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TECHNICAL REPORT

Changing the translational research landscape

a review of the impacts of Biomedical Research Centres in England

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Prepared for the Department of Health England

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Preface

In October 2008, the Department of Health commissioned RAND Europe to conduct a review of key stakeholders in Biomedical Research Centres in England, to explore what impact the scheme has had on institutional relationships between NHS and academic partners, industry and other collaborators, and the effects of any relationship changes on delivering the goals set out in *Best Research for Best Health*.

The review investigated how translational research and innovation were pursued prior to the BRC scheme, and the opportunities and barriers experienced in the past by NHS and academic partners; whether changes in institutional relationships associated with the BRC scheme are influencing the health research system, and if they are having such influence – in what way.

This report presents the findings of our review, based on the evidence presented by those we interviewed. The study was a perceptions audit, and we tried, as far as possible, to ask interviewees for examples of the views they expressed and the claims that they made. The views presented in this report are those of study informants only.

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Contents

Acknowledgements ii

Preface iii

Summary 7
Overview 7
Changes in institutional relationships between the NHS, academia and industry 9
The impact of the BRC scheme – and of associated changes in institutional relationships – on capacity-building 11
Resource-targeting, management and governance 12
On reflection 13

CHAPTER 1 **The BRC review context 21**

1.1 Background to the BRC review 21
1.2 BRC review – remit and approach 22
1.3 Organisation of findings 23

CHAPTER 2 **Collaboration dynamics: changes in institutional relationships between the NHS, academia and industry 24**

2.1 NHS-academia relationships as an enabler of translational research and innovation: the impact of the BRC scheme on a change in attitudes and behaviours 24
2.2 The impact of the BRC scheme on collaboration with industry 35
2.3 The impact of the BRC scheme on collaboration with other players 39

CHAPTER 3 **The impact of the BRC scheme and of associated changes in institutional relationships on capacity-building 44**

3.1 Physical infrastructure 44
3.2 The acquisition of new capabilities 47
3.2.1 Impacts on recruitment and retention 47
3.2.2 Research training and development 48

3.3 New organisational structures, systems and functions to facilitate collaborative research 53
3.4 Incentives for engaging in translational research and for collaboration 58

CHAPTER 4 **The impact of BRCs on resource-targeting, management and governance** **60**

CHAPTER 5 **On reflection** **64**

Appendix **68**

Tables

Table 1. Some examples of the impact of the BRC scheme identified through interviews 15

Table 2. The impact of the BRC scheme on NHS-academia relationships 28

Table 3. The impact of the BRC scheme on collaboration with industry 36

Table 4. The influence of the BRC scheme on collaboration with other players 40

Table 5. The impact of the BRC scheme on establishing physical infrastructure for translational research 45

Table 6. The impact of the BRC scheme on the acquisition of new capabilities in the health research system 50

Table 7. BRC influence on new structures, systems and functions to facilitate collaborative research 54

Table 8. Comprehensive and specialist Biomedical Research Centres 68

Table 9. List of interviewees 69

Summary

Overview

1) In January 2006 the Department of Health's (DH) *Best Research for Best Health*[2] strategy (BRfBH) was launched, "to create a health research system in which the NHS supports outstanding individuals, working in world-class facilities, conducting leading-edge research, focused on the needs of patients and public"[3]. BRfBH's overarching objectives are to realise improvements in health research system quality, capacity, patient benefits, efficiency and ethics.

   One of the flagship initiatives of BRfBH was the creation in April 2007 of 11 Biomedical Research Centres (BRCs) within leading NHS/university partnerships. The aims of this scheme are to: drive innovation in the prevention, diagnosis and treatment of ill-health; translate advances in biomedical research into benefits for patients; and provide a key component of the NHS contribution to UK's international competitiveness, by "making the best centres even better"[4].

2) This report describes a review of the BRC scheme, undertaken for the DH 18 months after the BRCs were commissioned. This review was a perceptions audit of senior executives involved in the scheme, and explored whether the scheme is working in the way intended. It considered how translational research and innovation were pursued prior to the BRC scheme (including the opportunities and barriers experienced in the past by NHS and academic partners); whether and how institutional relationships are changing because of the scheme; and (if so) how these changes are influencing the health research system.

[2] Department of Health (Research and Development Directorate) *Best Research for Best Health: A new national health research strategy,* London: Department of Health 2006. <www.dh.gov.uk/publications> (as of 25 March 2009)

[3] Department of Health (Research and Development Directorate) *Best Research for Best Health: A new national health research strategy,* London: Department of Health 2006; pg5

[4] Department of Health (Research and Development Directorate) *Best Research for Best Health Implementation Plan 5.6. NIHR Research Centres* (Version 6: final) London: www.nihr.ac.uk/about/Pages/about_implementation_plans.aspx>; pg1

3) The information obtained through our interviews[5] suggests that the BRC scheme is already contributing to observable *changes in institutional relationships* between the NHS, academia, industry and other players, and is helping shape the health research system to pursue translational research and innovation with the clear goal of realising patient benefit.

   The scheme, and the associated changes in stakeholder relationships it has fostered, is also making a significant contribution to *capacity-building* in the health research system, and is leading to *improved resource-targeting, management and governance*. 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. Table 1 then illustrates some of the key impacts of the scheme, at each individual BRC.

4) It is important to understand that this review was conducted at an early stage of BRC existence – 18 months since their inception. Interview-based evidence collection can be subject to the deliberate or unintended biases resulting from the position and experiences of the interviewees. In addition, we interviewed the most senior executives of BRCs (chief executives of trusts, deans of academic partner organisations, directors of BRCs). We tried, as far as possible, to ask interviewees for concrete examples of their views. However, given our wider knowledge of the health research system, we felt that the claims made by interviewees were credible and plausible.

   A more detailed review of the scheme at a later stage of BRC evolution could benefit from investigating the views and experiences of other participants (such as academics and clinicians involved in research projects, as well as NHS managers). It is also important to bear in mind that the trusts and academic organisations that are now part of BRCs were leaders in their activities even prior to the scheme. Our review gathered interviewee perceptions on the changes the scheme is bringing about, with supportive evidence. Selection criteria for being awarded BRC status focused on existing research quality, research capacity (critical mass), a record of excellence in partnership with key players (academia and industry) as early adopters of new insights in technologies, techniques and treatments for improving health, and a strong plan focused on biomedical innovation and translational research for the benefit of patients.

   A future review may consider a more detailed examination of the value added by the BRC scheme – for example by gathering information from a broader range of informants, and by comparing how NHS and academic organisations outside the BRC scheme are pursuing translational research and innovation. This was beyond the scope of the current study. These caveats should be borne in mind when drawing conclusions from the report.

[5] We conducted 29 interviews at 11 BRCs.

Changes in institutional relationships between the NHS, academia and industry

5) **NHS-academia relationships as an enabler of translational research and innovation**

Addressing historical barriers to collaboration between the NHS, academia and industry is at the core of the BRC mission. BRC leaders feel that one of the strongest impacts of the BRC scheme has been to bring NHS and academic stakeholders closer together to develop joint strategies for research intended to improve patients' health and general well-being. The BRC scheme has put the spotlight on translational research, and is changing the attitudes of NHS staff and academic researchers towards mutual collaboration. According to most interviewees – including trust chief executives themselves – the scheme's impact on the attitudes of trust staff to research and research collaboration with academics, has been particularly significant.

The BRC application process led academic and NHS partners to jointly revisit their existing research portfolios and determine future priority themes, with research relevance for patients as the focus. At all BRCs, there is now more debate about research activities and joint collaboration (and how they can be organised to maximise outputs and patient benefit) at the senior management and board levels of trusts and universities; academics are more involved in trust boards and committees, and vice versa.

There are more interactions between clinicians and academics, and a developing appreciation of the crucial links between the quality of research and the quality of patient care, manifested in the scale of collaborative activities, and the growing status of research in the NHS. The catalytic effect of the BRC scheme appears to be particularly striking in settings where collaboration has previously been less well established. New external relationships with trusts and academic institutions outside BRCs, nationally and internationally, as well as between BRCs, are being enabled and consolidated.

6) **Collaboration with industry**

The UK health research system functions in an increasingly competitive global environment. Ensuring industry participation in the system depends on the ability of health research organisations to offer competitive costs, superior quality and increased efficiency in the management and conduct of clinical trials. According to most interviewees, the BRC scheme has brought about improved collaboration between the NHS, academia and industry. BRCs are aware of the value industry can bring, and of the disadvantages of not leveraging industry collaboration to deliver innovations to the market. At one BRC, an interviewee

emphasised that academic reluctance to collaborate with industry due to fears of impropriety has been notably reduced. There is now a stronger focus on retaining existing collaborators, *and* on attracting new ones. Several BRCs have private sector members on advisory panels, and are creating specific functions (for example, business managers) to coordinate relationships with industry.

Some interviewees expect that BRC status, a critical research mass, and an increased emphasis on research governance probity and on infrastructure development, will further increase the attractiveness of BRC campuses to industry in the long run. At three BRCs, we were told that partner organisations have become more focused on exploiting intellectual property (IP) to generate commercial revenues. In general, government emphasis on the importance of the contribution that medical research and the NHS can make to GDP has placed a greater focus on collaborations with the private sector; and while changes in academic and NHS attitudes to collaborating with industry have not been driven *solely* by the BRC movement, most BRC leaders feel that they have been *significantly* reinforced by it.

7) **Collaboration with other players**

Most of the interviewees felt that BRCs are the 'engines', driving applications for Academic Health Science Centre (AHSC) status. The BRC scheme has set a template for clinical-academic partnerships, significantly influencing AHSC bids that include plans to extend collaborations with other acute trusts and primary care trusts (PCTs). BRCs are also collaborating with the NIHR Comprehensive Clinical Research Network programme and the NIHR Clinical Research Network Coordinating Centres, and also, in one case, with a regional development agency.

We were told that most BRCs are also working to raise awareness about translational research among the general public, and to involve patient groups in developing health research priorities. New structures and initiatives have been developed to ensure that BRCs maximise engagement and two-way communication with the public (via BRC management committees, patient advisory boards, information leaflets, and studies aimed at capturing how patients feel about research, what their concerns are, and what actions BRCs can take to encourage patient participation in studies). At three BRCs, we were told that the scheme is also leading to stronger contacts between NHS trusts and university departments outside medical faculties (for example, departments of physics, chemistry, engineering, health economics, psychology), as partnerships develop a more interdisciplinary translational research agenda.

The impact of the BRC scheme – and of associated changes in institutional relationships – on capacity-building

8) The information presented by the people we interviewed suggests that the BRC scheme is enabling:
   - the development of new physical infrastructures for academic and NHS partners
   - the acquisition of new capabilities for translational research, by improving recruitment and retention, as well as the training and development of human resources
   - the establishment of new organisational structures, systems and functions to facilitate translational research and innovation more effectively.

9) Physical infrastructure
   Across the BRCs we interviewed study informants widely agreed that biomedical research laboratories and clinical trial facilities are bringing together basic biomedical and clinical researchers under one roof, to facilitate closer interaction, exchange of experiences, and to accelerate research translation. Often this infrastructure is directly funded by the BRC scheme. Additional Department of Health capital expenditure has also contributed to infrastructure development. At seven of the BRCs, we were told that BRC funding has also been used to leverage funding for infrastructure development from additional sources (such as the MRC, Wellcome Trust, and industry). It is widely thought that the BRC scheme makes trust-academia collaborations more attractive to industry (for example, pharmaceutical and biotech companies), charities and individual benefactors, and to have increased the confidence of other funders in the capacity of partnerships to deliver high-quality research.

   BRC leaders at all the initiatives that we reviewed feel that capital funding availability needs to be sustained for the long term, because it is crucial in making a considerable difference to BRC capacities in translational research.

10) New capabilities
    At many BRCs, designated BRC funding has been used by trusts to make several high-profile appointments (for example, clinical academics and some chairs). One interviewee felt this has a positive effect not only for research, but also for the quality of service provision. The scheme has had the effect of raising the importance of applicants' research credibility in decisions about hiring NHS consultants. During interviews at three BRCs we were told that the scheme has encouraged trusts to dedicate their own financial resources to support protected research time in consultant job plans. In one interview, we were told that BRC support has also enabled new appointments of research nurses, administrators and database technicians. At all campuses, BRC funds are also supporting training in translational research: at some there are designated training themes. Integrated PhD studentships are being supported, allowing trainees to develop multidisciplinary skills through exposure to different disciplines (for example,

biomedical, engineering, physics) and through working in both hospital and academic environments. BRC-created training fellowships, which place clinical academics into a research laboratory (from where they can apply for funding to MRC, Wellcome and others), have been received with enthusiasm.

The BRC scheme is widely felt to have empowered investigators, and BRC support for training complements other national training schemes that are running in parallel. These include NIHR doctoral research fellowships, postdoctoral fellowships, career development fellowships and senior research fellowships. Academic-clinician training fellowships are also supported by the Wellcome Trust and the MRC, as well as by industry (for example, GlaxoSmithKline [GSK]). BRC leaders feel that a critical mass of experienced senior 'supervisors' is needed to provide research training of PhDs and MDs, as well as an appropriate research infrastructure. Some BRCs presented the need for critical mass availability as an argument for a limited number of academic health science centres (AHSCs).

11) New organisational structures, systems and functions

According to all interviewees, the BRC scheme and the collaboration that it has encouraged are driving the establishment of new organisational structures, divisions and functions to facilitate translational research, as well as supporting new means of communication.

At some BRCs new research roles and responsibilities for clinical staff have been created and in one centre significant changes in hospital organisation have taken place – with divisions along research theme lines that are linked to parallel changes in university structures. At many BRCs, industry and patient representatives are members of BRC advisory boards and governance committees, and BRC business managers are being appointed, helping to engage industry and the public in translational research agendas. At two BRCs we were told that the scheme has influenced the establishment of structures to enhance international competitiveness: clinical, academic and managerial staff are interacting with international experts sitting on BRC advisory boards and committees.

BRCs are bringing together partners with common interests in research, and facilitating communication through channels such as research forums, new functions such as communication managers, and, more generally, the recognition that effective ICT systems are crucial to collaborative research.

Resource-targeting, management and governance

12) Transparency in financial and performance management

Our interviewees reported that all BRCs are approaching research in a more businesslike manner, cleaning up their budgets and making sure BRC funding

covers eligible translational research costs. BRCs are becoming more diligent in how they monitor research spending and track the outputs from research. BRC funding is managed on strict budgetary terms, although there is some room for manoeuvre in how funding is allocated, which enables strategic responsiveness to emergent research needs and flexibility in distributing funds to university (as opposed to trust) principal investigators (PIs). At most BRCs, improvements in resource management and governance are being achieved through dedicated research offices, often shared by the trust and medical school/academic partner.

All BRCs have developed, or are developing, more streamlined processes for producing and supporting grant applications to external funders and addressing the requirements of research regulation. Some of the BRC leadership representatives we spoke to said that external advisory panels and steering committees peer-review the research taking place within a BRC (and ensure it is translational research for patient benefit and adheres to quality control measures), 'audit' performance, and monitor finances.

On reflection

13) This perceptions audit has been undertaken at an early stage in the BRC scheme. All interviewees feel that it is too early to expect (and therefore measure) the impacts on research productivity and patient benefit, but there have already been significant changes. New partnerships have been developed, collaborations have been strengthened, hearts and minds have been won, and new organisational and physical structures have been established to implement the BRC scheme. The scheme is about the integration of research and service, about promoting research advances leading to improvements in service, and identifying service needs to inform research agendas. It was widely felt by the BRC leaders to whom we spoke that vision, drive and an ability to think outside the box have been required to get BRCs to this stage.

    BRCs are cementing stakeholder relationships, starting new research projects in priority health areas, recruiting new staff, and developing human resources to ensure long-term research and innovation capacity. The scheme is also in some cases fostering more interdisciplinary research approaches. Although all BRC leaders emphasise that measurable outputs 'cannot happen overnight', there is evidence of some incremental achievements: examples include publications; research advances that are expected to translate into clinical trials in the coming year, promising hints of some novel products in the pipeline, and improved support systems for translational research and patient benefit (for example, electronic patient record systems).

14) BRCs represent a complex scheme, attempting a radical shift in the attitudes of clinicians, academics and NHS managers to the complex relationships between lab-based biomedical research, clinical research and the use of research results to improve clinical care. This is a challenging task, which takes time to achieve, in a

context that has historically not always been easy. Instant transformations cannot be expected. Nor is it likely that one scheme can achieve the task alone. Our study found that there is great enthusiasm for the BRC scheme, which was widely seen as a brave new effort on the part of the Department of Health.

The following quotes from some of the representatives we interviewed illustrate aptly the general perceptions on the impacts of the scheme:

- The BRC "*has changed the medical research landscape beyond recognition over last 18 months*".
- "*The BRCs have been a fantastic catalyst to bring about integration between the NHS and university partners. That is what was expected from the BRC movement, what they were designed to do, and what they are achieving."*
- "*The BRC is more than just grant funding. It has enabled all organisations to take a step up. It is a declaration of faith that the NHS has at last begun to understand research*."

However, it is important to consider the early stage of this scheme . For the benefits of *Best Research for Best Health* and of the BRC scheme to continue to be realised, the leaders of BRCs expect the NIHR to play a major role, and build on the already realised achievements in steering the health research system. We were told that important areas for NIHR engagement include:

- providing feedback and guidance to BRCs on their performance and progress
- communicating with BRCs about how they can tap into various complementary BRfBH funding streams and interact with other initiatives
- coordinating, collaborating and liaising with other health research funders
- mitigating the uncertainties of the current socioeconomic and political climate
- nurturing effective channels for enabling NHS and academic organisations that are not part of BRCs and other major NIHR initiatives to be included in the health research system – both to contribute their own expertise and share experiences, and to benefit from the advancements that centres of excellence are making
- ensuring sufficient levels of flexibility in the scheme
- continuing to encourage existing efforts for professions such as nursing and allied health professionals to engage in the research system.

Table 1. Some examples of the impact of the BRC scheme identified through interviews

BRC	A summary of the impact of BRC schemes
Comprehensive BRCs	
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	– NHS and academic partners have jointly revisited past research portfolios in the build-up to the BRC, and determined BRC priorities (ie themes). There is a stronger willingness to cooperate. – There has been more interest among investigators in the medical school as to how they can move research from a biomedical to a clinical research context. – The BRC is focusing on closer collaboration with PCTs for AHSC bid. – Introduced PET CT scanning through three-way support from trust, university and Merck. BRC funding helped leverage industry support. – There has been restructuring of clinical staff in trust, to introduce a designated line of research management authority in each division. – BRC funding has been used to make high-profile appointments. – 11th theme of BRC is specifically for training: Trainees at mid-levels in career pursue PhDs to become translational research specialists. PhDs are interdisciplinary. There are also jointly funded research fellowships with industry (for example, BRC/GSK support). NIHR F&S funding and BRC funding is used to establish academic clinical fellow schemes and integrated academic training clinical lectureships (the latter is 50 per cent funded by the local organisations). Nearly 50 'BRC posts' for clinical academics have been created, with 50 per cent NHS support for clinical work, and 50 per cent BRC support for committed research time. – There are jointly funded training fellowships with GSK. – Contingency funding from the BRC budget has been set aside so that the trust and university can respond to emerging research priorities, over time. – Publications from BRC-supported work have been produced, and research advances are expected to translate into clinical trials in the coming year. – More rigorous research management and governance systems have been implemented.
Guy's and St Thomas' NHS Foundation Trust/Kings College London	– The relationships between the trust and King's College London have dramatically improved as a result of the BRC. Staff at both organisations now understand far better than in the past that, "*if you want to do research you really need good-quality patient care. And really good patient care will only be delivered in an environment where there is research*"[6]. The trust and the university were two 'parallel universes' in pre-BRC times, but now collaborate very closely and share joint goals. – A biomedical research forum has been created for clinicians and academics to interact across all levels in partner organisations, as well as to enable them to link up with translational research experts across the UK and from overseas. – Patient advisory board allows public to have a say in research. – A BRC communications manager has been hired to help mobilise and sustain

[6] Interview with BRC leadership representative, November 2008

	interest in joint research between collaborators, and also to market the BRC to the public. – BRC status helped secure funding from Wyeth for an early clinical development centre. – The centre has set up a joint clinical trials facility to act as a one-stop shop for industry and help retain interest and support of the pharmaceutical sector. The facility will provide centralised facilities and coordinated clinical trial regulatory and management support for trial sponsors. – Because of BRC, the trust is more committed to dedicating its own additional funds to research (for example, supporting research in consultant job plans). The trust has funded approximately 100 clinicians to use 1.5 days a week of their programmed job-plan activities for research. – The BRC is supporting the creation of clinical research consultant posts, as well as four- year PhD studentships for training junior doctors to do translational research. – More rigorous research management and governance systems have been implemented and joint research offices between NHS and academic partners have been set up.
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/Imperial College London	– The BRC has focused the minds of academic and NHS staff on the need to work more closely together. There is a realisation that the research opportunities are greater in the new combined entity. – Building on existing strengths, there is an even stronger focus on collaboration with industry, such as GSK support for an imaging centre. Academic concerns about the possible impropriety of links with industry are diminishing. – BRC funding helped develop physical facilities: it helped persuade the university to spend £80m redeveloping blocks at Hammersmith Hospital, and secured funding from Wellcome Trust and £20m from the MRC for building and renovation of clinical research facilities. – BRC allowed Imperial College to set up a foundation academic school with 40 places for PhDs and academics; 20 per cent more clinical fellows (177) and 10 per cent more clinical lecturers (59) have been appointed. All new consultant posts have three sessions per week for research. – Recruitment and retention has improved: there has been a resurgence of interest in posts and international recruitment from Europe and the US. – There are now 250 research nurses. –More rigorous research management and governance systems have been implemented .
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	– BRC has had a dramatic impact in bringing the hospital and medical school leadership closer together and is helping resolve past tensions. There is a joint partnership board that meets weekly. – NHS and academic partners jointly revisited research portfolios in the build-up to the BRC, and together determined BRC priorities (i.e. themes). – Derelict hospital sites are being rebuilt and clinical research facilities located next to laboratories for biomedical studies.

	– There have been major changes in hospital organisational structures to facilitate organisation around research themes. – BRC funding has helped leverage funding from MRC and NIHR for a new cyclotron and a cancer imaging centre. – Joint BRC/trust funded translational research posts have been established: 52 consultants now have a research component in their NHS job plans in fields where there is no precedent for joint appointments. – More rigorous research management and governance systems have been implemented.
University College London Hospitals NHS Foundation Trust/University College London	– The process of applying to become a BRC initiative helped improve relationships between the trust and university by leading the partners to adopt a more disciplined approached to joint planning of R&D activities. – There has been a visible increase in the interest of university staff in demonstrating the impacts of their research on patient care. – New appointments facilitated by the BRC scheme have increased the breadth of research strengths. – Joint research offices for UCL/UCLH research were set up as a direct result of applying for BRC. Research governance is much better under the new arrangements, with all research activity being within specific integrated themes, in line with the partners' joint strategy, ethical best practice and a translational aspiration.
Specialist BRCs	
Great Ormond Street Hospital for Children NHS Trust/UCL Institute of Child Health	– The BRC has placed translational research high on the joint agenda of the trust and academic partners, and BRC leaders feel that there is now a more appropriate balance between the pursuit of basic and translational research. New relationships, such as those with a range of departments at University College London (UCL) are also being consolidated. The BRC experience has helped bring the trust closer to UCL, and to the other BRCs under the UCL umbrella. – The BRC is pursuing increased collaboration with new disciplines in the social sciences, such as the psychology department and the health economics department at University College London, and is developing joint-funded research projects with UCH and Moorfields. – Studies to understand what is needed to increase public participation in research are being conducted. There is a strong focus on understanding and managing public needs and expectations. An external advisory group with consumer representation is being developed. – BRC financial support, together with that from charity, has been crucial for recruitment. A number of clinical research fellows and clinical scientists to work in paediatric research have been recruited. – More rigorous research management and governance systems have been implemented

Moorfields Eye Hospital NHS Foundation Trust/UCL Institute of Ophthalmology	–The BRC has acted as a catalyst to the aspiration to develop a joint organisation. University researchers are more interested in how their research can benefit patients, and in how they can contribute to and benefit from the strengths and expertise of trust staff. – The BRC's ability to offer an environment of faster translation was an important factor in sealing a significant financial deal with GSK. –The BRC has allowed the trust and university partners to begin work on rarer diseases and translational therapeutic approaches to diseases such as scarring in retinopathy of prematurity, which would otherwise be too small in disease incidence to attract research, and yet they have enormous long-term implications for national health with no current effective treatment for very severe stages of disease. - The BRC is developing relationships with the MCRN (NIHR Medicines for Children Research Network) and LCRN (NIHR Local Clinical Research Network). It is also collaborating with other BRCs (for example, Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health). – The BRC is enabling international recruitment, most recently of a chair from the US – The BRC has provided a vehicle for much greater financial transparency and planning across our joint site.
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	– The BRC is enhancing the reputation of the trust as a centre of excellence, and focusing the resources of the university on the needs of the local population. There is now a stronger tie-in between local service needs and research interests The BRC has also enhanced the interests of the trust's board in supporting research. "*It's created a change in mindset, a can-do attitude*".[7] – As a result of the BRC and the growing research reputation, the trust is in a position to partner with industry in new ways. It is in the process of appointing a cardiac MRI specialist in partnership with Siemens, which will help the trust develop a research-active cardiac MRI service. – As a result of the critical mass of the BRC, the trust and university are able to provide a more attractive offering to other research funders. The trust has recently received support from Sir Bobby Robson's charity to open a cancer clinical trials research centre. The BRC has also played a big part in winning institutional grants from other funders (for example, £5m from the MRC and £6m from the Biotechnology and Biological Sciences Research Council [BBSRC]). Capital funding provided by NIHR (£2m) as part of the BRC award has been used to leverage additional funding from the regional development agency and from the university. – Interdisciplinary collaboration between the trust and the faculties of engineering and arts are leading to new projects in the areas of assisted living technologies and social change. – The BRC has helped attract new clinical academic personnel, and this has had a positive effect, not only for research but also for the quality of service provision. BRC funds have also enabled new appointments of research nurses, administrators

[7] Interview with BRC leadership representative, February 2009

	and database technicians. – Integrated academic training posts are helping to recruit young doctors to Newcastle. There are now clinical PhD studentships funded by the Wellcome Trust in partnership with industry. BRC funding is being used to support the training of both doctors and allied health professionals.
Royal Liverpool and Broadgreen University Hospitals NHS Trust/ University of Liverpool	– The BRC scheme has made research more integral to trust activities. More hospital NHS staff are beginning to see the benefits of working with academics, bringing in new trainees and new technologies into the NHS system (for example, for imaging), and of gaining access to joint labs. The hospital environment is becoming more receptive to research, and there is a growing interest in collaboration with academics. – There is active interdisciplinary collaboration. Some recent research projects (novel diagnosis, intelligent materials and new ways of decontaminating surfaces) are involving the chemistry and engineering departments of the university, and some sensor research work is involving academics from the physics department. – There is an external advisory group with international experts to govern the allocation of BRC budgets and facilitate the establishment of new collaborative relationships with US institutions (for example, Cornell University and Centre for Disease Control). This group also has industry membership, to facilitate interactions with private sector. – Patient representatives are now on the BRC management committee. – New clinical research facilities for phase 1 trials are being built. – BRC funding is helping leverage capital funding from North West Development Agency. – BRC funding is being used to help attract high-profile scientists and fill key positions. Currently, the BRC team includes a number of research nurses and about 25 postdoctoral scientists, who are working in the university but are actually employees of the trust. The BRC also has a small number of funded positions for medical staff. – There are hints in the pipeline of novel diagnostic technologies, intelligent materials, new ways of decontaminating surfaces. –More rigorous research management and governance systems have been implemented.
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	– NHS and academic partners have jointly revisited past research portfolios in the build up to the BRC, and together determined BRC priorities (ie themes). – There has been a focus on building relationships with comprehensive BRCs. – People with management experience and financial expertise have been hired to BRC leadership positions. – More transparent research funding and costing mechanisms have been put in place by academic and NHS partners.
South London and Maudsley NHS	– The BRC has fundamentally changed the medical research landscape. Maudsley and IoP drifted apart somewhat in the aftermath of the South London and

Trust/Institute of Psychiatry, King's College London	Maudsley Trust merger (into SLAM). The BRC has had a dramatic effect on re-establishing close relationships around common SLAM-IoP missions. – University (ie IoP) attitudes to translational research are also changing, largely influenced by ring-fenced funding that the BRC scheme is providing. There are more collaborative projects between trust and university staff. Clinical studies in particular have increased in scale in the last 6–9 months. Front-line clinical staff are now designated to facilitate translational research, with appropriate ethical considerations. Research is also becoming an explicit component of clinical jobs. – BRC external advisory panel has industry representatives. – BRC-funded work is being published. – A sophisticated electronic patient record system has been set up, enabling far more efficient clinical research. BRC support has contributed to developing a search tool for all patient records in the database. The BRC has recently been awarded a £3m infrastructure grant (funded by Guy's and St Thomas' Charity and the South London and Maudsley NHS Trust) to create what is expected to be the biggest single-case register and biobank for mental health in Europe (BRC nucleus data collection and analysis facility). – More rigorous research management and governance systems have been implemented.

CHAPTER 1 The BRC review context

1.1 Background to the BRC review

In January 2006, the Department of Health's *Best Research for Best Health*[8] strategy (BRfBH) 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. The strategy aimed to increase transparency and accountability in the use of R&D funding, improve the relevance of the research portfolio to patients and the NHS, and embrace collaboration as means for driving improvements in the research system and realising benefits for patients. Within BRfBH, the Biomedical Research Centres (BRC) scheme is expected to provide a significant contribution towards realising these ambitions.

One of the flagship initiatives of BRfBH was the commissioning, in April 2007, of 11 Biomedical Research Centres (BRCs), whose aims are to:

- drive innovation in the prevention, diagnosis and treatment of ill-health
- translate advances in biomedical research into benefits for patients
- provide a key component of the NHS contribution to UK's international competitiveness, by 'making the best centres even better'[9].

BRCs were created within leading NHS/university partnerships, and encompass organisations with a prior reputation for international excellence in a broad range of clinical areas, as well as leading specialist centres. Selection criteria focused on existing research quality, research capacity (critical mass), a record of excellence in partnership with key players (academia and industry) as early adopters of new insights in technologies, techniques and treatments for improving health, and a strong plan focused on biomedical innovation and translational research for the benefit of patients. The funding awarded to each centre was determined by the scale and nature of research conducted, and its anticipated impacts. Awards were made to the NHS partner, to be used to support the

[8] Department of Health (Research and Development Directorate) *Best Research for Best Health: A new national health research strategy,* London: Department of Health 2006. As of 25 March 2009 <www.dh.gov.uk/publications>

[9] Department of Health (Research and Development Directorate) *Best Research for Best Health Implementation Plan 5.6. NIHR Research Centres* (Version 6: final) London: pg1

costs of patient-focused research. BRC funding operates on a five-year cycle. All awards were made by open competition and judged by peer review, using an international team of experts. The BRC funding is additional to, and separate from, any other NHS R&D funding organisations can receive[10].

Table 8 in the Appendix summarises the NHS-university partnerships that were awarded BRC status and funding.

1.2 BRC review – remit and approach

In October 2008, the DH commissioned RAND Europe to conduct a review of the BRCs, to explore what impact the scheme has had on institutional relationships between NHS and academic partners, industry and other collaborators, and the effects of any relationship changes on delivering the goals set out in *Best Research for Best Health*.

The review investigated how translational research and innovation were pursued prior to the BRC scheme (including the opportunities and barriers experienced in the past by NHS and academic partners); whether and how institutional relationships are changing because of the scheme; and how any such changes are influencing the health research system.

At each BRC (comprehensive and specialist), we undertook semi-structured interviews with the chief executive of the trust, the dean of the academic partner institution, and the director of the BRC[11]. Details of those interviewed are given in Table 9 in the Appendix. We recorded, took detailed notes and analysed the interviews to identify recurring themes across the BRCs, as well as to explore aspects unique to particular centres.

We are aware that interview-based evidence collection can be subject to deliberate or unintended biases resulting from the position and experiences of the interviewees. However, given our wider knowledge of the health research system, we felt that on balance, interviewees gave dispassionate and complete accounts of where BRCs stand, and how they have evolved in the 18 months since they were set up. The fact that there was a broad consistency in these accounts gives us further confidence. In the following chapters we have avoided, for stylistic reasons, a repetition of a warning about this limitation, but it should be borne in mind when drawing conclusions from this report.

It is important to understand that this review was conducted at an early stage of BRC existence – 18 months since their inception. Interview-based evidence collection can be subject to the deliberate or unintended biases resulting from the position and experiences of the interviewees. In addition, we interviewed the most senior executives of BRCs (chief executives of trusts, deans of academic partner organisations, directors of BRCs). We tried, as far as possible, to ask interviewees for specific examples of the views they expressed. A more detailed perceptions audit could benefit from investigating the views and experiences

[10] Department of Health (Research and Development Directorate) *Best Research for Best Health Implementation Plan 5.6. NIHR Research Centres* (Version 6:final) London: Department of Health 2007 As of 25 March 2009 at <www.nihr.ac.uk/about/Pages/about_implementation_plans.aspx>

[11] We conducted 29 interviews

of other stakeholders involved in the scheme, such as academics and clinicians involved in research projects and NHS managers.

It is also important to bear in mind that the trusts and academic organisations that are now part of BRCs, were leaders in their activities even prior to the scheme. Selection criteria focused on existing research quality, research capacity (critical mass), a record of excellence in partnership with key players (academia and industry) as early adopters of new insights in technologies, techniques and treatments for improving health, and a strong plan focused on biomedical innovation and translational research for the benefit of patients. Whereas our review gathered interviewee perceptions on the changes the scheme is bringing about – a more detailed investigation of the 'counterfactual' at a later stage, and possibly entailing a broader range of informants, may contribute to a more rigorous evaluation of the value added by the BRC scheme. This was beyond the scope of the current perceptions audit. A future study may also want to compare how NHS and academic organisations outside the BRC scheme are pursuing translational research and innovation. These caveats should be borne in mind when drawing conclusions from the report.

1.3 Organisation of findings

The contents that follow present the key findings of this study, based on the perceptions of interviewees and examples they presented in support of their views:

- We first describe how the BRC scheme has influenced changes in institutional relationships between the NHS, academia and industry, to enable translational research for patient benefit – Chapter 2.
- We then discuss the impact of the BRC scheme and of associated changes in institutional relationships, on capacity-building (for example, physical infrastructure development; the acquisition of new capabilities; the establishment of new organisational structures, systems and functions to facilitate collaborative translational research; and new incentives for collaboration and engagement in research) – Chapter 3.
- We shed light on how the BRC scheme and the new partnerships it has fostered is effecting improvements in resource-targeting, management and governance in the health research system – Chapter 4.
- We conclude with a reflection on the study, including some thoughts on the future of this promising scheme.

In all chapters, we provide tables with the descriptive evidence we obtained from interviewees.

CHAPTER 2 Collaboration dynamics: changes in institutional relationships between the NHS, academia and industry

Collaboration is integral to the delivery of BRC goals. Addressing historical barriers to collaboration between the NHS, academia and industry (such as 'cultural' differences between key players, and organisational, regulatory and structural impediments) is at the core of the BRC scheme. According to all interviewees, one of the strongest impacts of the BRC scheme has been to bring NHS and academic stakeholders closer together around joint missions, to undertake research aimed at improving patients' health and the general well-being of the public.

The BRC scheme is also influencing a more positive mindset among NHS and academic staff, towards collaboration with industry. At three BRCs we were told that the scheme is facilitating collaboration with university departments outside medical schools, with a more interdisciplinary and translational research agenda. New external relationships with trusts and academic institutions outside a BRC, nationally and internationally, are also being enabled and consolidated.

The contents below elaborate on the impacts of the BRC scheme on changes in relationships between key stakeholders. We first describe various impacts, and then provide examples for individual BRCs, in the accompanying tables.

2.1 NHS-academia relationships as an enabler of translational research and innovation: the impact of the BRC scheme on a change in attitudes and behaviours

"*The NHS is the most fantastic opportunity for research in the UK – a single system with wonderful patient populations for research. To seize the opportunity, academia and NHS have to have close relationships. BRCs have been all about a change in research culture and about integration.*" - senior leadership representative of a BRC

The BRC scheme has put the spotlight on translational research and is changing the mindsets, attitudes and behaviours of NHS and academic organisations towards mutual

collaboration for patient benefit (albeit to varying degrees, depending on the levels of pre-BRC collaboration).

Some of the key impacts of the scheme on NHS-academia relationships are highlighted below:

1) **According to the senior leadership of BRCs, the scheme has had a significant influence on bringing NHS and academic stakeholders closer together, to jointly engage in translational research designed to improve patients' health and the general well-being of the public.**

   Evidence of pre-existing collaboration between the NHS and academia was a requirement for all BRC applicants, but the scope and effectiveness of collaborations varied considerably across different campuses.

2) **The scheme has improved the relevance of research for patients and the NHS. The process of applying for BRCs led academic and NHS partners to jointly revisit their existing research portfolios and determine priority themes going forward, under the explicit condition of pursuing research opportunities that are most likely to translate into benefits for patients.**

   Many of the senior executives we interviewed felt that a (common) historical notion that health research agendas could be determined by a medical school (university), without reference to service and population needs, has diminished. There was widespread agreement among interviewees that the scheme has also helped emphasise the importance of clinical research, as opposed to pure 'bench research', which previously had more esteem than clinical trials[12].

   Similarly, we were told that the more recent process of preparing for academic health science centre bids (AHSC) has placed research relevance for patients at the centre of focus for candidate universities and trusts. As one interviewee commented[13]: *"We used to think bench to bed, now we think bench to community. We are now collectively talking with GPs and PCTs about more integrated care pathways and research roles within them. We feel PCTs have to raise their game in terms of involvement in research, and we are working on this in our AHSC bid."*

3) **It was widely felt among those we interviewed that there is a stronger awareness among clinicians and academics of mutual reliance and interdependence, and a growing realisation of the links between the quality of research and the quality of patient care. This awareness is largely manifested in the scale of collaborative activities.**

   In pre-BRC times, individual investigators at trusts and medical schools/universities generally drove inter-organisational collaboration. BRCs have

[12] Clinical trials take a lot of effort to set up and complete, and it is harder to get credit for them because papers are frequently multi-authored (particularly in multi-centre trials). However, the level of support and recognition for clinical work is increasing under the new health research system, and academic and NHS staff alike are devoting more attention to the translational research interface.

[13] Interview with a BRC leadership representative, November 2008

drawn in a larger critical mass of research interested clinicians and academics into collaborative and translational research organisation.

4) **The status and importance of research in the NHS has increased.**

   According to most interviewees, the impact of the scheme on changing the attitudes of trust leadership and staff to research and research collaboration has been particularly significant. There is a system-wide acknowledgement that the BRC scheme is more than just grant funding. It is a declaration of faith that the NHS has begun to understand better than in the past, that in partnership with academia, industry and other stakeholders, it can become better equipped to compete for talented researchers and clinicians, as well as for the interest and engagement of industry, on a par with leading US organisations.

5) **Based on our interviews, the catalytic effect of the BRC scheme (as well as other BRfBH initiatives) on a culture of joint working between NHS and academic partners is apparent across all BRCs in England. However, it appears to be particularly striking in settings where a tradition of collaboration was historically less established.**

   Table 2 below shows examples,_such as South London and Maudsley NHS Trust/Institute of Psychiatry BRC; King's College London; Guy's and St Thomas' NHS Foundation Trust/King's College London BRC; Oxford Radcliffe Hospitals NHS Trust/University of Oxford BRC.

6) **Across BRCs, we were told that new external relationships with trusts and academic institutions outside BRCs, nationally and internationally, are also being enabled and consolidated.**

   BRCs have been active in collaborating with other trusts and academic institutions nationally (partly driven by upcoming AHSC bids, for which the BRCs are seen as important drivers). Some BRCs have also collaborated with each other to work together on particular research projects, dedicating part of their overall budget specifically to these partnerships – for example, the three BRCs associated with University College London. Some specialist BRCs have expressed ambitions to link up more closely with comprehensive BRCs in the near future (for example, the Royal Marsden NHS Foundation Trust/ Institute of Cancer Research BRC).

   Some BRCs, such as the Royal Liverpool and Broadgreen University Hospitals NHS Trust/University of Liverpool BRC, are also pursuing collaborations with academic institutions overseas more actively than in the past, in part because they have had greater exposure to these organisations through their advisory structures.

7) **According to our interviews the scheme has at all BRCs promoted closer working between trust and medical school/academic partner leadership, in efforts to implement more transparent and effective research management and governance structures.**

   Frequent communications and office proximity between partner organisations have been important. There is now much more debate about research activities and joint collaboration (and how they can be organised to maximise outputs and

patient benefit), at the senior management and board levels of trusts and universities. Academics are more involved in trust boards and committees, and vice versa.

Based on our interviews, Table 2 highlights how the BRC scheme is driving a change in the cultures of collaboration between NHS and academic partners, at each BRC.

Table 2. The impact of the BRC scheme on NHS-academia relationships

BRC	Academia-NHS relationships in pre BRC times	Changes in academia-NHS relationships driven by the BRC scheme
Comprehensive		
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	Translational research was facilitated by an existing mix of biomedical and clinical investigators in the trust and medical faculty, and by clinical research infrastructure (for example, a Wellcome Clinical Research Facility [WCRF], a SmithKline Beecham supported building dedicated to translational research, Cancer Research UK facilities). The campus was one of the first partnerships to agree on how joint research between the NHS and the university should be organised and governed (in 2006).	The BRC scheme has led to an even greater recognition that academic and NHS partners contribute equally to a joint mission of research for patient benefit, both to research excellence and to excellence in health services. There is now an even stronger willingness to cooperate and increased awareness of mutual complementarities and dependence. There has been more interest among investigators in the medical school as to how they can move research from a biomedical to a clinical research context. The BRC has also influenced how closely trust and medical school leadership works together to improve research management and governance structures.
Guy's and St Thomas' NHS Foundation Trust/King's College London	There was very little interaction between the university and trust partners prior to the BRC. They were two "*parallel universes at best*"[14], with limited formal liaison and communications. There was an NHS R&D office in the trust, which had a role in overseeing clinical trial activity, but there was very little translational research in practice. Individual clinical academics employed by the university (about 15 per cent of the consultant body) were the key bridge between the college and the trust. There was very little significant high-impact research conducted within the hospitals, apart from	The lead-up to the BRC influenced the trust and academic partners to create a joint mission, to establish a coordinated research agenda and strategy, and to address research management and governance systems. The relationships between the trust and King's College London have dramatically improved by virtue of the BRC. Staff at both organisations now understand far better than in the past that, "*if you want to do research you really need good-quality patient care. And really good patient care will only be delivered in an environment where there is research*"[15]. The BRC has set up a biomedical research forum, which is having a significant

[14] Interview with BRC leadership representative, December 2008

[15] Interview with BRC leadership representative, November 2008

	that by the clinical academics.	influence on mobilising organisation-wide buy-in for translational research. The forum meets monthly, and is integrated with the trust's medical staff meeting. It allows for interaction between clinicians and academic researchers at all levels in organisations. The forum usually discusses a clinical problem relating to a disease or condition, and how new advancements (for example, medical tools and diagnostics) are being developed through the translational research activities of the BRC. The forum is helping NHS staff and basic biomedical scientists understand translational research and demonstrating its value for patients.
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/ Imperial College London	Hammersmith was a postgraduate medical school run by clinical academics where everyone at a consultant level was an academic. There was no divide between doctors and managers, and academics and clinicians. The AHSC concept was, in that sense, already supported by the Royal Postgraduate Medical School (RPMS). When Hammersmith stopped being an RPMS and was subsumed into Imperial (IC) in 1997 it started to have a more focused NHS management. The merger between Hammersmith and Charing Cross Hospital (CCH) was not easy. Culture in CCH traditional undergraduate teaching hospital was different from Hammersmith and diluted the culture at Hammersmith. Clinical duties were driven by NHS targets, academic duties driven by Research Assessment Exercise (RAE) – there was an uneasy hole in the middle – none of them related to clinical research. There were separate agendas and people did not necessarily come together to serve a translational agenda. People's loyalties were to the previously separate institutions (for example, Hammersmith, St Mary's, Charing Cross and Queen Charlottes'). This was a	The BRC has acted as a catalyst, focusing the minds of academic and NHS staff on the need to work more closely together. People realise that the chances of success in research are higher as a combined entity, rather than by working separately. The drive of the BRC is to produce one organisation combining the separate member trusts with the medical school (rather than the looser partnership arrangements found in some other BRCs). Within this single organisation they have aligned the BRC themes to the divisional structure of the university and the clinical programmes. Different cultures have been merged successfully by establishing clinical programme groups; these have resulted in an increased number of transplants, novel therapies and new approaches. The links between research and patient care are now better communicated and better accepted across the NHS and university partners.

	barrier to establishing a united vision and joint research missions. Collaboration on trials or new approaches with a neighbouring trust was unlikely because they were in competition with each other.	
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	Despite local strengths in university-led biomedical and applied health research, the clinical research culture within the trust itself was not particularly strong in pre-BRC times. Although there were close relations between trust and academic partners 15–20 years ago, they had drifted apart in more recent times, for a number of reasons. First, there had been an increased focus on basic biomedical science in the university, and this directed research activity away from patient-based clinical research. The university's need to demonstrate excellence in the RAE further reinforced the focus on basic research. Second, there had been a change in NHS culture nationally, because of the emphasis on meeting service targets and ensuring service revenue streams. Third, the physical infrastructure needed for research was greatly neglected at the hospital. Before the BRC, NHS clinicians interested in clinical research had to establish personal collaborations with university investigators in order to be involved in research projects.	The BRC scheme has made a significant contribution to making the hospital environment much more tolerant and supportive of research. It has helped re-establish translational research capacity. BRC capital funding has been crucial in helping to improve clinical research facilities and relocate them close to biomedical research labs. A culture of clinical research in the NHS, and joint working between the trust and the university has improved notably. Interaction is gradually being transformed, and previous relational tensions around involvement in agenda-setting and decision-making by trust and university leadership are gradually being resolved. The aim is to continue to work towards producing a "*joint and seamless operation*"[16]. BRC leaders have started this process with the building of joint research governance, and joint contracts for staff of the NHS and the university. There is a stronger awareness of mutual complementarities between the academic and NHS partners: the university brings its considerable research strengths and experience of commercial exploitation to the trust, and the trust brings its clinical expertise and patient-focused approach.
University College London	For a long time, the trust and university operated separately. Each had its own R&D strategy and technology transfer office.	The process of applying to become a BRC helped improve relationships between the trust and university by leading the partners to adopt a more disciplined

[16] Interview with BRC leadership representative , November 2008

Hospitals NHS Trust/University College London	It was felt that the main health research funders preferred to deal with the university rather than with the trust. In 2002 the trust and university had begun to work more closely together and began efforts to develop more aligned research strategies.	approached to joint planning of R&D. There has been a very significant change in the way that clinicians and academics think about the importance of translational and applied research: There has been a visible increase in the interest of university staff in demonstrating the impacts of their research on patient care.
Specialist		
Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health	Cross-appointments between the trust and university were common before the BRC scheme, and academic clinicians represented about 20 per cent of the medical staff. But although there was considerable collaboration between NHS and academic partners, there were challenges in terms of resolving differences in priorities (for example, the focus of Institute of Child Health on basic science, and the focus of Great Ormond Street Hospital for Children on patient service and patient-centred research).	The BRC has placed translational research at the forefront of a joint agenda for the trust and academic partners, and there is now a more appropriate balance between the pursuit of basic and translational research. New relationships, such as those with a range of departments at University College London (UCL) are also being consolidated. The BRC experience has helped bring the trust closer to UCL, as well as to other trusts in the region. Their AHSC bid includes three trusts: Moorfields, University College London Hospitals and Great Ormond Street. The BRC is seen as a catalyst for strengthened collaboration, and the AHSC application is cementing these relationships.
Moorfields Eye Hospital NHS Foundation Trust/UCL Institute for Ophthalmology	The Institute of Ophthalmology was established 40 years ago to be the research side of Moorfields Eye Hospital. As such, there has always been some connection between the two, although the institute conducted predominantly basic research. In recent years however, the institute and trust grew apart because the institute pursued its reputation for research excellence and the trust focused on its core function of providing healthcare service delivery. The trust and university had separate R&D directors, and there was a big 'mental divide' between the institutions, without much strategic and	The process of applying to become a BRC influenced a change in attitudes among the partners. It forced them to jointly consider a translational research strategy and operational plan, and brought them closer together. The appointment of personalities who could work well together largely facilitated the improvement in the relationships between the trust and the academic partner. The BRC has acted as a catalyst to develop a joint organisation. University researchers are now more interested in how their research can benefit patients, and in how they can contribute to and benefit from the strengths and expertise of trust staff. Because it is still early days, the number of new collaborations is relatively small. It is expected that more joint working will develop in the

	joined-up thinking. "*Research is a series of islands and you need bridges to link islands into a coherent programme for effective research translation – and this was missing*"[17]. There was also some resistance in the hospital to funding bench-to-bedside research, partially because of a lack of experience. There were some cases of cross-funding, with the hospital funding chairs at the university, for example, but these were not very common.	coming year, as the BRC's research themes mature, and as research capacity on the clinical side is strengthened through joint appointments.
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	The trust and university already have historically had a close relationship and benefited from a joint campus. They had a joint research executive chaired by a senior member of the university's faculty of medicine, with representation from the trust (including the chief executive).They also had a joint strategy group and a joint careers management group. Reports on research activity were reviewed by the trust board but the trust mainly sought to support the excellent clinical researchers in the university. Collaborations between the trust and university were primarily driven by individual clinicians, around a principal investigator's agenda	*"The BRC has crystallised the importance of the translational research agenda"*[18]. The BRC is enhancing the reputation of the trust as a centre of excellence and focusing the resources of the university on the needs of the local population. There is now a stronger tie-in between local service needs and research interests (for example, respiratory disease), and a much more coherent research focus between the trust and medical school. The BRC has also enhanced the interests of the trust's board in supporting research. "*It's created a change in mindset, a can-do attitude*"[19]. The strategy of excellence through differentiation (as a centre of international excellence in ageing and chronic disease) is seen as a critical enabler of long-term funding and growth for the partnership The BRC strategy has helped align the university's research institutes; (institutes for ageing and health, cell and molecular bioscience, cellular medicine, human genetics, neuroscience, cancer research, and health and society). There is widespread evidence of basic science being conducted with a view to translation (for example, work on gene-based prescribing of anti-coagulation medicines).

[17] Interview with BRC leadership representative, January 2009

[18] Interview with BRC leadership representative, February 2009

[19] Interview with BRC leadership representative, February 2009

Royal Liverpool and Broadgreen University Hospitals NHS Trust/University of Liverpool	Generally speaking, pre-BRC there was less partnership working between the medical school and the trust. The medical school tended to carry out lab research on cells, molecules and animals, whereas the hospital focused on working directly with patients through registered clinical trials. The trust had a heavy reliance on clinical academics and its range of research themes was broader than that of the university. Most of the leading science in the trust was generally done by academics with honorary NHS contracts. Many NHS staff felt that, "*research was something that just happened and there was not a general awareness of who was doing it, what was being done, what it was achieving and what it can contribute for patients*".[20]	The BRC scheme has made research more integral to the trust's activities. BRC funding and collaboration agreements are helping to increase buy-in at all levels of the organisation, for the notion that translational research is important for patient benefit. More hospital NHS staff are beginning to see the benefits of working with academics, bringing in new trainees and new technologies into the NHS system (for example, for imaging), and of gaining access to joint labs. The hospital environment is becoming more receptive to research, and there is a growing interest in collaboration with academics. The Liverpool BRC is strengthening ties with academic organisations overseas. One important consequence of establishing an external advisory panel for the BRC – with experts from overseas – is that both the trust and the medical school are more engaged with researchers at American universities and research institutes (for example, Cornell University and the US Center for Disease Control). They have also developed a cooperative relationship with the two other "northern English" BRCs (Manchester and Newcastle).
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	The Royal Marsden and the Institute of Cancer Research have had a historically integrated relationship between trust and university partners at board level, in terms of joint research strategies, as well as at the level of recruitment. The collaboration was always run like a joint institution with a single strategy determined by a single research committee that defined research direction. However, this level of pre-BRC integration is somewhat specific to this particular partnership. The institution is relatively small, quick on its feet and	The main changes that have occurred following BRC status, have been an increased focus on systematising and refining NHS-academic partner relationships, sharpening the research prioritisation strategy (particular in molecular diagnostics and molecular biology) and looking more broadly at Royal Marsden's role in innovation practice in healthcare (for example, nursing, psychology-based research).

[20] Interview with BRC leadership representative, November 2008

	focused, and its experience is not easily generalisable to other NHS-academia partnerships.	
South London and Maudsley NHS Trust/ Institute of Psychiatry, King's College London	Although the Maudsley and Institute of Psychiatry (King's College) had very close relationships prior in the past, they 'drifted apart' when the Maudsley joined with South London to become 'SLAM'. This was because the focus of the new collaboration was 70 per cent on community mental health and only 30 per cent on tertiary psychiatry – the core focus and strength of the Maudsley. A translational research agenda was not a core focus.	The BRC has been a major catalyst in re-establishing close relations between all partners, and "*has changed the medical research landscape beyond recognition over last 18 months*"[21]. In addition to BRC support, SLAM is committing its own funds to translational research. University (ie Institute of Psychiatry) attitudes to translational research are also changing, largely influenced by ring-fenced funding that the BRC scheme is providing. There are more collaborative projects between trust and university staff. Clinical studies in particular, have increased in scale in the last 6–9 months. Front-line clinical staff are now designated to facilitate translational research, with appropriate ethical considerations. Research is also becoming an explicit component of clinical jobs.

21 Interview with BRC leadership representative, December 2008

2.2 The impact of the BRC scheme on collaboration with industry

Government emphasis on the importance of the contribution that medical research and the NHS can make to GDP is placing far greater focus on collaboration with the private sector. A positive change in mindset towards collaboration with industry has developed among NHS and academic staff at BRCs. While a change in academic and NHS attitudes to collaborating with industry has not been driven *solely* by the BRC movement, in the opinion of our interviewees, it has been *significantly* reinforced by it:

1) **Most of the individuals we interviewed felt that the BRC scheme has acted as a catalyst for collaboration between the NHS, academia and industry. At the bidding stage, it was made clear that engaging with industry was expected from all applicants. BRCs are becoming more aware of the value industry can bring, and of the disadvantages of not leveraging industry collaboration to deliver innovations to the market.**

   At one BRC, an interviewee emphasised that academic reluctance to collaborate with industry due to fears of impropriety has been notably reduced.

2) **There was a widespread view among those we interviewed that there is now a stronger focus on retaining existing collaborators, *and* on attracting new ones.**

   BRC leaders feel that the UK health research system is functioning in an increasingly competitive global environment, where ensuring industry interest and participation in the system depends more and more on the ability to offer competitive costs, superior quality and increased efficiency in the management and conduct of clinical trials. Emerging markets, such as China and India are becoming increasingly strong competitors for industry R&D funding.

   At a time when the business models of industrialised research are changing, it is widely felt (according to those we interviewed), that BRCs need to be fleet-footed and adaptive to changing times and uncertainty. A number of BRCs are increasing private sector membership on their advisory panels, as well as creating specific functions (for example, business managers) to coordinate relationships with industry. BRC support has also enabled trust and academic partners to build up the infrastructure for translational research that is essential for attracting and retaining industrial partners.

3) **Some interviewees expect that BRC status, a critical research mass, and an increased emphasis on research governance probity and on infrastructure development will further increase the attractiveness of BRC campuses to industry. At some campuses this is thought to have already helped attract new industrial partners (see Table 3).**

   The Guy's and St Thomas'/King's College London BRC for example, has established an clinical trials office, which aims to act as a 'one-stop shop' for trial sponsors, with centralised and coordinated regulatory management systems (for example, help with ethics approvals, network functions, supply of patients).

4) **At three BRCs, we were told that the scheme has also influenced partner organisations to become more focused on science commercialisation and exploiting intellectual property (IP) to generate commercial revenues.**

   BRCs are approaching research in a more businesslike manner and developing more effective IP strategies.

Based on our interviews, Table 3 shows how the scheme is influencing changes in NHS and academia relationships with industry at individual BRCs.

Table 3. The impact of the BRC scheme on collaboration with industry

BRC	BRC influence on changes in relationships with industry
Comprehensive	
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	The campus has historically been collaborating with the private sector, but the BRC scheme has influenced an even stronger focus on attracting new industrial collaborators. The Cambridge BRC is doubling the size of its campus, and hopes that this will enable even closer relationships with industry interested in translational research, as well as with other types of organisations (for example, research institutes, PCTs). Recently established relationships with industry are also helping to facilitate the campus's training agenda (for example, there are now jointly funded fellowships with GSK).
Guy's and St Thomas' NHS Foundation Trust/King's College London	The trust and university have historically had good relationships with industry (the pharmaceutical and medical equipment industries, and contract research organisations (CROs), but the BRC is facilitating new collaborations. Relationships focus on trials and on product development. Ensuring that the research environment continues to be attractive for the pharmaceutical industry is crucial to the BRC's leadership. To this effect, Guy's and St Thomas', in partnership with King's College London and King's College Hospitals, have set up a set up a joint clinical trials office, which aims to act as a 'one-stop shop' for trial sponsors, with centralised and coordinated regulatory management systems (for example, help with ethics approvals, network functions, supply of patients). This office has been very successful, and the waiting time from approach by sponsor to initiation of a trial has been reduced from 168 days to 66 days in one year. In addition, the trust has established an early clinical development centre with Wyeth support, and now has preferred partner status for Wyeth phase 2 trials. Because of the BRC, the trust and academic partners having steadily focused on building the infrastructure for translational research that is essential for attracting industrial partners.
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/ Imperial College London	The focus on relationships with industry is now stronger than ever. At trust level, perceptions about the benefits of such collaboration have changed. In the past, relationships with industry were patchy and clinical researchers were generally reluctant to collaborate with industry because of concerns about potential conflicts of interest. The BRC scheme has acted as a catalyst for collaboration, because it was made clear that engaging with industry is expected. Government emphasis (through Cooksey etc) on the importance of the contribution that medical research and the NHS can potentially make to the GDP has influenced a change in the perceptions of the benefits of collaboration with industry. Although liaison is at an early stage, important collaborations such as

	GSK support for an imaging centre exist because of the BRC. Industry liaison is on the BRC committee agendas.
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	The BRC has influenced partner organisations to become more focused on exploiting IP to generate commercial revenues. ISIS (the University of Oxford technology transfer company) has been instrumental in developing effective IP strategies, and in providing assistance with patent applications to clinical researchers from the trust. The Oxford BRC is also now involved in commercial collaborations with pharmaceutical companies, such as Roche and Pfizer.
University College London Hospitals NHS Trust/University College London	The UCL/UCLH partnership is now in a stronger position to partner with industry and this aspiration forms one of the BRC's six main strategic themes. The BRC has developed a seed-funding initiative together with UCL Business and UCL Biomedicine to facilitate the development of translational research proposals with potential for commercial exploitation; it is hoped that this will improve engagement with industry. The BRC has also attracted funding for translational research from a number of industry partners, including Astra Zeneca and Roche and has studentships established with GSK and GE Healthcare. It has also established a post for a research fellow in neuroimaging, jointly funded by UCL/GSK.
Specialist	
Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health	Great Ormond Street already had a substantial portfolio of industry-funded research prior to the BRC. As a tertiary centre it naturally attracted research on drugs with specialist and end point users, or specialist industry links – and for this work the BRC is a natural conduit. The BRC is now in the process of establishing a new clinical research facility (through charity funding), and industry is involved in this process. A business manager for the clinical research facility has also been hired, to coordinate with the pharmaceutical industry and drug manufacturers. BRC-funded staff will have access to the facility, and it is anticipated that BRC-supported projects will contribute to furthering collaboration with the private sector.
Moorfields Eye Hospital NHS Foundation Trust/UCL Institute for Ophthalmology	It has historically been difficult to get industry involved with the research of the organisations. The fact that the partner organisations have now won support for translational research via the BRC has made industry more interested in being engaged as well. The BRC demonstrates that there is strategic and sustained support for translational research from central government, and industry is beginning to see the public sector as more attractive in terms of offering access to translational research expertise. New partnerships with pharmaceutical companies, device companies and CROs are being established. "*Previously these deals would not have been feasible. They are now, as a direct result of the clinical research facilities that we're building as part of the BRC*"[22]. The partners recently signed a significant financial deal with GSK, and the BRC's ability to offer an environment of faster translation is said to have definitely been an important factor in the deal.
Newcastle upon Tyne Hospitals	As a result of the BRC and the growing research reputation, the trust is in a position to partner with industry in new ways that will improve service delivery. For example, the

22 Interview with BRC leadership representative, January 2009

NHS Foundation Trust/Newcastle University	trust is in the process of appointing a cardiac MRI specialist in partnership with Siemens. This joint appointment will help the trust develop a cardiac MRI service that will also be research-active. The trust is also planning to redevelop the Newcastle General Infirmary site together with Tesco, to create a new campus for ageing and vitality, new facilities for delivery of community geriatric care and a Tesco supermarket, which will be built under guidance from the university's assisted living programme, to be more accessible for elderly customers. Tesco initiated this proposition, encouraged by the reputation of the university *and* the trust for research into ageing.
Royal Liverpool and Broadgreen University Hospitals NHS Trust/University of Liverpool	One of the BRC's aims is to get more intensively involved with the pharmaceutical industry. The centre's expert advisory panel now has company membership. The BRC is expected to be an asset in leveraging further industry involvement, because it represents a good standard of research and gives credence to the research capabilities of the trust and the medical school. A new clinical research facility will help the trust to interact with industry further and in a new way, by enabling it to carry out Phase 1 research trials. It is anticipated that CROs will also want to access these facilities.
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	Relationships with industry have traditionally been good, and BRC leaders believe that industry is essential for taking products to market. The Royal Marsden/Institute of Cancer Research partners have experience of working with the pharmaceutical industry, and had already established a business commercialisation outfit to manage spin-offs, in pre-BRC times. The BRC is hoping to stay attractive to industry and competitive in terms of quality and costs, in the face of increasing global competition, especially for Phase 3 trials. To date, industrial partners have valued the access to skills that they received when collaborating with the BRC.
South London and Maudsley NHS Trust/Institute of Psychiatry, King's College London	The BRC's leaders see the pharmaceutical industry as motivated by three things in terms of collaborating with their institution: access to subjects for research; using new technologies and advances in translational research; and contract R&D for early target identification. The scale of mental health operations at the BRC is a key source of competitive advantage for SLAM. The critical mass enabled by BRC support is facilitating industrial collaborations.

2.3 The impact of the BRC scheme on collaboration with other players

Among those we interviewed, it was felt that BRCs are influencing a growth in entrepreneurial spirit in the NHS and academia, and together with new organisational relationships being developed in anticipation of academic health science centres (AHSCs), they are fostering more integrated partnerships than existed in the past:

1) **During interviews at three BRCs we were told that the scheme is facilitating collaboration with university departments outside medical schools in a more interdisciplinary translational research agenda (for example, departments of physics, chemistry, engineering, health economics, psychology).**

   At these campuses, university departments that traditionally did not interact with medical schools are now engaging with BRC campuses.

2) **Most of the BRC leadership representatives we spoke to felt that the BRCs are the 'engines' driving AHSC bids.**

   BRCs demonstrate the feasibility of pursuing a tripartite mission of excellence in research (particularly translational), education and healthcare delivery. The move towards AHSCs is also influencing the further development of relationships with hospital trusts outside BRCs, and with primary care trusts.

   The BRC scheme has set a template by which to organise clinical-academic partnerships, and the structure of AHSC bids will be significantly influenced by BRC set-ups. Most partnerships are now considering how to align the work of BRCs within an AHSC context, infrastructure and institutions (for maximum impact).

3) **We were told at most BRCs that the scheme is acting as a hub for raising awareness about translational research among the general public, and involving patient groups in taking forward health research priorities.**

   Mobilising and sustaining public support for translational research requires effective communication of BRC objectives and progress as well as explaining how this research can benefit patients. There are new structures and initiatives to help ensure that BRCs maximise two-way communication with the public (via management committees, patient advisory boards, information leaflets; and through studies aimed at capturing how patients feel about research, what their concerns are, and what actions BRCs can take to encourage patient participation in studies). This was made explicit at seven of the BRCs in our sample. The NIHR itself recognises the need to support such BRC efforts (as well as those of other BRfBH initiatives).

4) **All BRCs are collaborating with other parts of NIHR.**

   This includes links with the NIHR Comprehensive Clinical Research Network (CCRN) and the comprehensive local research networks (CLRNs), which aim to mobilise greater public participation in clinical trials, are facilitating clinical trial

coordination across the health research system[23], as well as providing funding for research support. The Liverpool BRC has also collaborated with its local regional development agency, and obtained funds for a capital project.

Based on our interviewees, Table 4 highlights some examples of how the BRC scheme is influencing changes in NHS and academic partner relationships with other stakeholders.

Table 4. The influence of the BRC scheme on collaboration with other players

BRC	BRC influence on changes in NHS and academic partner relationships with other players
Comprehensive	
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	The Cambridge BRC is placing more emphasis on engagement with the public, in matters of research specifically. The process of preparing for AHSC bids is cementing research relevance for patients a central focus for candidate universities and trusts. A leadership representative commented: *"We used to think bench to bed, now we think bench to community. We are now collectively talking with GPs and PCTs about more integrated care pathways and research roles within them. We feel PCTs have to raise their game in terms of involvement in research, and we are working on this in our AHSC bid.[24]"*
Guy's and St Thomas' NHS Foundation Trust/King's College London	A patient advisory board allows the public to influence the way in which patient-centred research is developed in the local area, and to raise any potential concerns that they may have. London provides opportunities for access to uniquely diverse patient populations for clinical research. BRC leaders believe that ensuring public support and that their voices are heard, is very important for the BRC's work and long-term sustainability. The BRC has also hired a communications manager to help sustain interest in translational research among partner organisations, as well as to market and explain the needs for translational research to other trusts, and to the general public.
Hammersmith Hospitals NHS Trust & St Mary's Hospital NHS Trust/ Imperial College London	The research governance committee involves patients, and all researchers are encouraged to do clinical trials with a patient support group to review proposals. They are also encouraged to present latest trials to a patient panel meeting. At a research meeting in summer 2008, a member of the patient panel commented that "*there was not a single mouse on the programme – just straight clinical research*"; something that wouldn't have

23 Department of Health (Research and Development Directorate) (2009). 1) *Best Research for Best Health, Implementation Plan 5.1. NIHR Clinical Research Network Version 8.* London: Department of Health 2009 2) *Best Research for Best Health, Implementation Plan 5.1a: NIHR Comprehensive Clinical Research Network, Version 7*. London: Department of Health 2009. As of 26 March 2009, both at <www.nihr.ac.uk/about/Pages/about_implementation_plans.aspx>

24 *Interview with BRC leadership representative , November 2008*

	happened in Hammersmith in the old days. Relations with the NIHR have also strengthened.
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	The partnership board of the BRC interfaces with planners and policymakers and facilitates strategic alliances with other NHS, academic and industrial organisations. The steering committee and operational management group ensure coherence and good links between the BRC and other parts of NIHR, including other BRCs and the NHS R&D networks. The research engagement group sets the work of the BRC in a broad context and supports contributions from leaders and patients' representatives within individual themes. It harnesses expertise not typically considered to be 'translational' – for example, health economics, outcomes research, social sciences, and ethics and, most importantly, patient care. It ensures patients are kept informed about the activities of the BRC. The BRC is also collaborating with the James Martin 21st Century School
University College London Hospitals NHS Trust/University College London	Collegiate relationships with other BRCs have been developed. for example, with the Moorfields and Great Ormond Street BRCs. Joint research departments between University College London Hospitals NHS Trust, University College London and Barts are examples of post-BRC launched institutional arrangements.
Specialist	
Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health	The BRC hopes to increase collaboration with new disciplines in the social sciences, such as the psychology department and the health economics department at University College London. The BRC is also developing joint-funded research projects with the other two BRCs under the UCL umbrella (UCH and Moorfields). Part of the BRC's research activities revolve around trying to make families' understand the importance of research, and involving them in research projects. The BRC has explored how families and children would like to be approached about research, has set up a website to get young people interested in research, and has produced information leaflets for the public. There are plans to develop an external advisory group with public representation. Relations with clinical research networks and NIHR have also been strengthened as a result of the BRC.
Moorfields Eye Hospital NHS Foundation Trust/UCL Institute for Ophthalmology	The BRC is developing relationships with the NIHR Medicines for Children Research Network and NIHR Local Clinical Research Network. It is also collaborating with other BRCs (for example, Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health) The BRC application process has been very important in helping

	prepare the application for the AHSCs. The BRC aims to develop a 'London Campus for Eyes', to be a multi-institution centre of ophthalmological excellence.
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	As a result of the critical mass of the BRC, the trust and university are able to provide a more attractive offering to other research funders. The Trust has recently received support from Sir Bobby Robson's charity to open the Sir Bobby Robson Cancer Clinical Trials Research Centre to support the conduct of phase 1 clinical trials. The BRC has also led to improved relationships with the strategic health authority and the Comprehensive Local Research Network (CLRN), as they are represented on and consulted by the BRC board. The BRC hopes to increase collaborations with primary care providers via the CLRN. The Newcastle BRC has also established collaborative relationships with Liverpool BRC and has played a big part in winning institutional grants from other funders; (for example, £5m from the MRC and £6m from BBSRC). Interdisciplinary collaboration between the trust and the faculties of engineering and arts are also leading to new projects in assisted living technologies and social change.
Royal Liverpool and Broadgreen University Hospitals NHS Trust/ University of Liverpool	The trust's relationship with the university now spans a variety of departments including chemistry, physics, engineering, biomedical sciences, and the separate veterinary faculty and the Liverpool School of Tropical Medicine. This was not the case prior to the BRC, which is now acting as a hub for trying and testing new entrepreneurial and interdisciplinary ways of doing things. Some recent research projects (novel diagnosis, intelligent materials and new ways of decontaminating surfaces) are involving the chemistry and engineering departments of the university, and some sensor research work is involving academics from the physics department. The Liverpool BRC is also placing more emphasis on engagement with the public. There are patient representatives on the BRC management committee, to make sure that the work of the BRC maximises engagement with the public and communicates in appropriate language – "*in Queen's English*"[25].
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	The Royal Marsden NHS Foundation Trust hopes to link up more closely with other BRCs, particularly comprehensive ones in the near future. It already interact and shares experiences with other BRCs (for example, Moorfields Eye Hospital NHS Foundation Trust/UCL Institute for Ophthalmology).
South London and Maudsley NHS Trust/Institute of Psychiatry, King's	Mobilising and sustaining public support and patient participation has not always been easy, partially due to local population cultures

[25] Interview with BRC leadership representative, December 2008

College London	and sensitivities to clinical research. One of the research themes within the BRC is stakeholder participation. This focuses on service users and carers, as well as on groups that are under-represented – on grounds of gender, age, culture and ethnicity. The BRC is establishing a service-user advisory group to offer advice and expertise to the BRC. The BRC also engages with schools and churches, to try explain the benefits to local populations of participation in mental health research.

CHAPTER 3 The impact of the BRC scheme and of associated changes in institutional relationships on capacity-building

According to our interviews, the impacts of the BRC scheme on capacity-building are most obvious in areas such as:

- *The establishment of new physical infrastructure* for academic and NHS partners, which greatly facilitates collaborative research
- *The acquisition of new capabilities*: through impacts on recruitment and retention of staff, and on training and development
- *The establishment of new organisational structures, systems and functions to facilitate translational research and innovation* more effectively than in the past

3.1 Physical infrastructure

1) **At all the BRCs where we interviewed, study informants felt that new physical infrastructure – such as biomedical research laboratories and clinical trial facilities – are bringing together basic biomedical and clinical researchers under one roof, to facilitate closer interaction, exchange of experiences, and to accelerate research translation.**

   Often this infrastructure is directly funded by the BRC scheme. Additional Department of Health capital expenditure budgets have also contributed to supporting infrastructure development (for example, equipment, building and refurbishment) at BRCs.

2) **At seven centres, we were told that BRC funding has also been used to leverage funding for infrastructure development from additional sources.**

   It is widely thought by BRC management that the BRC scheme makes trust-academia collaborations more attractive to industry (for example, pharmaceutical and biotech companies), charities and individual benefactors. According to many of the leadership representatives we interviewed, BRC status has increased other

funders' confidence in the partnerships' capacity to deliver high-quality research that will impact on patients' health.

3) **Clinical research requires expensive equipment, and lack of funds to buy such equipment can create a bottleneck in translation. Some capital funding is available via the BRC scheme, and this money has also helped leverage additional investment from other funders, such as the MRC, Wellcome Trust and industry.**

   The leaders of BRCs at all of the initiatives we have reviewed feels that capital funding availability needs to be sustained for the long term, because it is crucial in making a considerable difference to BRC capacities in translational research. At some campuses there are also barriers to optimum levels of clinical infrastructure improvement due to limitations in physical space.

Based on our interviews, Table 5 highlights how the BRC scheme is improving physical infrastructure.

Table 5. The impact of the BRC scheme on establishing physical infrastructure for translational research

BRC	BRC influence on new physical infrastructure to facilitate collaborative research
Comprehensive	
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	BRC funding helped leverage industry funding for a PET CT scanning facility. This was introduced with three-way support from the trust, university and Merck. "*BRC funding gave us something tangible to bring to the discussion table when we negotiated partnering with Merck*"[26]. In addition, one of the capital schemes has been to develop the Good Medical Practice (GMP) facility to prepare stem cells that will be used both in research and therapeutically. BRC funding for this facility is expected to help attract funding from MRC (matched funding), to move the stem cell research into a clinical context
Guy's and St Thomas' NHS Foundation Trust/King's College London	BRC status helped secure funding from Wyeth for an early clinical development centre.
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/ Imperial College London	BRC funding was crucial in helping to persuade the university to spend £80m redeveloping certain blocks at Hammersmith Hospital, and helped secure funding from Wellcome Trust, and £20m from the MRC, for the building and renovation of clinical research facilities vital for translational research
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	BRC capital funding has been crucial in helping to rebuild derelict sites, improve clinical research facilities and relocate them close to biomedical research labs. BRC. It has helped leverage funding from the MRC and also from other NIHR streams for a new cancer imaging centre. Approximately £10m of BRC funding

[26] Interview with BRC leadership representative, November 2008

	has contributed to infrastructure development.
University College London Hospitals NHS Trust/ University College London	BRC capital funding was earmarked to support the development of a clinical research facility for early phase cancer trials at UCH. It has also facilitated the establishment of a GMP cell culture room at Queen's Square as well as establishing a radiochemistry clinical laboratory.
Specialist	
Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health	BRC funding helped leverage further funds from industry, charities and Great Ormond Street trustees for a new clinical research facility (a dedicated eight-bed unit with an associated lab).
Moorfields Eye Hospital NHS Foundation Trust/ UCL Institute for Ophthalmology	Capital funding from NIHR has supported the development of a new translational research clinical centre (fast-track unit).
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	Capital funding provided by NIHR (£2m) as part of the BRC award has been used to leverage additional funding from the regional development agency and from the university.
Royal Liverpool and Broadgreen University Hospitals NHS Trust/ University of Liverpool	BRC funding has been used to build new clinical infrastructure for NHS and university staff to jointly use. These new facilities have enabled them to make better use of beds and staff. These facilities will also enable them to interact with industry further and in new ways, by enabling them to carry out Phase 1 and 2 research trials. There is a strengthened feeling by clinicians that joint premises and, "*the ability to connect with the scientific community matters to the outcomes of patients*"[27]. BRC funding has helped to access capital funding from the North West Development Agency (NWDA).
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	Building a new translational research facility for molecular pathology.
South London and Maudsley NHS Trust/Institute of Psychiatry, King's College London	The BRC has been awarded a £3 million infrastructure grant (funded by Guy's and St Thomas' Charity and the South London and Maudsley NHS Trust) to create a new BRC Nucleus data collection and analysis facility. The BRC Nucleus brings researchers together to create what is expected to be the biggest single-case register and biobank for mental health in Europe. The funding will support refurbishment of space for BRC research initiatives (as well as new posts).

[27] Interview with BRC leadership representative, November 2008

3.2 The acquisition of new capabilities

The BRC scheme has made an important contribution to the acquisition of new capabilities for translational research, through its impacts on recruitment and retention, and on the training and development of staff.

3.2.1 Impacts on recruitment and retention

According to most of the interviewees, if BRCs and other BRfBH initiatives are to achieve their goals they must develop a critical mass of exceptional human capital. One interviewee commented that *"building research capacity is the key in all this, to ensure the next generation of clinical research"*[28]. In addition to the funding available through the BRC scheme and other BRfBH initiatives, the research councils, charities, and industry are providing substantial funding to recruit and retain talent in the UK health research system. In this context, the BRC scheme is part of a broader infrastructure that has empowered investigators and boosted resources for translational research. Clinicians (and academic researchers) are now able to make a more substantive contribution to research than in the past.

1) **At many BRCs, designated BRC funding for translational research has been used by trusts to make a number of high-profile appointments, (such as clinical academics and some chairs).**

   One interviewee expressed that this has a positive effect not only for research, but also for the quality of service provision. According all the study informants, although the BRC label is prestigious, it is not the main or only reason people are recruited to BRC campuses (most of the BRC trusts and academic faculties have long appreciated the need to identify, recruit and nurture talent). However, it is widely felt that the designated funding for translational research has helped significantly in recruiting to acquire new capabilities.

2) **At many campuses we were told that the BRC is also influencing the extent to which the research credibility of applicants for NHS consultant posts influences decisions on hiring.**

3) **According to most interviewees, the scheme has improved trusts' direct support and involvement in filling new positions, and in securing research time for clinicians.**

   At three BRCs, we were told that the push that the BRC scheme has given to *translational* research activity has in a number of cases also influenced trusts to dedicate their own *financial* resources to support clinicians' translational research. At Guy's and St Thomas'/King's College London BRC campus for example, the trust has provided for 1.5 days per week of financial support and time provisions for approximately 100 clinicians to pursue research activities, and particularly those that are in line with BRC themes.

[28] Interview with BRC leadership representative, December 2008

4) **At many BRCs, we were told that the application process encouraged trusts and their academic partners to ensure that the key senior personnel needed to lead the BRC themes were hired before the application was submitted.**

   In some cases (for example, the Cambridge BRC), this was easier to achieve than in others (for example, the Liverpool BRC). One of the challenges the Liverpool BRC faced was to get the people in place quickly. There is a perception that 'geography matters' and that it is easier to recruit within the 'golden triangle of London, Cambridge and Oxford' than elsewhere, although the expense of London militates against this. The Liverpool BRC hopes it will be able to attract more people nationally and internationally in the long term, and that demonstrating success as a BRC will make it more attractive to academics and clinicians.

5) **At one BRC, we were told that it has become slightly easier to attract researchers from industry.**

   This is thought to be partly due to the increased focus of NHS-academia partnerships on translational research that is being facilitated via BRCs, and partly due to the general socioeconomic climate, which is making careers in industry less attractive.

6) **Associated with the new NHS-academia partnership is the need to reflect on which types of contractual arrangements for staff, and which types of sorts of fiscal responsibilities work best.**

   BRC money is NHS money, and we were told by many interviewees that making appointments in the university can take time to sort out because of the need to transfer funds and other administrative arrangements (for example, due to differences in VAT regulations or financial years).

3.2.2 Research training and development

1) **BRC support is directly influencing the scale of training in translational research in the UK health research system**

   Most of the BRC leaders we interviewed felt that the BRC scheme's support for research training complements other national training schemes, such as NIHR doctoral research fellowships, postdoctoral fellowships, career development fellowships and senior research fellowships. Academic-clinician training fellowships are also supported by the Wellcome Trust and the MRC, as well as by industry (for example, GSK).

2) **At some BRC campuses, we were told of designated training themes within the scheme** (for example, at Imperial and at Cambridge).

3) **At some BRCs interviewees said that integrated PhD studentships are being supported via the scheme, and are helping develop multidisciplinary skills.**

   These studentships allow trainees (generally mid-level and/or junior career-wise) to build up experience in translational research by exposure to departments in different disciplines (for example, biomedical, engineering, physics), working in

both hospital and academic environments. BRC-created training fellowships that place clinical academics into a research laboratory (from which platform they can apply for funding to MRC, Wellcome and others) have been received with great enthusiasm.

4) **BRC leaders feel that a critical mass of experienced senior 'supervisors' is needed to provide research training of PhDs and MDs, as well as an appropriate research infrastructure. Some BRCs presented this as an argument for a limited number of academic health science centres (AHSCs).**

5) **Some interviewees emphasised the need for research training opportunities for nurses and allied health professionals, and saw it as an area where further momentum can be gains.**

   The UKCRC Sub-Committee for Nurses in Clinical Research (chaired by Janet Finch) published a report that proposes practical ways forward to enable nurses to pursue a research career, and to combine clinical and academic work.[29]

   Five BRCs told us that they are trying to create such training opportunities for staff: Cambridge University Hospitals NHS Foundation Trust/University of Cambridge; Oxford Radcliffe Hospitals NHS Trust/University of Oxford; Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/Imperial College London; Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health; Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University)

Based on our interviewees, Table 6 highlights some examples of the BRC scheme's impact on the acquisition of new capabilities in the health research system.

[29] Report of the UKCRC Subcommittee for Nurses in Clinical Research (Workforce) *Developing the best research professionals. Qualified graduate nurses: recommendations for preparing and supporting clinical academic nurses of the future, London: UK Clinical Research Collaboration* 2007. As of 26 March 2009 at <http://www.ukcrc.org/PDF/Nurses_report_August_07_Web.pdf>

Table 6. The impact of the BRC scheme on the acquisition of new capabilities in the health research system

BRC	BRC influence on new structures to facilitate collaborative research
Comprehensive	
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	Nearly 50 'BRC posts' for clinical academics have been created, with 50 per cent NHS support for clinical work, and 50 per cent BRC support for committed research time. The BRC application process encouraged the trusts and their academic partner to ensure that the senior personnel needed to lead the BRC themes were hired before the application was submitted. At Cambridge the 11th theme of the BRC is specifically related to training. One of its elements is to engage trainees in translational research in a science department based at the university, mentored by an academic clinician based at the hospital. These trainees are clinicians who are generally midway through their medical training, and who will undertake a PhD with the help of BRC support. The condition of this fellowship is that it must be linked to a bioscience department and clinical school; this allows for interaction between clinical perspectives and basic biological research. This type of integrated training did not happen much before the BRC existed. Another element of the BRC training theme is to fund fellowships (2–3 annually) jointly with GSK. These programmes hope to 'build bridges' and new partnerships between the university (including those departments not typically involved in medical research – such as engineering), the medical school and industry – and are also an example of how BRC funding has helped leverage industry funding. The Cambridge BRC has also used both BRC funding and the NIHR's sustainability and flexibility funding to help establish the academic clinical fellow schemes and integrated academic training clinical lectureships. In the latter case, the NIHR and the trust share the costs 50/50. A requirement in the scheme is that an additional clinical lecturer post has to be supported by local organisations.
Guy's and St Thomas' NHS Foundation Trust/King's College London	BRC money has been used to create clinical research consultant posts. In addition, the trust has funded approximately 100 clinicians to use 1.5 days a week of their programmed job-plan activities for research. The trust implemented this scheme because it wanted more clinicians to be actively involved in research (rather than as a hobby). The BRC has supported the creation of clinical research consultant posts to train junior clinicians to be more involved in research (the BRC will fund between 5–15 of such posts). These staff will have five programmed activities for service and five for research in their job

	plans. The scheme is funded 50/50 by the trust and the BRC. Four-year BRC-supported PhD studentships have also been introduced. During the first year, students will do rotations in various departments, before selecting a translational research project to pursue for their PhD degree.
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/ Imperial College London	There has, since the BRC, been a resurgence of interest in posts and more international recruitment from the US and Europe. There are now 250 research nurses. The BRC has changed the environment for doctors. All new consultant appointments have three sessions per week for research. The BRC has enabled Imperial College to set up a foundation academic school, with 40 places for individual PhD and academics. It has 400 academic training posts and 20 per cent more clinical fellows (177) and 10 per cent more clinical lecturers (59) have been appointed.
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	Joint BRC/trust funded translational research posts have been established (50 per cent NHS support for clinical work, and 50 per cent BRC support for committed research time). 52 consultants now have a research component in their job plans
University College London Hospitals NHS Trust/University College London	The BRC has catalysed the strengthening of clinical human resources for R&D because the BRC's reputation has helped in recruiting the best experts (for example, in cardiac R&D and service). New appointments facilitated by the BRC scheme have increased the breadth of research strengths.
Specialist	
Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health	BRC financial support, together with that from charities, has also been crucial for recruitment. They have recruited a number of clinical research fellows and clinical scientists to work in paediatric research have been recruited.
Moorfields Eye Hospital NHS Foundation Trust/UCL Institute for Ophthalmology	The BRC has helped in recruitment, including at international levels, with "high flyers" tangibly excited by the BRC and possibility of AHSCs.[30]
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	The BRC has helped attract new clinical academic personnel, and this has benefited not only research but also the quality of service provision. BRC funds have also enabled new appointments of research nurses, administrators and database technicians. Integrated academic training posts are helping to recruit young doctors to Newcastle. There are now clinical PhD studentships funded by the Wellcome Trust in partnership with industry. BRC funding is being used to support the training of both doctors and

[30] Interview with BRC leadership representative, January 2009

	allied health professionals. The BRC scheme has also provided some flexibility to pump-prime innovative areas of more speculative research via intramural funding. It is thought that much of this research would not have been supported otherwise.
Royal Liverpool and Broadgreen University Hospitals NHS Trust/ University of Liverpool	Liverpool is using the BRC funding to help attract high-profile scientists and fill new positions. It is hoping that the BRC will make it increasingly attractive for scientists and academics to move there. Currently the BRC team includes a number of research nurses and about 25 postdoctoral scientists, who are working in the university but are actually employees of the trust. The BRC also has a small number of funded positions for medics.
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	People with management experience and financial expertise have been hired for BRC leadership positions.
South London and Maudsley NHS Trust/Institute of Psychiatry, King's College London	The BRC recruited 45 people in the last year. It is hoping to have a more streamlined process for recruitment in the future, to increase the speed at which positions can be filled with the most appropriate candidates.

3.3 New organisational structures, systems and functions to facilitate collaborative research

The BRC scheme and the collaboration that it has enabled is also helping shape the health research system by encouraging the establishment of new organisational structures, divisions and functions to facilitate translational research, and supporting new means of communication.

1) **At some BRCs we were told that the scheme has provided support for changes in hospital structures to enable translational research.**

   This has included the establishment of new research roles and responsibilities for clinical staff, and in one centre we were told of new types of hospital organisation – with divisions along research theme lines that match parallel changes in the university.

2) **Many of the people we interviewed felt that the BRC has influenced the establishment of new organisational structures to engage the industry and the public in translational research agendas.**

   Examples of this include having industry and patient representatives on advisory boards and governance committees, and also the appointment of BRC business managers.

3) **At two BRCs, we told that the scheme has influenced the establishment of structures to help pursue international competitiveness in translational research and innovation for patient benefit.**

   A number of BRCs now have expert advisory boards and committees with international experts. Clinical and academic staff more exposure to international translational research experts, and international standards increasingly influence budget allocations.

4) **It is widely felt (by those we interviewed) that BRCs are bringing together a group of partners with common interests in research, and facilitating their *close interactions and communications*.**

   Research forums, new functions such as communication managers, new types of research groups structures and composition, and the establishment and modernisation of ICT systems are all enabling more integrated research (for example, patient record systems).

   At many campuses, the importance of effective ICT systems to facilitate collaborative research is viewed by BRC leaders as being higher up the agenda of most NHS-academia partnerships, than it used to be.

5) **At all the BRCs we were told that the BRC scheme has had an impact on changes in research management and governance in both trusts and academic organisations.**

New structures such as joint research offices 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 of BRC funds to appropriate projects, the monitoring of spending, and of research progress and performance.

The new structures are also providing administrative support, for example, with applications for grants, ethical approvals. One informant commented: "*We know someone will come in three years and ask us to show them what we have done. This has definitely changed our mindset in terms of focus on monitoring research spend and outputs".*[31]

It is widely felt that there is a lot more professionalism in managing research as an integral and important activity of the trust, and within academia-trust partnerships.

Based on our interviews, Table 7 highlights examples of the BRC scheme's impacts on the establishment of new organisational structures, systems and functions to facilitate collaborative research.

Table 7. BRC influence on new structures, systems and functions to facilitate collaborative research

BRC	BRC influence on new structures, systems and functions to facilitate collaborative research
Comprehensive	
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	Changes in hospital structure Cambridge is restructuring clinical staff so that there is now a designated person with authority for research in each division of the trust. Changes in research management and governance structures More rigorous research management and governance systems have been implemented.
Guy's and St Thomas' NHS Foundation Trust/King's College London	New organisational structures and functions to engage industry and/or the public A patient advisory board gives the public a say in research. A BRC communications manager helps mobilise and sustain interest in research by NHS and academia partners, and markets the BRC to the public. Structures to help pursue international competitiveness A biomedical research forum exposes clinical and academic staff at the BRC to international translational research experts (for example, via seminars). Improved communication processes

[31] Interview with BRC representative, December 2008

	The biomedical research forum provides a place for biomedical and clinical researchers, across junior (including student) and senior levels to hear about research developments at the BRC, in other BRCs and internationally (for example, via guest speakers), and to exchange experiences.
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/Imperial College London	Changes in research management and governance structures More rigorous research management and governance systems have been implemented. Research applications have been streamlined – through a joint clinical research office that coordinates applications, and the development of clinical trials. All the different R&D offices across the campus are merged. The partner trusts and the university have aligned the clinical themes to the divisional structure of the university and streamlined arrangements for service support and education. Improved communication processes Cross-site working through new clinical research groups, aligned with divisions in the university, has brought people together who did not realise that they had interests in common. Previously people were working in isolation; new research organisation is facilitating communications.
Oxford Radcliffe Hospitals NHS Trust/ University of Oxford	Changes in hospital structure A reorganisation of the hospital – from a structure focused on operational divisions to one focused on research theme divisions – is taking place. The impact of the BRC on establishing new facilitatory organisational structures for translational research has been particularly dramatic at Oxford. The BRC has acted as a catalyst for changes to take place in the hospital structure. Without these changes, it is thought that a lot of people would have left the hospital. When the BRC was first established, it was a real challenge to make service line management efficient. In particular, it was strongly felt that hospital operations should be located within individual 'research themes', and that each theme should be able to oversee its own recruitment, estate, governance and operations with its own operational team. The university's structure is based around research themes whereas the hospital had various operational divisions (for example, divisions for all things medical, surgical etc). By virtue of becoming part of a BRC, the hospital structure is now beginning to change. Changes in research management and governance structures More rigorous research management and governance systems have been implemented. There is now a steering committee that has equal membership from both the trust and the university.

	The committee meets weekly, to discuss particular themes for assigning funding and to take care of issues such as capital, the estate and HR. This committee is BRC-focused and helps to push the BRC agenda forward. There is also a joint partnership board between the university and the trust, which includes the university vice-chancellor and senior leaders from the trust. The BRC is permanently changing the way the trust and the university work together.
University College London Hospitals NHS Trust/University College London	Changes in research management and governance structures Joint research offices for UCL/UCLH research were set up as a direct result of applying for BRC status. Research governance is much better under the new arrangements, with all research activity being within specific integrated themes, in line with the partners' joint strategy, ethical best practice and a translational aspiration.
Specialist	
Great Ormond Street Hospital for Children NHS Trust/UCL Institute for Child Health	Changes in research management and governance structures More rigorous research management and governance systems have been implemented. There are improved internal arrangements (through the research adoption committee) for supporting the development of research protocols and applications.
Moorfields Eye Hospital NHS Foundation Trust/UCL Institute for Ophthalmology	Changes in research management and governance structures The BRC has provided a vehicle for much greater financial transparency and planning across the joint site. Hospital management is also more receptive to including research considerations in operational planning, than in the past.
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	Changes in research management and governance structures Changes to enable research translation have been implemented. For example, there is now a joint NIHR management group for the BRC partners, to manage performance and encourage applications for other NIHR grants.
Royal Liverpool and Broadgreen University Hospitals NHS Trust/University of Liverpool	New organisational structures and functions to engage industry and/or the public External advisory panels with international experts have been established to govern the allocation of BRC budgets. These panels have industry membership to facilitate interactions with the private sector. The BRC management committee has patient representatives. Structures to help pursue international competitiveness External advisory panels with international experts are facilitating the establishment of new collaborative relationships between the

	BRC and US institutions (for example, Cornell University and the US CDC). <u>Changes in research management and governance structures</u> Mechanisms available to governance boards include a 'kill button' that enables them to stop research that is going nowhere. Boards now have tighter control on research funds. The aim is essentially to, "*get the research questions right and use an appropriate methodology*"[32] to answer these questions.
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	<u>Changes in research management and governance structures</u> More transparent research funding and costing mechanisms have been put in place by academic and NHS partners since becoming a BRC. There is an operational group that looks at the nuts and bolts of scientific and clinical relationships. Even at the interview stage for consultants, the panel consists of a member from the Institute as well as the Royal Marsden, because research is a component of every consultant's job.
South London and Maudsley NHS Trust/ Institute of Psychiatry, King's College London	<u>New organisational structures and functions to engage industry and/or the public</u> External advisory panel is weighted by representatives from industry. <u>Improved communication processes and systems</u> The SLAM/IoP BRC now has an electronic patient record system, that is greatly facilitating a range of BRC-funded projects. People across disciplines in the trust and university are inputting data into these records, allowing for an innovative clinical database for research purposes. Allowing research practitioners at every level to get involved in something that has a research dimensions is influencing the entire institution, because everyone has a stake in the new platform. BRC support contributed to developing a search system for the records in the database. The BRC has recently been awarded a £3m infrastructure grant (funded by Guy's and St Thomas' Charity and the South London and Maudsley NHS Trust) to create what is expected to be the biggest single-case register and biobank for mental health in Europe (BRC Nucleus data collection and analysis facility).

[32] Interview with BRC leadership representative, November 2008

3.4 Incentives for engaging in translational research and for collaboration

1) **Trust chief executives feel that clinicians are motivated to engage in research for a number of reasons:**

   - **job diversity (an alternative to a pure service-based career) and intellectual stimulation**
   - **a realisation of the links between research and better patient care**
   - **career development opportunities**
   - **esteem.**

2) **Across BRCs, we were told that the scheme is playing a significant role in bridging historically different incentives and cultures of clinicians and academics, and uniting them in common missions.**

   Clinicians and academics have traditionally had different career agendas. Clinical duties are driven by NHS targets (looking after patients), while academic duties are driven by the need to obtain good RAE) scores (including high rates of publication), and this tended to place university research focus on basic science. Although the Clinical Excellence Award Scheme has been rewarding clinicians for excellence across research and service, it has not been perceived as a major incentive for engaging in research *per se*. Upfront financial support for clinicians to engage in research is essential.

   There is now more interest in medical schools about how research can move from a biomedical to a clinical context. Efforts to communicate the interrelatedness of basic and applied research, and the importance of the translational research interface for realising healthcare improvements have also helped stimulate academic interest.

3) **BRC leaders acknowledge that the NIHR Comprehensive Clinical Research Network (CCRN) programme and the NIHR clinical research network coordinating centres (CRNCC) are also reducing barriers to effective clinical trial activity.**

   Multi-centre, large-scale trials offer the best prospects for the most conclusive results, but the rush to publish and get accredited with authorship, can perpetuate smaller trials, which provide less conclusive results. The CCRN and CRNCC are aiming to help to improve the quality, speed, and coordination of clinical research (including within and between various BRCs).

4) **It is acknowledged by trust executives and university leadership that a research culture is not about everybody in a trust doing research. It is, however, about enabling even those trust staff not actively engaged in research to understand its importance and value, and encouraging them to help facilitate the research activities of others (for example, by providing**

various types of information, and by helping researcher-clinicians get access to patients for clinical trial studies). BRCs are playing a crucial role in creating such research-friendly environments, and in promoting an awareness of the benefits that research can bring to all stakeholders

This (among other factors) includes an awareness of the links between research and patient benefit, an awareness that research can help raise the reputation of a hospital, and help attract patients. Overall, the new health research system is facilitating clinical academic careers. Although the options open to junior doctors to pursue research careers have increased, service pressures and the duration of medical education and research training still present impediments to leveraging even further trust-wide engagements in research.

CHAPTER 4 The impact of BRCs on resource-targeting, management and governance

In the mid-1990s, under the Culyer reforms[33], NHS organisations for the first time distinguished between the costs of healthcare, R&D, and training, and began to receive budgets accordingly. From 1996, trusts declared estimates of their annual R&D spend, and were allocated funds based on these estimates. R&D funds were divided into two budgets: one for research support costs and to fund 'own account' work, and the other to cover investigations in national priority areas not funded by other non-commercial bodies.

However, it proved difficult to realise the desired levels of transparency in the costs and spend on research conducted by NHS trusts, and it gradually became clear that many trusts were cross-subsidising services with funds that were earmarked for research and/or research support.[34] In 2004, the Department of Health called for funding recipients to make clear the exact use of their R&D budgets, and the 2006 BRfBH strategy pledged to increase transparency and accountability in the financial management and governance of NHS R&D. Within the new strategy, the BRC scheme earmarked funding for translational research.

The amount of public funding available for biomedical research increased substantially between 2000 and 2008, and the funding available for translational research is now greater than before. In addition to the DH funding, there is also support for translational research from charities, industry, development agencies and individual benefactors. Some BRCs have seen a significant increase in research funding compared with the funds they had received through the Culyer levy.

The BRC scheme has been successful in addressing historical inefficiencies in the targeting of research funding, and in resource management and governance:

1) **The conditions for receiving BRC funding were clearly specified and communicated to applicants early on in the bidding process. BRC leaders to**

[33] Culyer, A. *Supporting research and development in the NHS. Report of the Department of Health Research and Development Task Force*. London: HMSO, 1994

[34] Shergold, M. and J. Grant, 'Freedom and need: the evolution of public strategy for biomedical and health research in England' *Health Research Policy and Systems*, Vol 6 No.2, 2008

whom we spoke said that it was a priority in all BRC bids to demonstrate that strengthened NHS-academic partnerships had the potential to establish more rigorous research governance and management structures to ensure better financial transparency, performance monitoring and research administration.

At all BRCs, NHS and academic partners are approaching research in a more businesslike manner, cleaning up their budgets and making sure that BRC funding is allocated to eligible translational research costs. The BRCs are becoming more diligent in how they monitor research spending and ascertain research outputs.

Eligible costs within BRC schemes include: research and research support staff focused on translational research in the NHS; the costs of research training leading to higher degrees (for example, MPhil, MD, PhD) in relevant areas; and some indirect costs (for example, HR, finance). A separate capital budget was made available for capital expenditure needed to support the research of a BRC[35].

2) **Trust chief executives, deans of academic partner organisations and BRC directors feel that structural changes are facilitating transparency in resource management and governance.**

   These include bodies such as joint research offices between academic and NHS partners, external advisory panels, and steering committees. These bodies peer-review the BRC's research (and ensure that it is translational research for patient benefit and adheres to quality control measures). They also 'audit' performance, and monitor financial transparency.

3) **BRC leaders to whom we spoke see two-way communications with the NIHR as important for ensuring that transparency and accountability of *all* stakeholders is maintained and nurtured. These communications are also important so that the fairness of the NIHR funding system (in terms of decisions about the levels of funding distributed to various centres) continues to be accepted and trusted.**

4) **According to many of the interviewees we spoke to, although BRC funding is managed on strict budgetary terms, there is some flexibility in how funding is allocated, enabling the centres to respond to emergent research needs that may not have been identified at the time of BRC applications (for example, via contingency funds).**

   BRCs also try to be flexible in distributing funds to university versus. trust principal investigators (PIs). A good example of this is in BRC-funded appointments, which have been created both in universities and in NHS trusts to ensure that the post is established in the most appropriate environment (for

[35] Department of Health (Research and Development Directorate) *Best Research For Best Health, Implementation Plan 5.6. NIHR Research Centres Version* . London: Department of Health 2007 www.nihr.ac.uk/about/Pages/about_implementation_plans.aspx (as of 26 March 2009)

example, a technical post for a laboratory-based element will be established in a university, a research nurse will be trust-based, a senior lecturer post will be placed in a university). The BRC scheme has also provided some flexibility to pump-prime innovative areas of more speculative research via intramural funding.

5) **BRC leaders acknowledge that the DH is addressing some of the administrative difficulties in resource management and governances. These include those pertaining to the transfer of funds from a trust to a university (due to VAT regulations and differing financial years for example), and also the challenges that some BRCs have experienced in short-term spend.**

6) **We were told by some senior BRC executives that although there is flexibility in allocating BRC funding to translational research activities, it can be challenging for some research divisions in trusts – which do not obviously and intuitively fit within a BRC theme – to be included and supported via the BRC scheme.**

   The bidding process for BRCs was such that themes had to be organised around areas of established and clearly demonstrated strength. Funding was allocated to support these areas further. The level of flexibility that is needed to maintain a focus on designated BRC themes, while at the same time not neglecting new and important research projects on the outskirts (which may be higher risk because they are at early stages of development) – is an emerging area for strategic consideration by the NIHR. That said, there are other sources of NIHR funding – such as flexibility and sustainability funding – that NHS organisations can access to support research components not already provided for in other funding sources.

7) **The BRC scheme is also affecting how trust and academic partners deal with research process bureaucracy.**

   Our interviews suggest that all BRCs have developed, or are developing, more streamlined processes for producing and supporting grant applications to external funders. They are doing this through dedicated research offices, often shared by the trust and medical school.

8) **Despite some progress, there is general consensus among those we interviewed on the need to curb the growing external bureaucracy associated with research regulation.**

   At present, considerable resources need to be devoted to meeting multiple regulatory requirements (for example, NHS research and ethical approval, MHRA requirements, the EU clinical trials directive).

   Although these processes are essential for safeguarding patients, there is a need for greater consistency across various regulatory bodies. Several national initiatives are trying to reduce this bureaucracy and to streamline regulatory processes. The NIHR has established a series of 'bureaucracy-busting' plans. These include: *Governance Advice and Ethics Implementation*; *Ensuring Good Governance through Networks*; *NIHR Coordinating System for Gaining NHS Permission (CSP)*, which includes the Integrated Research Application System (IRAS); *Research Passports*, a *Regulatory and Governance Advice Service*, *Research Ethics*, and *NIHR Information*

Systems Programme implementation plans[36],[37]. Many of these initiatives are still in early stages of implementation, and more time is needed to reflect on their effectiveness.

[36] See <www.nihr.ac.uk/about/Pages/about_implementation_plans.aspx> (as of 26 March 2009)

[37] See <www.nihr.ac.uk/about/Pages/about_implementation_plans.aspx> (as of 26 March 2009)

CHAPTER 5 On reflection

The review describes how the BRCs are evolving and presents a snapshot of where they stand now, according to the perceptions of BRC senior executives and the examples they provided in support of their views. The review suggests that the BRC scheme is substantially shaping the health research system to pursue translational research.

It is too early to expect, and therefore measure, tangible impacts on research productivity and patient benefit, but there have already been significant changes in the processes of identifying research need and commissioning and undertaking research projects. Across BRCs, there is a view that joint-working between NHS and university staff has been made easier as a result of the scheme, and has improved the ability to generate and implement translational research. New partnerships have been developed, collaborations have been strengthened, hearts and minds have been won, and new organisational and physical structures have been established to implement the BRC scheme. It is widely felt by the BRC leadership representatives we spoke to, that the BRCs have required vision, drive and an ability to think outside the box, and that the ongoing enthusiasm of the senior leaders we interviewed is a pivotal asset for the scheme.

It is important to highlight some caveats of the study, which should be borne in mind when drawing conclusions from the report. The review has been undertaken to a tight timetable at an early stage in the BRC scheme. It has relied on expert informants, who may have their own biases and prejudices. We interviewed the most senior executives of BRCs, and a more detailed review of the scheme at a later stage of BRC evolution could benefit from investigating the views and experiences of other participants, such as academics and clinicians involved in research projects, and NHS managers. It is also important to bear in mind that the trusts and academic organisations that are now part of BRCs were leaders in their activities even prior to the scheme. Our review gathered interviewees' perceptions on the changes that the scheme is bringing about, and we tried to obtain concrete examples of the interviewees' views and claims. However, given our wider knowledge of the health research system, we felt that the claims made by interviewees were credible and plausible.

A future review may consider a more detailed examination of the value added by the BRC scheme – for example by gathering information from a broader range of informants, and through comparisons with how NHS and academic organisations that remain outside the BRC scheme are pursuing translational research and innovation. This was beyond the scope of the current study. These caveats not withstanding, the review provided significant insights into the impacts that the scheme has already had on *changes in institutional*

relationships between the NHS, academia, industry and other players – to enable translational research and innovation for patient benefit; on *capacity-building* in the health research system; and on *improved resource targeting, management and governance*.

Leadership is a crucial factor in steering the BRCs. According to those we interviewed, it is exemplified in:

- individuals who understand both basic and clinical research, and their interrelatedness
- good relations and frequent communications between leaders at NHS and academic partner organisations
- individuals with management experience and demonstrated business acumen
- individuals who can motivate and communicate the importance of a BRC to front-line staff
- successful efforts to engage clinicians in research by, for example, ensuring protected time in consultant job plans and introducing career development incentives
- an honest dedication to pursuing BRC missions, as opposed to vested agendas and individual benefits
- an ability to absorb new information, be adaptable and in tune with emerging priorities in the health research landscape.

Through various initiatives, including the NIHR Leadership Programme, the DH is addressing a well recognised need to nurture effective leadership for BRCs and other BRfBH initiatives.

The BRC scheme is about the integration of research and service, about research advances leading to improvements in service, and service needs informing research agendas. BRCs are cementing stakeholder relationships, starting new research projects in priority health areas, recruiting new staff, and developing existing human resources to ensure long-term research and innovation capacity. At some campuses the scheme is also fostering more interdisciplinary research approaches. BRC leaders whom we interviewed felt that taking the time to incubate a BRC and to settle in (in some cases this took a little bit longer than was anticipated) has allowed trust and academic leaders to reflect on research priorities and strategy in a way that was not achieved in the past.

Although BRC leaders emphasise that measurable outputs cannot happen overnight, there is evidence of some incremental achievements. At Cambridge, for example, we were told that a number of studies are now being published, and research advances are expected to start translating into clinical trials in the coming year. At Liverpool, BRC leaders said that there are already some promising hints in the pipeline in novel diagnosis, intelligent materials and new ways of decontaminating surfaces. These research projects are interdisciplinary (for example, a wide range of departments at the university are involved, including chemistry, physics, engineering, biomedical sciences, the veterinary faculty and the Liverpool School of Tropical Medicine, together with the trust). According to interviewees at the Moorfields Eye Hospital/Institute of Ophthalmology BRC, there has been a clear improvement and increase in the flow of basic biomedical research into new diagnostic and treatment interventions, and there are many more promising developments in prospect. Some new therapeutics (such as gene therapy for blindness) are the fruits of

the previous NHS R&D system, and are seen as examples of the types of work that the BRC leaders told us that they expect to see more of.

Like Cambridge, the South London and the Maudsley/Institute of Psychiatry BRC is already delivering publications from BRC-funded work, and BRC leaders consider that one of the major recent achievements is the further development of a system of electronic patient records for research. This is an example of infrastructure that is boosting the effectiveness of BRC-supported studies. We were told that the electronic medical database is allowing researchers to conduct anonymised clinical research in a more structured, better coordinated and more efficient way. Supplementary BRC support has allowed them to develop a search system for all patient records in the database. The BRC has recently been awarded a £3m infrastructure grant (funded by Guy's and St Thomas' Charity and the South London and Maudsley NHS Trust) to create what is expected to be the biggest single-case register and biobank for mental health in Europe (BRC nucleus data collection and analysis facility).

Based on our interviews, it is widely accepted that new performance metrics tailored to translational research are needed in health research systems globally. At present, measures of research quality are largely based on publication volumes and bibliometric indicators, numbers of PhDs, and research income. BRC leaders feel that these indicators do not measure translational research outputs and impacts very effectively. In leading journals it is basic research that is most often published. A lot of patient-related research does not have high-impact journal outlets. There is an acknowledgement that the NIHR is being proactive, and engaging in stakeholder consultations to try establish appropriate metrics for translational research outputs and impacts. We were told by BRC leaders that it is important to consider realistic timeframes for adjudicating performance, and metrics that can take into account the unique circumstances under which individual NHS-academia partnerships have engaged in the BRC initiative.

Finally, it is important to reiterate that BRCs are a complex scheme attempting a radical shift in the attitudes of clinicians, academics and NHS managers, to the complex relationships between lab-based biomedical research, clinical research and the use of research results to improve clinical care. This is a challenging task, which takes time to achieve. Instant transformations cannot be expected. Nor is it likely that one scheme can achieve the task alone. In addition, different BRCs have had different starting points, in terms of pre-existing resources and relationships that can facilitate translational research and innovation for patient benefit, and are likely to be exposed to a mix of common and unique challenges and opportunities. Despite this, our study found that there was great enthusiasm for the BRC scheme, which was widely seen as a brave new effort on the part of the Department of Health, with significant potential for patient benefit. The following quotes from some of the representatives we interviewed illustrate aptly the general perceptions on the impacts of the scheme:

- The BRC "*has changed the medical research landscape beyond recognition over last 18 months*".

- "*The BRCs have been a fantastic catalyst to bring about integration between the NHS and university partners. That is what was expected from the BRC movement, what they were designed to do, and what they are achieving."*

- "*The BRC is more than just grant funding. It has enabled all organisations to take a step up. It is a declaration of faith that the NHS has at last begun to understand research*."

For the benefits of *Best Research for Best Health* and of the BRC scheme to continue to be realised, as the scheme matures, the leaders of BRCs expect the NIHR to play a major role, and to build on achievements to date in steering the health research system. We were told that important areas for NIHR engagement include:

- providing feedback and guidance to BRCs on performance and progress
- communicating with BRCs about how they can effectively tap into various complementary BRfBH funding streams and interact with other initiatives
- coordinating, collaborating and liaising with other health research funders
- mitigating the uncertainties that the current socioeconomic and political climate presents
- nurturing effective channels for enabling NHS and academic organisations that are not part of BRCs and other major NIHR initiatives, to be included in the health research system – both to contribute their own expertise and share experiences, and to benefit from the advancements that centres of excellence are driving forward
- ensuring sufficient flexibility in the scheme
- continuing to encourage and enable existing efforts for professions such as nursing and allied health professionals to engage in the research system.

Appendix

Table 8. Comprehensive and specialist Biomedical Research Centres

'Comprehensive' Biomedical Research Centres	
NHS organisation	**Academic partner**
Cambridge University Hospitals NHS Foundation Trust	University of Cambridge
Guy's and St Thomas' NHS Foundation Trust	King's College London
Imperial College Healthcare NHS Trust	Imperial College London
Oxford Radcliffe Hospitals NHS Trust	University of Oxford
University College London Hospitals NHS Foundation Trust	University College London

'Specialist' Biomedical Research Centres		
NHS organisation	**Academic partner**	**Specialism**
Great Ormond Street Hospital for Children NHS Trust	UCL Institute of Child Health	Paediatric/Child health
Central Manchester & Manchester Children's University Hospitals NHS Trust	University of Manchester	Genetics and developmental medicine
Moorfields Eye Hospital NHS Foundation Trust	UCL Institute of Ophthalmology	Ophthalmology
Newcastle upon Tyne Hospitals NHS Trust	Newcastle University	Ageing
Royal Liverpool and Broadgreen University Hospitals NHS Trust	University of Liverpool	Microbial diseases
Royal Marsden NHS Foundation Trust	Institute of Cancer Research	Cancer
South London and Maudsley NHS Trust	KCL Institute of Psychiatry	Mental health

Source: http://www.nihr.ac.uk/infrastructure/pages/infrastructure_biomedical_research_centres.aspx

Table 9. List of interviewees

BRC	Director	Chief executive	Medical school dean
Comprehensive			
Cambridge University Hospitals NHS Foundation Trust/University of Cambridge	Dr John Bradley	Gareth Goodier	Professor Patrick Sissons - Regius Professor of Physic
Guy's and St Thomas' NHS Foundation Trust/Kings College London	Professor Richard Trembath	Ron Kerr	Professor Robert Lechler – Vice Principal (Health)
Hammersmith Hospitals NHS Trust and St Mary's Hospital NHS Trust/Imperial College London	Professor Charles Pusey	Stephen Smith	Professor Stephen Smith – Principal, Faculty of Medicine
Oxford Radcliffe Hospitals NHS Trust/University of Oxford	Professor Keith Channon and Dr Mark Taylor (BRC manager)	Trevor Campbell Davis	Professor Alastair Buchan
University College London Hospitals NHS Foundation Trust/ University College London	Professor Ian Jacobs	Robert Naylor	Professor Edward Byrne – Executive Dean Faculty of Biomedical Sciences and Head of the Medical School University College London
Specialist			
Great Ormond Street Hospital for Children NHS Trust/UCL Institute of Child Health	Professor David Goldblatt	Jane Collins	Professor Edward Byrne – Executive Dean Faculty of Biomedical Sciences and Head of the Medical School University College London
Moorfields Eye Hospital NHS Foundation Trust/UCL Institute of Ophthalmology	Professor Peng Khaw	John Pelly	Professor Edward Byrne – Executive Dean Faculty of Biomedical Sciences and Head of the Medical School University College London
Newcastle upon Tyne Hospitals NHS Foundation Trust/Newcastle University	Professor Chris Day	Len Fenwick	Professor Oliver James – Pro Vice-Chancellor and Dean of Medicine
Royal Liverpool and Broadgreen University Hospitals NHS Trust/ University of Liverpool	Professor Peter Winstanley	Tony Bell[38]	Professor John Caldwell – Dean of Faculty of Medicine

[38] Chief Executive was Maggie Boyle at the time of the BRC application

BRC	Director	Chief executive	Medical school dean
The Royal Marsden NHS Foundation Trust/The Institute of Cancer Research	Dr Stephen Johnston (Director, Clinical R&D)	Cally Palmer	Professor Peter Rigby (Chief Exec and Director of Research)
South London and Maudsley NHS Trust/Institute of Psychiatry, King's College London	Professor Simon Lovestone	Stuart Bell	Prof Robert Lechler – Vice-Principal (Health)