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Academic Health Centres in research-intensive settings in Europe

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1. Introduction

Academic Health Centres (AHCs) are close associations of universities with a medical school and highly specialised university hospitals. They have a key role in the development of the health care of the future, leveraging on basic science, clinical excellence and large patient populations organised in structured forms in which physicians, nurses, other health care professionals and researchers work together in a multidisciplinary setting. The AHCs provide an integrated environment for advanced clinical service, research and teaching. In order to provide this resource for continued health care development, the unique environment of the AHCs must be actively stimulated and recognised. This involves integrating an advanced biomedical academic environment with advanced health care provision, including registries, repositories and access to large patient cohorts. It must be recognised, however, that AHCs have a special role in the health care system and do not provide routine health care in the same way as other medical institutions do.

The legal structure of these AHCs varies within and across countries. For a large part they are publicly funded, but independently of their exact governance structure, the AHCs fulfil a similar unique mission in society.

The close links to comprehensive research-intensive universities are a fundamental asset to AHCs. It offers, often in a joint effort of various disciplines, the opportunity to a flexible and adequate answer to complex problems, thus being an attractive environment for top professionals and students. The need for high quality care, top research and educational excellence is also enhanced by globalisation. A competitive environment increasingly poses new challenges and should inspire and attract the best talents.

In the context of LERU we have explored the position of AHCs in the different member countries, some of which have resulted in a more specific case study. In this paper we first explore the mission of AHCs and we then present a number of case studies.

Introduction

The triple mission of AHCs

The uniqueness of an AHC is that it combines within a single institution specialised patient care, education and training, and biomedical research and development. This interaction fosters the delivery of high-quality health care and the constant striving for improvement in the health of the community, the education and training of students and of the next generation of health care professionals, and the rendering of scientific discoveries into the practice of health care. It is this translational research, 'from bench to bedside and back' that leads to continuous innovation in medical care, at the same time giving the opportunity, to students and professionals alike, to get acquainted with high standards in health care and research. These interactions are enhanced by the intimate links between the AHC and the university, giving the AHC access to a broad range of scientific disciplines and to the results of recent developments in science and technology. Thus, a major characteristic of AHCs is that they offer accessible care for everyone, taking into account current innovations that have not yet spread to other institutions. They drive the overall quality of care and they are indispensable for keeping education and training up to date.

AHCs are further characterised by the essential role they play in the evaluation of new and existing medical technologies ('Health Technology Assessment') and in the rationalisation of their activities ('evidence based medicine and healthcare'). As such, AHCs play a pivotal role in the health care system, not only providing excellent quality of care across all clinical services, but also offering last resort care for complex diseases.

Medical innovation is a dynamic phenomenon. Medical treatments often require highly specialised expertise and/or equipment at an initial stage of development. Innovative treatments established in AHCs frequently evolve to become routine practice in general hospitals. This process of disseminating medical innovations once they have reached maturity is fuelled by the AHCs. They integrate innovation with current standards of high quality care and with the teaching they provide to health care professionals during

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their education. These professionals then proceed to spread these new insights throughout the community at large.

Finally, AHCs have an important economic impact on top of the activities they generate through patient care. The research activities at the AHCs require the multidisciplinary input from different specialties both within the biomedical faculty and in other faculties within the university. AHCs also seek collaboration and alliances outside the university, with other health care providers and organisations, public and private institutions and industry, creating substantial employment in the region. Involvement with the transfer of knowledge can lead to new research questions and to the creation of new knowledge, thus enabling a fruitful feedback between the different areas. Also on an international level, AHCs cooperate, for instance with foreign AHCs and biomedical research groups, in EU funded projects and with biomedical companies. AHCs therefore play an important role in a 'knowledge based economy' that most European countries wish to develop, through the creation of new knowledge and by providing jobs for highly qualified professionals with different backgrounds. This contribution can be direct, through local employment and development of commercial activities, and indirect, through knowledge-creation, increased human capital and improved health of the population.

The aim of this report is to substantiate the triple mission of the AHC and to show how the unique blend of patient care, research, and education benefits health care and society in general.

2. The three core responsibilities explored

2.1. Patient care

Everyday health care is, in the end, one of the 'key products' of a general hospital as well as the AHC. However, many of today's routine procedures in patient care have once been developed as an innovative procedure in an AHC. Examples include treatments of cancer by chemotherapy or irradiation, minimal invasive surgery, coronary bypass operations, but also the use of CT and MRI scans. Even the simple routine of the electrocardiogram (ECG) has been developed in an AHC from studies of the electrical properties of the heart, performed more than 100 years ago.

Top referral care

Apart from research activities and teaching and training for medical and other health sciences students, 'top-referral' care (tertiary services) is what distinguishes the AHC from general hospital services (secondary services). Top referral or 'last resort' care is highly specialised care that requires a sophisticated diagnostic and therapeutic approach for which further referral of the patient is not possible. In other words, the AHC provides care to patients who have no other place to go to because of the complex nature of their medical problems. AHCs are thus serving as an institution for the wider, even national community.

Last resort care and top referral care require specialised expertise, expensive equipment and an infrastructure for specialised patient care. This is most efficiently centred in AHCs. Here, the university hospital and the medical faculty provide an infrastructure with a strong interaction between patient care and scientific research. Specialised patient care in an AHC is characterised by multidisciplinary, i.e. cooperation between various preclinical and clinical disciplines. Preclinical disciplines are, for example, biochemistry, pharmacology and genetics. They are university-based sciences that find their application in university hospitals.

The three core responsibilities explored

The blend of patient care and academic research is what makes the AHC capable of providing top referral or last resort care. There is, in short, no alternative to an Academic Health Centre.

Patient care in relation to teaching

Obviously, patient care in an AHC consists not only of last resort care. The care for patients with less complex diseases, injuries and illnesses like appendicitis, a broken arm or uncomplicated diabetes, is equally important. In this way the AHCs also function as hospitals for the local and regional community. Patients from this community have access to state-of-the-art care but also to the most innovative treatments available. Contact with these patients also is an indispensable part of the undergraduate education and training of medical students, which occurs predominantly in AHCs. Postgraduate training is not confined to AHCs, but is organised in such a way that all residents come in touch with patients with common disorders in non-AHC hospitals, in order to experience the handling of 'routine' health care procedures.

A broad range of services

AHCs offer a broad range of services. Some specialised care programs are provided virtually exclusively by the AHCs, e.g. solid organ transplantation (heart, liver, kidney, bowel transplantation). Equally, bone marrow transplantation, treatment and support of patients with cystic fibrosis, newborn surgery, major surgery of the gastrointestinal tract (including oesophageal and pancreas cancer) and the treatment of HIV and related disorders take place in AHCs. A number of the specialised care programs offered by the AHCs are available in the large general hospitals as well, e.g. cardiac surgery, cancer care, and fertility treatment. The AHCs, however, receive the most complex, most complicated and most severely ill patients.

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This partly accounts for higher costs of care in the AHCs than in general hospitals. In addition, AHCs engage more extensively in providing second opinions, for which no specific funding through the health insurance is available.

Patient care in an AHC is of course not confined to patients with chronic disease. For many patients the contact with the AHC begins at the emergency department. The percentage of patients admitted for further treatment varies between countries from 20% to 50%, depending on the way health care is organised. Highly experienced trauma teams treat the most severely injured patients. The core components of the trauma teams include surgery, orthopaedics, anaesthesiology, and radiology, but the teams often call on other specialised resources in the hospital to meet patients' needs. AHCs provide all specialised services 24 hours a day, 7 days a week. By consolidating an emergency room, computed tomography, and a surgical suite into one advanced multi-trauma unit, the most severely injured patients do not need to be moved within the hospital. It is the environment of an academic health centre that spurs this kind of innovation.

Laboratory services are an indispensable part of patient care. The laboratory is an important element in the continuum of care. For some specialised lab tests, the entire country is the catchment area in most AHCs. Most laboratory services focus on analysis, interpretation, and advice to serve clinicians who are in direct contact with the patients. The laboratory is also closely linked to the research community. For example, the laboratory participates in extensive research on the origins of genetic diseases. In clinical genetics the medical history of families is analysed and valuable guidance is provided about potential risks for disease. The laboratory is also closely associated with biobanks, an important resource for research, not least involving the major public health diseases.

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2.2. Research and medical innovation

In the introduction to the previous section, we mentioned the development of today's ECG from research initiated more than 100 years ago. Times have changed since then, but the impact of research on technology and society and on innovation and development of patient care remains undiminished. Research can redefine our knowledge, can offer new explanations and can give an answer to new opportunities and problems. It is obvious that research greatly contributes to increasing quality of life and life expectancy.

Research and innovation are essential functions of AHCs primarily aimed at improving health care. This results in the development of more reliable forms of diagnostics and medical treatment, more effective surgical interventions, a more efficient health care delivery or creating marketable products.

It is important to note that innovation should be defined not only from a technological or organisational point of view, but should also highlight the importance of 'brains', human capital being the biggest asset of AHCs. It goes without saying that AHCs are operating in a very internationally oriented environment. All major research projects require that competence and resources are focussed, necessitating collaboration with several other international actors, both with respect to research and to financing. All AHCs contribute to leading edge research skills in a number of important international networks and a number of international centres of excellence. They all participate in a great number of projects and programmes financed for example within a EU framework.

Results of research and innovation developed in the AHCs find their way to health care providers by clinical guidelines and postgraduate training of doctors, but also in often rather diffuse ways (articles in journals, participation in congresses). Research commissioned in the AHC has contributed to the understanding and often successful treatment of a variety of very serious health conditions, such as cancer and cardiovascular diseases.

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The importance of data registry and biobanks

There is more to research than just performing experiments. The systematic collection of data, blood samples and tissue from patients in the AHC is fundamental to clinical research. Most AHCs participate in epidemiological studies, collecting data from healthy people in the general population as well. Comparison of data from healthy people with patient data helps to identify the determinants of health and disease. Databases and biobanks are invaluable not only for research into the causes of disease, but also for a less obvious purpose such as patient safety.

2.3. Education and training

Education and training of medical students and health care professionals is another core mission and a major responsibility of the AHCs. Through their links with universities, AHCs have the infrastructure, technology and expertise to provide society with the professionals (e.g. physicians and nurses) who are needed for the health care of the local, national and global community of the future and who can become leaders in improving the health care of the population. AHCs are aware of the need to develop innovative curricula and excellence in teaching and to use state-of-the-art technology. Nowadays, e-learning, virtual patients and skills labs are widely applied in the AHCs. Undergraduate students as well as postgraduate trainees make use of these facilities.

Above that, AHCs have the task to educate and train researchers and professionals in different related areas, e.g. biomedical sciences and pharmacy. Furthermore, by providing and developing high quality research programs in a challenging and multidisciplinary environment, AHCs are able to attract top professionals.

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Education of undergraduate students

Most of the undergraduate teaching is provided exclusively by AHCs. Internships, however, are also provided by general hospitals in close cooperation with the academic hospitals. This is partly because academic hospitals have limited capacity to house interns, partly because interns should get acquainted with common diseases as presented in general hospitals. In the AHCs, interns are introduced to more complex and innovative diagnostic and therapeutic procedures and care models. Students receiving clinical training participate in several areas of patient care and receive supervision from involved and professionally active instructors.

Postgraduate teaching and education

The mix of patient care and research contributes to the teaching and training of the next generation of doctors, nurses and other health care professionals. Following graduation most medical students continue their training to become junior medical staff. The postgraduate training of medical doctors is often coordinated by the AHC. This includes the training of general practitioners and specialists ranging from anaesthesiologists to urologists.

The AHCs provide continuing education for thousands of physicians, nurses and other professional groups and the AHCs are the only institutions that provide facilities like skills labs for the training of residents and consultants. The importance of AHCs in postgraduate training is clear. They help to ensure that clinicians keep their knowledge and skills up to date and at the forefront of clinical practice. Postgraduate training at the AHCs is a way to propagate clinical guidelines and to keep the quality of care at the highest standards.

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In the last ten years, eight University Medical Centres (UMCs) were created in the Netherlands. In a UMC the Faculty of Medicine, with its responsibility for the initial training of physicians and for scientific research, is merged with the Academic Hospital, with its responsibility for tertiary care and clinical research and innovation. All medical faculties and academic hospitals in the Netherlands are now a UMC.

Each UMC is a public not-for-profit enterprise with strong links to the University and with an Executive Board including a Dean of Medicine. The finances come from the Ministry of Education, Culture and Science, the Ministry of Health, Welfare and Sport as well as from the health insurance companies that operate the mandatory health insurance in the country. The eight UMCs have a special position in the health care system because, although they are legally private entities, they have a distinct public mission. This mission can be divided into three core responsibilities: teaching and training, basic and clinical research and (tertiary) patient care.

3.1. Bridging the gap between three worlds

The added value of UMCs is that they integrate these three core functions, patient care, (bio)medical research and (bio)medical education. Medical students are exposed to patients as well as basic research from day one of their curriculum and they become part of the UMC community. Many of them will participate in research projects during their studies and many will opt for a MD/PhD programme. Almost every doctor and nurse is involved in the teaching process. And as students enter their clinical rotations they will be an important driver for quality of care as their supervision requires doctors and nurses to provide a good role model. Increasingly the modern curriculum will include a mix of clinical and basic science around a specific disease, and therefore both clinicians and scientists often lecture together.

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As the science labs are often located within the same building as the hospital, interaction between clinicians and scientists is frequent, but also many doctors continue to work in a lab as well. Good clinical epidemiology in most UMCs has supported many clinical researchers (doctors and nurses) and the close vicinity of patients has proven to be of immense importance in the recent developments in the area of genomics, proteomics and other fields of translational medicine. This is visible in the position of Dutch (bio)medical research in the international scientific community.

Increasingly results of research are taken further, either as direct innovations in patient care, after thorough evaluation studies or through patents, spin-out companies or other forms of 'valorisation' of science. Innovation in clinical therapeutics or diagnostics has always been important in academic hospitals. Increasingly UMCs are also responsible for innovations in the process of care delivery, not only in the hospital setting but also, through for instance their departments of Family Practice in primary care or nursing home care. Innovations can be thoroughly evaluated before becoming standard practice and their value in improving outcomes for patients or in reducing costs can be critically assessed. In that way the whole health care system profits from academic medicine.

Finally UMCs have an important responsibility in tertiary care. Patients with rare diseases, difficult to manage complications or in need of very complex interventions are often referred to a UMC. Transplantations, neonatal intensive care, genetic diseases, rare metabolic disorders and complex cancers are examples of patient groups that are concentrated in some or all UMCs so that sufficient volume guarantees expertise. However, despite the unique responsibility for tertiary care, all of the UMCs provide a certain amount of regular hospital care, if only for training purposes. For those patient services the UMCs compete in the health care market just as general hospitals do.

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3.2. Facts and figures

Teaching and training

Since 1992 the Netherlands have increased the number of first-year medical students from 1485 to 2850 a year. Each UMC has an average between 315 to 410 new first-year students. After a six-year training, of which two years on average are spent in clinical rotations (50% in a UMC and 50% in another health care institution) physicians can enter specialty training. UMCs offer all specialties including family practice and public health, but during most specialty training the physician will spend approximately 50% of his training in a general hospital. Around 60% of the Dutch hospitals participate in specialty training in regional networks around each UMC. The UMC plays an important role in providing courses and skills labs for students and teachers.

All UMCs also have at least one degree programme in biomedical sciences (around 500 students a year) and all participate actively in the training of nurses and nurse specialists.

Clinical research and basic science

The UMCs together are responsible for one third of the scientific output in the Netherlands in terms of publications and on average they have a citation score of almost 40% above international average, with variations by field in the different UMCs. Together the UMCs award 800 doctoral degrees a year, which means that on average each UMC has 400 PhD students.

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UMCs have both clinical and basic science research groups. Increasingly the combination of the two creates powerful groups specialised in translational medicine. Although UMCs have a certain amount of funding for research through the medical faculty, most get a much larger amount of funding from the research councils at the national or international level, from charities and from projects together with industry. Both other faculties of the university and biotech companies collaborate with UMCs in solving biomedical mechanisms, developing new methods for diagnostics or therapeutic interventions and evaluating the results in clinical trials.

The tradition of sound clinical evaluation studies have proved to be a very successful field in medical research, not only in the large industry driven trials, but also in the much smaller investigator driven trials which have helped practitioners decide about the best course of action when there is doubt, and have formed the basis for many clinical guidelines. These papers are often among the most cited publications.

Each UMC has a research infrastructure and in certain cases close collaboration between the UMCs provides a unique scientific environment. An example of this is the Pearl String Initiative (PSI) in which the eight UMCs are jointly building prospective patient cohorts for which both clinical data and biomaterials are collected in a standardised fashion. For some diagnoses this means that all patients with that diagnosis in the Dutch population are included in one database. This PSI bio bank will provide unique material for research on the interaction between genotype and phenotype.

Another example of the strength of cooperation in research is the recently established MCRN, the Medicines for Children Research Network. UMCs feel children deserve 'evidence-based medicine' and thus a critical evaluation of the medication they take as much as adults do. That will require careful assessment using randomised controlled trials (RCT). Recent European legislation has emphasised the necessity of trials for children, UMCs feel it is part of their public mission to provide a methodologically sound environ-

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ment to do so. It is always difficult to explain to the public that the essence of a successful RCT is that one of the two study groups will prove to have a worse outcome, thereby helping us decide what treatment is best. They often find it particularly hard to understand when it concerns children. However, parents are often appalled to discover that there has not been an adequate evaluation of the treatment proposed for their sick child. With the MCRN, the UMCs propose a safe environment for parents to allow their children to participate in the so needed clinical studies.

Together the UMCs have taken responsibility for technology assessment studies, partly financed through the Medical Research Council (ZonMw). Outcomes of such studies have been instrumental in deciding which new treatments are included in the basic benefit package and in disseminating innovation to other hospitals. Many of the researchers in the UMCs are involved in advisory bodies to the government, such as the National Health Council.

UMCs have a long tradition of close collaboration with private partners as well. Many of the new medical devices have first been tested and refined with physicians from UMCs. Pharmaceutical companies have traditionally worked together closely with UMCs for the required evaluation of new drugs. But in the future one can expect a new kind of collaboration. As the importance of patient material for the understanding of biomedical mechanisms that will lead to new products becomes apparent, the interest in working together closely with the basic scientists of the UMCs will grow. The Netherlands has invested in that public private partnership in a number of large innovation programmes in the field of translational medicine. The Dutch UMCs are convinced that these new partnerships will prove very productive, but they also require a good understanding of each partner's interests. The Valorisation Code of the joint UMCs provides a good start to avoid a conflict of interest, while allowing for the joint effort to improve patient care through research.

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Special hospitals for special patients

Although all UMCs provide basic hospital services, their public function is primarily determined by the top clinical services they provide together with their last resort function for referrals from other hospitals. Such tertiary care should build on the knowledge infrastructure that the UMC provides, with clinical research, innovation, a multidisciplinary approach and it provides continuity of expertise, 24 hours a day 7 days a week. Such continuity is important for patients but also to preserve centres of excellence over time so that tertiary care is not only dependent on one person.

Increasingly as the market for care evolves, some more complex or more costly patients will be referred to a UMC. That is why the financing of UMCs requires special measures; otherwise academic medicine would be in danger.

3.3. Funding

'Part of the health care market where possible, separately financed when necessary'.

It is with this credo that the then Minister of Health Hans Hoogervorst explained to Parliament why the UMCs needed a special position in his reforms of the Dutch health care system. As he transformed the Health Insurance System to achieve universal coverage with risk and income solidarity, executed by private insurance companies, he introduced a special financing scheme for the UMCs.

Of course, UMCs are financed in many different ways. Part of their budget comes from the Ministry of Education, Culture and Science, through the Universities, both for the faculty and the academic hospital

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to provide the infrastructure for teaching and research. A major part of the research money of the UMCs is secured in the fierce competition for grants at a national or international level. But for their patient care budget a distinction is made between the negotiated budget between the insurer and the UMC for the regular services and the block grant provided as so called 'academic budget' for the excess costs of tertiary care patients. This last budget is strictly limited to UMCs.

3.4. A new future for academic medicine

With the creation of UMCs academic medicine in the Netherlands has entered a new phase. Where ICRAM (the international campaign to revitalise academic medicine) worries about the position and the power of academic medicine in the future, the eight UMCs have shown that merging two traditional institutions, a medical faculty and an academic hospital, provides a good environment in which innovation and quality of care can be developed, assessed and passed on to the next generation of doctors and nurses. The three core responsibilities, education, research and patient care, are intertwined and as such can no longer be evaluated in separation. Together they are the essence of academic medicine and the R&D of any health care system.

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4.1. Policy towards NHS-University Partnerships in the UK

Until recently, the idea of the Academic Health Centre was notable by its absence from mainstream British health policy. Policy makers have been reluctant to accept that the centres where NHS-university interaction is at its most intense amount to a distinctive organisational form, worthy of a distinguishing term or of any special consideration in policy making. The most obvious explanation for this mindset is that the NHS is a national health service, in which great emphasis is placed upon equity and consistency as policy goals. As a consequence, there has been a reluctance to see any subset of NHS hospitals as requiring special consideration on account of their high level of engagement in the academic missions. This reluctance has not, however, been accompanied by an unwillingness to make policy for research and education in the NHS. For example, since the 1970s hospitals have received funding uplifts to compensate for the incremental service costs associated with academic programmes. Further policy has related to matters such as clinical academic careers, workforce development and research governance. Policy in these areas has been applicable to all NHS organisations, although in practice it has impinged mainly upon the main university hospitals because this is where research and education occur on a significant scale.

In 2007, a review of future health care provision in London first introduced the concept of the 'Academic Health Science Centre' (AHSC) into the mainstream of UK health policy. That review defined AHSCs as 'corporate entities with integrated governance and leadership structures that are strategically and operationally directed towards excellence and integration in the delivery of clinical care, education and research'¹. The review argued that "'AHSC' is not a label that should be applied indiscriminately ... like

1. *NHS London (2007) A Framework for Action*

<http://www.london.nhs.uk/news-and-health-issues/press-releases/archive/healthcare-for-london:-a-framework-for-action>

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'university hospital' and 'teaching hospital,'" and proposed six criteria to determine whether an academic-clinical partnership really formed an AHSC:

- integrated governance;
- internationally recognised excellence in research and clinical practice;
- clear integrated funding streams for research and teaching;
- integrated leadership and career paths;
- joint programs which combine research and clinical work; and
- commercial expertise to market research developments and benefit the UK's economy.

Soon thereafter Sir Ara Darzi, the principle architect of the London review and by this time elevated to the peerage as a government minister, carried out a further strategic review of the whole NHS in England and recommended adopting the AHSC model as national policy. Subsequently, the Department of Health launched a competition for AHSC status and appointed an international panel to peer review applications from NHS-university consortia. In March 2009, the Department officially designated five universities/NHS partnerships as AHSCs. Designation did not lead to immediate government funding. Rather, the process was intended as recognition of current excellence and as a catalyst for the further strategic alignment of universities, and in particular medical schools, with their NHS partners. The competition was notable for the competitive fervour it provoked, reflecting expectations by AHSC leaders that designation would help them protect their current research and education income; secure government funding earmarked for health care innovation; and give them an edge in competition for peer-reviewed grants.

Two further points are worthy of note in discussing the policy context. First, AHSC policy is applicable only to England and not to the smaller nations of the United Kingdom², for whom health policy and the health

2. *Scotland, Wales and Northern Ireland.*

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services are devolved functions. Second, AHSC policy is only one of a number of policy initiatives focusing on university-NHS partnerships that have been launched in recent years. The National Institute of Health Research has channelled funding into a range of competitive schemes requiring close collaboration between the NHS and universities, most notable Biomedical Research Centres (BRCs) and Collaborations for Applied Health Research and Care (CLAHRCs). Darzi's national review also introduced the idea of Health Innovation and Education Clusters (HIECs) as regional collaborations between the NHS, universities and industry, and the Department of Health, following a further competition in late 2009, has recently announced 17 HIECs in England. All of these initiatives are current in England only and all of them (unlike AHSC status) bring substantial additional funding. In the case of Biomedical Research Centres this amounts to £450m over 5 years.

4.2. Organisational innovations

The AHSC designation process has stimulated organisational innovations in England, the purpose of which is the more effective integration of governance and better management of the tripartite mission. These innovations can be placed into two categories. The first of these, represented by Imperial College Healthcare NHS Trust alone, is the quasi-merger model. The second category, into which the other four AHSC partnerships fall, is the intermediary organisation model.

Quasi-merger

The quasi-merger model is an attempt to achieve structural integration of governance as fully as is possible whilst stopping short of merging the university and its partner hospitals into a single legal entity. This

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involves a range of strategies, including single leadership. The Principal of the Faculty of Medicine is also the Chief Executive of the NHS Trust and other key posts, for example the Director of Research in both organisations, are concurrently held by a single individual. There is also extensive cross-representation between the governing bodies of each organisation, for example Imperial College representation on the board of the NHS Trust and senior NHS Trust management representation on the board of the Faculty of Medicine. Below the level of the governing bodies, the AHSC pursues a strategy of integration through the alignment of clinical programme groups and academic departments. It uses single leadership where suitable individuals can be found and otherwise paired leadership with cross-representation. Support services relevant to the academic missions, for example the research management offices of both NHS Trust and medical school, are also effectively merged under single leadership.

Imperial is unique in the UK in that it involves only one NHS partner organisation. However, this bald fact does not tell the whole story as Imperial College Healthcare NHS Trust was formed only in 2007 out of the merger of two very large NHS Trusts. The AHSC project acted as a catalyst for this merger, which has produced the largest single NHS organisation in England.

Another notable difference between Imperial and the other AHSCs is that the NHS Trust is not a Foundation Trust. NHS Foundation Trusts (NHSFTs) were introduced in 2004 in an attempt by the Government to create more autonomous NHS providers. NHSFTs are accountable to an independent regulator rather than to the Secretary of State for Health. Governance must be based on the principle of accountability to local communities and NHSFTs operate under a two-tier system in which they must have a supervisory Board of Governors, in which elected public governors form a majority, as well as a Board of Directors. Originally it was intended that all NHS Trusts were to become NHSFTs by 2008 but this has not been achieved and now appears unlikely to ever be achieved unless the financial regime for NHSFTs is significantly relaxed. A full discussion of this issue is beyond the scope of this paper other than to note that only Imperial amongst the AHSCs has been free to pursue its policy of quasi merger untroubled by the need to

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satisfy Boards of Governors in the NHS partners or by the concerns of the regulator to maintain the governance principles laid down for NHSFTs.

Intermediary model

The 'intermediary model', adopted by the four other AHSCs, is one in which NHS and university establish a new organisation as a means of pursuing their shared goals as an AHSC. These organisations are separate legal entities, typically constituted under company law. In each case these are organisations with one university but several NHS members. Cambridge University Health Partners (CUHP), for example, brings together the University of Cambridge and its three principal NHS partners, all of which are NHS Foundation Trusts. The picture is the same in the other centres using this model, although two of the four AHSCs have some NHS Trusts that have not yet achieved FT status amongst their members.

In Cambridge, all four member organisations have an equal share in CUHP and contribute equally to core costs. The company has a board of twelve directors that has been designed to balance university and NHS interests under an independent chairman. This includes the Chief Executive Officer and Chairman from each of the NHS Foundation Trusts and their equivalents from the university. All but three of the directors are appointed ex officio from the member organisations, within which they hold leadership positions, however when sitting as directors of CUHP they must act consistently with CUHP's 'objects'³, which are in essence the pursuit of the tripartite mission. The head of the medical school is ex officio the executive director of CUHP, a model followed in all but one of the other AHSCs.

3. *Under UK law, a company must have an 'objects clause' in its constitution that defines the purposes of the company and the activities that it can undertake.*

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Drawing on experience in Cambridge it is becoming clear that AHSC intermediary organisations can operate in different ways. They can act as a relationship manager, allowing for regular, formal and supported communication between university and NHS partners around a range of issues of shared interest. They can serve as the platform for the development of shared strategy and they can act as a broker to secure agreement on partnership projects. They might also be used as bidding vehicles, for example CUHP successfully bid for Health Innovation and Education Cluster funding and will act as the delivery vehicle for this project. These organisations can also be used to provide services that would otherwise not fit comfortably in either NHS or university structures but which are, nevertheless, of shared value. For example, CUHP is providing marketing support services to the commercial developer of the medical science park development that is an element of the development of the Cambridge Biomedical Campus. Finally, these new intermediate entities are being developed as a shared brand but with significant differences in branding and communications strategy between the four AHSCs.

4.3. Facts and figures

As has already been discussed, NHS-university collaborations are widely distributed across the entire NHS and the AHSC designation process set a high bar for performance, which only five partnerships were able to clear. It would be misleading, therefore, to give facts and figures as if these five represented the totality of major university-NHS collaborations in the UK. Oxford, for example, has an international reputation in health research, which it undertakes on a significant scale and in partnership with the NHS, but was unsuccessful in the competition for AHSC designation. The Association of UK University Hospitals (AUKUH) limits membership to organisations that can demonstrate a substantial involvement in research and undergraduate medical education and have a significant clinical academic presence. On this basis,

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the association has a membership of 40 hospital trusts in England, of which only 11 are involved in AHSC partnerships. In the case of Cambridge and Manchester, the AHSC partnerships include members that are not members of AUKUH, demonstrating how some Trusts have been prompted to seek closer alignment to their University partners through the AHSC process.

The only report available on the activities of all AUKUH members and their medical school partners was published in 2005, using data mainly from 2004/5⁴. This includes data for 32 university hospital NHS Trusts in England (membership of AUKUH was smaller at that time), including 12 organisations now part of AHSCs⁵. The main findings from this study include:

- UK medical schools attracted around £0.75bn in grant funding each year at that time,
- research activity in university hospitals attracted over £0.5bn in external funding in England, which was around 70% of the total for England,
- over 14,000 research projects were supported by university hospitals in England,
- nearly 20,000 peer-reviewed publications resulted from research projects based in university hospitals in 2004/5,
- over 1,100 higher degrees were being supported by research programmes in University Hospitals,
- UK-based charities were the largest source of grant funding to both medical schools and university hospitals at that time,

4. SQW Consulting 'The economic and social impact of UK academic clinical partnerships'
*A project for the Association of UK University Hospitals and Council of Heads of Medical Schools
 Phase 1 Report, 2005 - available at <http://www.medschools.ac.uk/Publications/Pages/default.aspx>.*
5. *St Mary's Hospital and Hammersmith Hospitals were separate at that time but have since merged to form Imperial Healthcare NHS Trust, hence 12 AUKUH members now in AHSCs rather than the current number of 11 referred to.*

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- NHS R&D Support Funding amounted to some £375m pa for university hospitals,
- UK medical schools conduct high quality research with between 50% and 75% of departments rated 5 or 5* in the 2001 Research Assessment Exercise according to unit of assessment.

An update of this exercise, separating out AHSC members from the remaining AUKUH membership and including AHSC members not members of AUKUH would be required to demonstrate the contribution of those centres designated as AHSCs, as opposed to the larger population of university hospitals as defined by membership of AUKUH.

4.4. Challenges for the future

This case study is being written at a time of considerable political uncertainty in the UK and in the context of an impending shrinkage in public spending that is likely to call into question the very fundamentals of the NHS. Nevertheless, a number of challenges can be identified for AHSCs.

The first of these is uncertainty about the extent to which policy-makers will actively support the idea of AHSCs in the UK context in the future. Darzi changed a long history of indifference towards the idea of the Academic Health Centre in the UK but this may be seen to have been only a brief discontinuity as he resigned as a minister after only two years in mid 2009. A further challenge for AHSC is the 'alphabet soup' created by multiple government initiatives: AHSCs, BRCs, CLAHRCs, HIECs have all been mentioned and to these we might add further initiatives more targeted at NHS/academic research/industry interaction, such as the recent call for 'Therapeutic Capability Clusters' (TCCs). What all of these initiatives have in common is that they require the UK's best universities to work in collaboration with the NHS to produce health and economic gain. The challenge for AHSCs is to integrate these initiatives in operation and to

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develop a communications strategy that presents them in a seamless, accessible and persuasive manner to a range of audiences. AHSCs also need to decide whether they wish to do this collectively as the elite club defined by the government through the designation process, or whether they wish to adopt a more inclusive approach to NHS-University partnerships so as to engage a larger constituency in defending academic medicine in an era of austerity. Finally, it is by no means clear that the legitimacy of greater university influence over NHS affairs is universally accepted and, indeed, it could be argued that this principle is in conflict with the Foundation Trust model of governance, which assumes that the public and patients should have the dominant voice.

5. The case for France

In France the situation develops in the direction of Hospital Institutes becoming a driving force applied to biomedical research and healthcare.

To reach this position €850m are anticipated to finance a maximum of five so called 'University Hospital Institutes(UHI)' which also actively participate in the industrial innovation by increasing its links with private research.

The UHIs fall within the governmental investment priorities such as the following programmes: 'Campus of excellence', 'Laboratories of excellence', 'Institutes for Technological Research', or 'Agencies for the Acceleration of Technological Transfer', financed by the so called 'National Loan' covering postgraduate education and research and representing more than €21bn.

A certain number of structuring elements have already been defined leading to biomedical Centres of Excellence or 'University Hospital Institutes' which should:

- be limited to a number of five maximum,
- provide a level of international excellence in terms of patient care, research and education,
- be shaped around internationally recognised talents and allow to attract the best experts,
- be organised around a single-themed coherent scientific project,
- be located within University Hospitals, on a single site or within a restricted geographical location,
- be designed following a competitive call for applications (in a single or two-fold stage) leading to a stringent selection of the best projects in the most strategic areas by an international jury,
- benefit of a specific status allowing to attract and retain the best international talents and simplify the partnerships between research and the Industry for a sufficiently long period of time,
- integrate the objective of technological transfer, which implies close relationships with industrial partners,
- include a partnership with a systematic co-funding by the private sector, and potentially by the local authorities in order to promote the development of the so-called 'translational' and partner research.

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The governance of a UHI will be organised along the following lines:

- A UHI will have a limited Board of Directors, which will include:
 - the Director of the UHI,
 - a Medical Director, possibly responsible of the hospital department,
 - a Scientific Director supervising research and education and, if need be, a Director in charge of valorisation.
- The UHI will have the status of a 'fondation de coopération scientifique'. The status of the Foundation along with the internal rules and regulations will have to offer the strength and flexibility required to achieve the objectives of the UHI, especially by giving the UHI Director and the Board of Directors a real management autonomy in strategic, financial and managerial matters, and in the defining and application of the UHI project.
- The UHI will have an international Scientific Committee, providing support to the Board of Directors. The international Scientific Committee will forward its recommendations to the administrative board.

Beyond the selection of 5 centres it has been advised that the excellent projects that have not been selected should be offered financial support in the framework of future investment schemes dedicated to higher education, research and innovation.

It is expected that the creation of University Hospital Institutes offers a unique opportunity for France to speed up innovation in the field of (bio)medical technology and in the field of technologies and medical devices. This will without any doubt strongly stimulate economic growth. Furthermore the creation of 5 centres of excellence will initiate a process of cultural change in the French biomedical community as a whole.

6. AHC's economic and societal impact, four LERU members highlighted

In the preceding pages it was shown how important AHCs are for society in terms of provision of high-quality health care, commissioning of research and training of health care professionals. AHCs have also impact in an economic way. In January 2007 the Association of American Medical Colleges (AAMC) published a study from which it appeared that in 2005 the combined economic impact of AAMC members equalled over \$451bn. Although there are no comparable figures for the EU, it is not to be expected that the economic impact of AHCs in Europe would be significantly less than that of their American counterparts. Quantification of the economic and societal impact in terms of the care given to a patient is difficult, because there are no clearly defined criteria to weigh the different social and economic aspects of health care delivery.

It is evident that successful commercial exploitation of research results can have a positive impact on the creation of professional and skilled employment. AHCs are in a position to create highly qualified jobs for professionals in health care and partly also in industry, in a direct and indirect way. Again, it is clear that this influence can hardly be underestimated. It is beyond the scope of this text to elaborate much further in general terms on this issue. However, in the study of the AAMC it appeared that during the year 2005, AAMC members accounted for more than 3 million full-time jobs, meaning that one out of every 48 wage earners in the US labour force works either directly or indirectly for an AAMC member. Again, it is not to be expected that figures for the European AHCs would differ substantially from those reported for the American AHCs.

As noted before, research efforts in an AHC are part of a translational process bringing new knowledge created in the laboratory, and the applications thereof, into clinical practice.

AHC's economic and societal impact, four LERU members highlighted

One way of doing this is by valorisation of the research results thereby creating novel drugs, devices, equipment, software etc. that can be brought to the health care market. An AHC will rarely do this alone but most often in collaboration with a commercial partner via patent licensing or the creation of spin-off companies. Commercialisation results in the generation of additional jobs in industry as well as in the AHCs themselves, since they re-invest their revenue from licensing and participations in spin-offs in their own expanding research activities. Finally, through commissioned research projects, AHCs contribute significantly to the R&D process in industry. The geographic clustering of biotech companies and of R&D facilities of large pharmaceutical companies in the vicinity of AHCs is an indirect illustration of the importance of AHCs for the health care industry.

7. Conclusions

In this paper we aimed to introduce the new academic organisation known as Academic Health Centre, University Medical Centre, Academic Health Science Centre, etc. and to explain its importance in academic medicine. The interrelationship between the three core functions and the resulting synergy warrants the term 'Tripartite mission'.

AHCs have a key role in the development of the healthcare of the future by providing an integrated environment for advanced clinical service, research and teaching. Medical innovation is a process that requires a constant and close interaction between researchers and health care professionals. In principle, this means that hospitals with strong links to comprehensive universities should offer the most suitable environments for innovation. Being close together, however, is not enough to ensure the intense cooperation needed to make true progress. Effective organisational structures, usually mainly through the medical faculty of the university, are equally important. But creating such structures is far from a straightforward task. Universities and hospitals are very different organisations, with different missions and cultures. In many cases, the size of a university hospital, in term of staff and resources, is several times that of the medical faculty of the university it is linked to. The University College London Hospitals NHS Foundation Trust, for instance, is three times the size of UCL's Faculty of Biomedical Sciences in terms of both staff and turnover. The budget of the Leiden University Medical Center is larger than that of the complete University. The situation is further complicated by the fact that medical research is often to a large extent funded by research councils and private parties. Finally, there is the teaching assignment of the medical faculty, for which the university hospital is indispensable too. This all makes a combined university medical centre a highly complex organisation.

The countries mentioned in this paper nevertheless have all recognised and accepted this challenge, but have tackled the issue in different ways.

Conclusions

In France, up to five University Hospital Institutes are being set up, facilitated by the government with €850m. These institutes are to be located within university hospitals, preferably on a single site, and are expected to build close relationships with both industrial partners and the private sector.

It is beyond doubt that these new UHIs will boost research performance in France, not least because of the substantial sum of money made available to these new institutes. Five UHIs, however, may not be enough to unlock the full research potential of the country in the field of (bio)medicine.

LERU, being a network of research-intensive universities, emphasises the importance of education. The intertwining of research and teaching is a precious asset that distinguishes universities from specialised research institutes. Unlike the latter, it allows universities to produce a constant stream of young researchers next to research output. Therefore, LERU feels that the focus on research in UHIs should not result in a subordinate role of teaching.

In England, the above-mentioned differences in missions and cultures between the universities and the hospitals were perhaps most notable. For a long time, these stood in the way of the formation of academic health centres. Recently, however, two organisational models have emerged in the sector of academic medicine. The first model, adopted now by four Academic Health Science Centres, brings a university and several NHS Foundation Trusts under a single board. The partners remain separate legal entities, but use the common structure for various purposes like the development of a shared strategy or as bidding vehicles.

The other model is a quasi-merger of the medical faculty of a university and its university hospital. The organisations remain separate legal entities, but their governance is structurally integrated under a single leadership.

Conclusions

The Dutch model, which is now adopted by all university-university hospital pairs in the Netherlands, is similar to the English quasi-merger model. The university hospital and the corresponding medical faculty are governed by a single board that is responsible for research, teaching and patient care. All staff is employed by the University Medical Centre; some staff members are seconded to the Faculty of Medicine for assignments for which the university is primarily responsible, in particular teaching. In practice, however, the organisation functions as a single unit. The board of the UMC not only supervises all activities, but is also in control of the total budget, regardless of its source: various government ministries, research organisations and private partners.

In LERU's opinion, teaching at a research-intensive university should be constantly informed by research. In addition to that, a clinical environment is essential in the field of medicine. For that reason, teaching, research and patient care have always maintained a close relationship. LERU advocates formalising that relationship by creating strong administrative links, since that seems to be an obvious way forward to increase the efficiency and the effectiveness of the organisation as a whole. The precise form of such links, as is illustrated by the examples given in this paper, may depend on local circumstances, law, traditions, culture etc. LERU is convinced that these new organisations offer unique environments in which excellence can thrive, and hopes that the examples given in this paper may serve as an incentive to establish similar structures elsewhere.

LERU was founded in 2002 as an association of research-intensive universities sharing the values of high-quality teaching in an environment of internationally competitive research. The League is committed to: education through an awareness of the frontiers of human understanding; the creation of new knowledge through basic research, which is the ultimate source of innovation in society; the promotion of research across a broad front, which creates a unique capacity to reconfigure activities in response to new opportunities and problems. The purpose of the League is to advocate these values, to influence policy in Europe and to develop best practice through mutual exchange of experience.

LERU publishes its views on research and higher education in several types of publications, including position papers, advice papers, briefing papers and notes.

All LERU publications are freely available at www.leru.org.

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