastructure and people associated with the BRUs. Both BRUs are also embedded in local Clinical Research Networks (CRNs).  
| • The cardiovascular and respiratory BRUs are joining forces to establish a biobank facility. The trust has nearly doubled or matched BRU support for infrastructure development. There has also been additional commitment from the university (e.g. for salaries).  

| **Royal Brompton & Harefield NHS Trust and Imperial College London** | • The BRU is a centripetal force bringing academic investigators and clinicians working in cardiovascular research closer together.  
| • The BRU has re-enforced the focus of collaborative research on research for patient benefit.  

| **College London**  
**Cardiovascular disease** | • The management structure enables a sufficient degree of autonomy for the BRU to pursue its goals while at the same time ensuring a requisite degree of integration and accountability to the trust and university more broadly.  
• The cardiovascular BRU is building a new CRF, a chain of cardiovascular and genetics clinics, a catheterisation lab, and state of the art MRI equipment.  
• Some positions have already been appointed (e.g. a BRU manager, a physicist, research nurses, sessions for a cardiovascular geneticist).  
• Training programs for basic scientists, clinical scientists, nurses and technicians are supported by major institutional training programs but not the BRU. |
| **Royal Brompton & Harefield NHS Trust and Imperial College London**  
**Respiratory disease** | • The BRU is changing the way people in the university and trust think about translational research in respiratory disease. It creates the much needed capacity for scientists and clinicians to work together more closely than in the past, talk more to each other and have the facilities they need to deliver outputs for patient benefit.  
• Physical capacity supported through the BRU scheme includes a CRF and CT scanning.  
• The respiratory BRU has been planning the staffing needs and developing a recruitment strategy for the respiratory CRF. Each consortium will have a coordinator. Some lung-function staff have been hired.  
• There will also be training for four PhDs (one with BRU funding working on stem cells and regenerative medicine). The other three are from trust parallel funding for MD and PhD posts. |
| **Leeds Teaching Hospitals NHS Trust and University of Leeds**  
**Musculoskeletal disease** | • The process of applying for a BRU has promoted a sense of more equitable ownership of the research agenda by the trust and university. Academic strengths, clinical service strengths and clinical need determined the priority areas to focus on in the BRU.  
• Targeted NHS-based funding for translational research has been a highly effective stimulus for increasing the scale and scope of trust–university collaboration. Research is now seen as an essential part of trust business strategy, and senior trust leaders have placed a lot of effort into communicating the importance of research to clinicians, and achieving organisation-wide buy-in. Clinicians and academics are collocated on the same site, and the scale of collaborative and multidisciplinary project is increasing.  
• The environment for translational research has become much better since the NIHR came into play. Interviewees thought that the BRU has had an impact on leveraging further funds: approximately £20 million of external funding has been attracted since receiving the award. The trust and university have also committed additional funding to the BRU.  
• The Leeds BRU leaders are very open to collaborations with other groups in the region and wants to remain inclusive. It hopes to engage PCTs in particular. At present, there is collaboration with other NIHR initiatives, for example with the Sheffield BRU and with the Leeds CLAHRCs.  
• There is patient representation and involvement within several elements of the governance structure. |
• The types of research collaborations taking place are far more translational in nature than was the case in the past. The university and trust partners are moving away from discipline-focused research to more thematic research. The BRU is increasing the levels of multidisciplinary collaboration (e.g. between medicine and engineering). Academics and clinicians from various disciplines will be colocated in the same space. BRU leaders think this to be important for the sharing of ideas and for accelerating translation.

• The BRU is a pillar for trying to strengthen research areas other than musculoskeletal disease in a similar way to the BRU model (but financed by trust and university in early phases of the effort).

• BRU funding is being used to establish an imaging facility and an integrated ICT database across the unit, linking information gathered across the research groups, and linking in the NHS data system. There is also some BRU support for developing an orthopaedic tissue retrieval bank.

• Three-quarters of the staff for the BRU have now been appointed. This includes group chairs, research fellows, and administrative and technical support staff.

• BRU funding is training six clinical research fellows. There is also additional translational research training support from other sources.

University Hospitals of Leicester NHS Trust and University of Leicester Cardiovascular disease

• Putting together the bid for BRU status for cardiovascular disease facilitated closer and better coordinated interaction between the trust and university. NHS employees have been brought into the translational cardiovascular research agenda more than in the past. The university and the trust have signed up to the same vision of translational research from bench to bedside, and have common expectations: the point of the BRU is for the synergy between the two partners to deliver advances for patient benefit, and for both involved parties to benefit from the partnership.

• A change in the university occurred in parallel to the development of the BRU, whereby the university moved from a departmental-based system to a theme-based system. This is influencing the ethos by which research is conducted in the university, allowing for much more interdisciplinary research organisation.

• The BRU scheme is expected to extend its influence beyond those generating the research ideas or conducting research, to those who are actually putting the research advancements into practice. There is an explicit strategy to increase public engagement in the research of the BRU and to increase the percentage of patients who participate in research activities (e.g. via communicating and mobilising patient participation in studies, in a tissue repository and in a bioinformatics database).

• There have already been some expressions of interest from industry in the BRU, particularly around the clinical phenotyping unit which is to be set up.

• The whole spectrum of NIHR initiatives are getting NHS trusts and universities to think more strategically in regions, and to look more seriously at regional collaboration. There is a strong focus on increasing patient participation in research, and infrastructure to facilitate this will be developed with support from BRU funding (e.g. biorepository for tissue samples and an informatics centre). There are also plans to establish a Leicester BRU faculty whose membership can include researchers from throughout the region. Membership will enable access to BRU facilities, and is expected to be beneficial for more frequent intellectual exchange between people active in
cardiovascular research in the region.

- Leicester has never had anything like a BRU before in terms of support for translational research, and the scheme provides a huge opportunity to reform the way cardiovascular research is done in Leicester. BRU capital funding will be used to develop a bio-repository and informatics centre, a CRF and a cardiovascular research centre. The trust and university are also committing their own resources to enhance the infrastructure.
- The Leicester BRU is only 3 months old. The trust and university had in pre-BRU times taken steps to enhance the sustainability of cardiovascular research by making a number of senior appointments. It is hoped that being a BRU will help recruit new people because it is a badge of recognition for the quality of cardiovascular research happening at Leicester.
- There is BRU funding the training of MDs and PhDs.

| Royal Liverpool & Broadgreen University Hospitals NHS Trust and University of Liverpool Gastrointestinal disease | Although the commitment to joint working was already present prior to the BRU, the scheme has further raised the profile and importance of collaboration between the trust and the university. It led to “a better organisation” of the existing “good-will”. There is a strong sense of commitment to the BRU by all participants, and this is part of a wider dialogue about harnessing opportunities for joint research between the NHS and academic partners. Translational research is now integral to the work of the university and trust.
- The BRU has been “utterly essential” in raising the profile of translational research in cancer and pancreatic disease. One of the leadership representatives commented on pancreatic disease: “If it had not been for this investment, I don’t think that there would have been any prospect of significant advance for many years.”
- Centralisation of the process to commission research is enabling funding to be used more efficiently and effectively.
- The BRC and BRU have affected the research governance across the trust and university, not just across the directly supported specialities. A joint research office across nine local NHS organisations is being planned for the near future.
- The BRU is providing the critical mass required to enhance work with the private sector, but it is still early days. Early signals of interest are beginning to surface. Forty representatives from industry recently visited the Liverpool CRF, and this has not happened before. The event was a chance to discuss the BRU plans and to explore avenues for fruitful collaboration, including phase 1 and phase 2 trials.
- The regional environment for collaboration is improving. The BRU is creating opportunities for closer collaboration with PCTs. This is very important, particularly because alcohol abuse is a major issue in Liverpool. The relationships between the BRU and local CRN are very positive.
- BRU leaders expect significant progress with recruitment in the next few months. They have already attracted a much better class of candidates through the posts they advertised than they think would have been the case in the absence of the BRU recognition. In addition, one interviewee said that two people he thought might have moved on elsewhere have chosen to stay at Liverpool, and he sees this as a sign of the campus becoming much more competitive.
- Liverpool has been successful in securing training awards for translational and clinical research from a number of sources before being
awarded a BRU. The BRU provides an established pathway for career progression and further personal development of the next generation of research leaders.

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<th>Nottingham University Hospitals NHS Trust and University of Nottingham</th>
<th>Common to all three BRUs at Nottingham:</th>
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<tr>
<td><strong>Gastrointestinal disease, respiratory disease, deafness and hearing</strong></td>
<td>• The trust and university now have a much clearer vision of what each partner contributes, and of respective complementarities. The BRUs have provided clear incentives for the partners to align research priorities.</td>
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<td>• Obstacles to clinician engagement in research are being removed (e.g. through provisions of protected research time). Obstacles for academics to collaborate with clinicians are also being removed (e.g. by developing integrated ICT infrastructure, through the co-location of academic researchers and clinicians).</td>
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<td>• The management and governance of research resources is much more rigorous and transparent than in the past. There is regular monitoring of research spend, and the partners are developing a performance scorecard for each of the three BRUs to help manage performance internally.</td>
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<td>• All three BRUs will also be gathering patient stories as the BRUs mature, to see how patient conditions have been improved as a result of the application of translational research enabled by the BRUs.</td>
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<td>• There is flexibility for staff to transfer funds to the next financial year to deal with difficulties in short-term spend, which is very helpful.</td>
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<td>• The funding environment for translational research has been vastly improved by virtue of the BRU scheme. The scheme is also having a positive side-effect: the trust and university are working together to develop shadow BRUs in other areas outside those funded by the NIHR, and committing their own resources to this task.</td>
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<td>• Nottingham has won a Medical Research Council (MRC) Developmental Pathway funding scheme award. Having three BRUs was a big factor in the successful bid, because the BRUs create a channel for picking up and further developing the research outputs that will over time come from the MRC awards. The BRUs are also beginning to attract additional grants: the importance of the BRUs is often made explicit in referees’ comments.</td>
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<td></td>
<td>• Both the trust and the university are matching BRU funding support.</td>
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<td>• Informal responses to the BRU award from industry have been very positive.</td>
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<td>• The BRU has impacted on developing relationships with other local players in a number of positive ways. For example, BRUs helped catalyse the bid for AHSC between Nottingham and Leicester. Although the bid was not successful, the universities and trusts involved are pursuing efforts to establish a shadow AHSC-like centre, and think that their chances of a successful bid in future rounds will be greatly enhanced because of this. There is also collaboration with the regional development agency.</td>
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<td>• There is also scope for a lot of collaboration between the gastrointestinal and respiratory BRUs at Nottingham. Some collaboration already exists and is expected to be further strengthened as the BRUs mature.</td>
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</table>
The BRU scheme is having an enormous impact on improving infrastructure for translational research across all three BRUs. The trust has also committed to contribute towards the capital schemes. Improvements in physical infrastructure have acted as an early signal to staff of the benefits the scheme can deliver in terms of providing a more conducive environment for research and ultimately for patient benefit. There is also capital support from other organisations – charities, the Higher Education Funding Council for England (HEFCE) and the Capital Infrastructure Fund (CIF).

### Nottingham University Hospitals NHS Trust and University of Nottingham

#### Gastrointestinal disease

- The BRU has led to a more formalised approach to collaboration between the trust and university, which makes it easier for academics and clinicians interested in gastrointestinal and hepatology research to identify and make use of opportunities for joint studies. The scheme has helped expand the number of clinicians and academics conducting translational research.
- The BRU scheme helped leverage additional funding from the MRC and other NIHR funding streams.
- The BRU application process led the trust and university to re-examine the research portfolio and re-focus and concentrate on a somewhat narrower range of areas of international research strength, where there is also a high clinical need for scientific advancements. Basic scientists are more engaged with patient-based research than in the past.
- BRU leaders are considering how to develop innovative and creative approaches to engage other trusts in the region to collaborate with the gastrointestinal BRU, and to facilitate access to patients in other catchment areas.
- The scheme is funding the development of a separate BRU unit and imaging capacity. This will allow academic and clinical staff to be collocated on a single site, and in this way be beneficial for the exchange of information and knowledge and for fertilising new ideas.
- Everybody they planned to appoint for the BRU has been appointed, and everybody bar two people are now in post. These appointments include eight research nurse posts at various grades, two technicians, a database manager, a clinical trials support worker, a clinical lecturer and two more people who are yet to start but have been recruited (clinical associated professors, at the beginning of their consultant grade and moving into primary research).
- Four clinical research fellows who will be doing PhDs as part of (and funded through the BRU) have been appointed.

### Nottingham University Hospitals NHS Trust and University of Nottingham

#### Respiratory disease

- The BRU scheme has put the spotlight on translational research, and the research agendas of the university and trust have been "enormously refocused" as a result. Although the flavour of the bid for BRUs was university led, the trust provided strong support and buy-in, and made additional financial commitments to the BRU from its own resources.
- The BRU has also pulled together a lot of research groups in the university which had some activity in the respiratory disease area in the past, but without respiratory disease research being their core focus. Because of the opportunities created via the BRU, respiratory research is become more and more of a focal point for these groups as well.
- Since becoming a BRU, a number of other awards have been received, including a large EU collaborative grant (Innovative Medicines Initiative).
- The respiratory BRUs nationally are talking about how they can collaborate more and work together. They have already been
collaborating in the successful bid for the Innovative Medicines Initiative collaboration. There is also collaboration between the BRU and other universities (e.g. Leicester). The BRU is organising an event where it will showcase their research and plans, and all the respiratory consultants from the other trusts in the Trent Comprehensive Local Research Network (CLRN) region are invited. The meeting is hoped to help gauge the interest of other organisations to collaborate with the Nottingham respiratory BRU.

- BRU funding is being used for the refurbishment of a lung function facility, a clinical research area, and another area for respiratory outpatients to be used in research studies (phenotyping and genotyping).
- Most of the posts needed for the BRU have now been recruited. The appointment of research nurses has been an important milestone.
- The scheme is having an impact on increasing the scale and quality of training provided in translational research. The respiratory BRU has already taken in 11 training posts, some of which are funded directly through the BRU.

| Nottingham University Hospitals NHS Trust and University of Nottingham | • The BRU has galvanised the university and trust to place hearing and deafness research higher up in their research agendas. The hearing BRU is unique in that it is a three way partnership between the university, trust and the MRC Institute for Hearing Research (IHR).
  |
|---|---|
| Deafness and hearing | • There are four areas of research the BRU focuses on, all with patient benefit being the key driver of projects. The BRU is unique nationally, and has included some very innovative aspects into its research portfolio (e.g. studying links between the loss of audibility and speech perception and intelligibility). The research has a sociology angle, an education angle and a learning to hear better angle.
  |
| | • Interviewees felt that other colleagues active in hearing research nationally are very keen to work with the BRU and access BRU resources. The university works closely with the Learning Sciences Research Institute.
  |
| | • Capital funding from the NIHR was matched by the trust. The funding covers the refurbishment of facilities for the BRU on one floor of the Nottingham general hospital, and most of the equipment. They now have sound-proof booths. The clinical service is on the floor adjacent to that of the BRU.
  |
| | • The BRU has already had an impact on increased capacity for hearing research in the UK because it is bringing in people from different countries and disciplines. A lot of the BRU money for posts has been transferred to the university, because all but 3.5 posts (the BRU unit manager, a secretary and 1.5 clinical scientists) are university posts. Fourteen academic staff are now in place. Recruitment has been facilitated by the fact that Nottingham has a very strong reputation in hearing research.
  |
| | • There is BRU support for four training posts (PhDs and MDs). The university is also making a contribution (e.g. providing student accommodation).
  |

| Nuffield Orthopaedic Centre NHS Trust and University of Oxford | • The BRU has developed on a foundation that was already in place. The scheme has led university and trust leaders to consider how they can further improve their ways of working, and to take new actions towards this end. Some of these actions include joint appointments of clinicians, and the possibility of buying back the time of clinicians for research rather than adding research hours onto normal working hours.
  |
| Musculoskeletal | • The scheme is leading to progress towards an ever more integrated research system and infrastructure. The BRU has further formalised
the importance of research in the trust and the common vision, through a direct and explicit programme for research flow.

- Clinical leaders are also leading in research thereby bringing all parties together.
- Musculoskeletal disease research taking place at Oxford is now driven primarily by a clinical goal, and is much more translational in nature than before. Research themes were selected for high impact in common disease and programmes with rapid delivery were been prioritised. There are regular patient forums to ensure that the research being taken forward is of relevance and benefit for patients.
- The BRU has had a significant impact on improving research governance structures. Individuals in charge of sourcing grant funding who used to sit in the old-style R&D governance have been subsumed under a new BRU structure, putting a system of scrutiny in place to ensure that those researchers doing inadequate own-account work are helped to achieve higher quality research.
- A new relationship that would not have happened without the BRU has been established with Smith & Nephew and GSK in the area of tissue engineering and regenerative biology. The trust and university are actively thinking about how to create ways for more effective interaction with industry, and this is largely driven by the Health Education and Innovation Clusters (HEICs) bid.
- There is a strong sense of community between the BRU and the CLRN and they collaborate closely. The BRU is also developing its relationship with the Kennedy Institute of Rheumatology, which could extend the scope of the translational research agenda undertaken by the BRU. BRU leaders are exploring how they can work closer with GPs (following the example of the very successful liaison that orthopaedic and rheumatology researchers at Keele have developed with their local practitioners).
- Most of the posts planned for the BRU have been appointed, around 20–25 of which 13 are full-time, including clinicians, therapy posts, research nurses and various support posts. Approximately half of these posts are part-time with the BRU, and are otherwise funded by the university or NHS. The BRU helped escalate the critical mass of qualified staff working on translational research in musculoskeletal disease.
- The BRU intends to create the next generation of clinical researchers. It has helped open up PhD training opportunities for 33 students of which 15 are surgeons. This is the largest number of PhD students doing orthopaedic surgery in the world. Half were recruited in the last year.
- The trust has leveraged an approximately 5% increase in income since becoming a BRU. Not all of this leverage is directly attributable to the BRU, but it is (according to senior leaders) reinforced by it.

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<tr>
<th>Sheffield Teaching Hospitals NHS Foundation Trust and University of Sheffield</th>
<th>Musculoskeletal Common to both BRUs at Sheffield:</th>
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<td>• The BRU has re-invigorated academic medicine. BRU funding is having a significant impact on Sheffield’s capacity to engage in translational cardiovascular research. With much of the infrastructure in place, the BRU is starting to phenotype and test people with heart attacks to inform some more upstream research about the implication of specific genes in cardiovascular biology. The trust also plans to set up a follow-up clinic for patients who participate in research.</td>
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<tr>
<td>• Resource sharing between NHS and university partners enables economies of scale to be realised. This includes the sharing of</td>
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| Sheffield Teaching Hospitals NHS Foundation Trust and University of Sheffield | databases and a bio-repository that is being established of sample processing resources, as well as some staff (e.g. a common receptionist for the BRU.  
• The success with the BRU bids has also influenced the trust board to invest money in research, which it would not have before. The trust is playing an active part in including research in consultants’ job plans.  
• The trust and university are now seeking to reproduce the BRU model and impacts in areas outside musculoskeletal and cardiovascular research.  
• There is a much stronger focus on public and patient involvement in research than ever before.  
• The management and governance of research resources is much more transparent and better targeted than in the past. There is a far stronger emphasis on structured planning for taking research forward, and on monitoring performance; poor own-account research undertaken by NHS staff is being discouraged and a new attitude to high-quality, relevant research is being encouraged.  
• Relationships with industry haven’t changed yet, but the BRU has provided a pretty strong sales pitch: it enables the partner organisations to market their research on drugs in development and their access to improved infrastructure (including equipment to evaluate drugs, and better access to patients). There is potential for some partnerships with GSK and Pfizer to develop. They are clear about what is needed and where they want to go; the next step is to develop the operational, administrative and regulatory environment that can add value to industry. The BRU governance representatives regularly meet and discuss ways of increasing collaboration with industry.  
• Both BRUs are engaged with the Sheffield Medical Innovation Centre, through project officers.  
• Having BRU status is enabling Sheffield to attract the required researchers. Although it is difficult to find concrete evidence, BRU leaders feel that it is now easier to persuade younger fellows to stay at Sheffield, as there are new and exciting opportunities via the BRUs.  
• The BRU has placed musculoskeletal research much higher up on the agenda of the trust than in the past.  
• The Sheffield musculoskeletal disease BRU communicates with the BRC at Guy’s and St Thomas’ to learn lessons about how they have developed the BRC. This has been an evolving and very helpful relationship.  
• The BRU is also developing a relationship with the School of Health and Related Research (SCHARR), and in general is strengthening relationships between the trust and all its academic partners as the new collaborative ethos is taken up by others outside the BRU.  
• The BRU has helped improve imaging infrastructure (e.g. Xtreme CT for state of the art measurement of bone structure). The improved infrastructure is enabling new research and involvement in multi-centre trials (that couldn’t be done before). Patient database capacity is also improving, increasing the availability of patients for research, and facilitating the development of a bio-repository.  
• They have recruited 19 staff so far (scientists, statisticians, nurses). Some of the positions are part-time. |
<p>| Musculoskeletal disease | disease, cardiovascular disease |</p>
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<th><strong>Cardiovascular disease</strong></th>
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<td>• The BRU has led to a more coordinated strategy for collaboration between trust and university staff in cardiovascular research.</td>
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<td>• The BRU is collaborating with some new university research groups (e.g. in medical physics). Some individuals from other university departments have approached the BRU and asked to become involved (e.g. a clinical research fellow).</td>
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<td>• BRU funding is helping expand pre-existing CRF facilities.</td>
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<td>• 90% of the staff the BRU planned to appoint are now in place. Some “spectacularly good appointments which were certainly helped by BRU status”. These include the manager of the programme, an ex-PhD student, a research nurse with a cardiovascular background with health-service-related research experience, and a biometrician with a previous Wellcome Trust fellowship. One more post will be appointed in the next year, to lighten the director’s responsibilities.</td>
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<td>• There are now three basic science PhDs being trained to conduct translational research. Three 1-year entry-level clinical fellows should be appointed in the next few weeks. Some nurses are also in training at the BRU.</td>
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<th><strong>Southampton University Hospitals NHS Trust and University of Southampton</strong></th>
<th><strong>Nutrition, diet and lifestyle, respiratory disease</strong></th>
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<td><strong>Common to both BRUs at Southampton:</strong></td>
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<td>• The BRUs have catalysed stronger collaboration between the clinicians and academics than existed in the past. The scheme has had a very strong impact on raising R&amp;D right up the agenda for the trust. There is a much stronger realisation of the strategic links between research and the quality of service provision, which is partially manifested through more uptake of research opportunities by clinicians.</td>
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<td>• Both BRUs have created an integrated management and governance structure. The allocation of resources in a targeted and transparent manner means that there are more opportunities for NHS clinicians to get protected research time.</td>
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<td>• The BRUs have mobilised a stronger focus on the relevance of research for patients.</td>
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<td>• The BRU scheme has had an amplifying effect – it has mobilised the trust and university to invest their own funds in creating shadow BRUs in other areas (outside nutrition and respiratory disease). This included the creation of a shadow BRU in cardiovascular disease, for example.</td>
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<td>• The two BRUs at Southampton collaborate with each other. Collocation also facilitates collaboration between the two BRUs.</td>
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<td>• The BRUs magnify historical links with other players and are a stimulus for even more collaboration. There are close relationships with the regional CLRNs.</td>
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<td>• The involvement of patients and public is very high up in the BRU’s research strategies and plans. Involvement activities include representation on advisory boards, the engagement of research nurses with clinical nurses to promote a culture of partnership between those delivering care, receiving care and taking part in research; as well as public lectures and open days.</td>
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<td>• The original BRU capital bid is funding a two-floor building for translational research, in which both BRUs will be located. This has now been approved and commissioned, and they hope to move into the building by the end of next year. This building will house staff, labs and equipment (e.g. a mass spectrometer and other specialised equipment). The trust is also investing in building physical capacity for</td>
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<td><strong>Nutrition, diet and lifestyle</strong></td>
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<td>the BRUs (e.g. a 3T MRI scanner to improve imaging capacity).</td>
<td>• The explicit and clear recognition of excellence that the BRU award conveys has further raised the importance of nutrition research among the different specialities in the trust, and has given a new, more concrete form to collaborations.</td>
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<td>• Significant progress with recruitment has been made. The majority of staff employed by the BRU have NHS contracts primarily.</td>
<td>• The recognition of excellence that the BRU gives has also helped increase the interest of nutrition specialists throughout the country to collaborate with the BRU.</td>
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<td>• There are clinical research fellowships allowing people to work between the two BRUs, doing a PhD (via synergy funding of approximately £400,000 per year over the life of the BRU).</td>
<td>• Some of the research conducted at the BRU is not very amenable to industrial exploitation: to date there has not been a major change in relationships with industry because of the scheme.</td>
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<td><strong>BRU-funded physical infrastructure is helping improve the ability to make good nutritional diagnoses. New technologies and modern methodologies are being implemented.</strong></td>
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<td>• An operations manager and six research nurses have been recruited. Some university staff are also now formally employed by the BRU.</td>
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<td>• The BRU support will help train a cadre of nutrition research nurses (of which there are currently practically none in the country, and particularly not senior nurses).</td>
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<td>• Historically, near patient integrative nutrition research has not been well supported nationally. The BRU funding is helping change this.</td>
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<td>• There is more enthusiasm for putting in bids to NIHR and research councils, and since Southampton was awarded a BRU, they have been more successful in winning funding from other sources.</td>
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<td>• In addition, the trust and university “do more than match” the funds from NIHR BRU funding.</td>
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<td>Southampton University Hospitals NHS Trust and University of Southampton Respiratory disease</td>
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<td>• Having the BRU has created a step change in the university’s relationship with the trust. Many more NHS consultants are now actively engaged in respiratory research activity.</td>
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<td>• Interviewees felt that there are three things that help you win money and establish new collaborations with the private sector: projects, people and place. The BRU is improving all three of these enablers. Therefore, although there is no concrete evidence on this, the BRU leaders feel that it is very probable that the scheme has helped in winning recent funding from two industry players. In addition, the BRU has recently been successful - as part of a consortium - in a €23 million award from the Innovative Medicines Initiative. Southampton will receive £1.45 million.</td>
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<td>• The respiratory BRU hopes to integrate more with other respiratory BRUs in the country. It is already collaborating with the BRUs at Nottingham and Royal Brompton and Imperial).</td>
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<td>• The BRU building (shared also with nutrition) will be right next to the Wellcome CRF, which will help harness complementary infrastructure.</td>
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<td>• Scientists, technicians and clinical research fellows have been appointed.</td>
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<tr>
<td>• BRU funding will support two PhD scientists and two clinical research fellows.</td>
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