Annexes Final

Health Technology Scenarios and Implications for Spectrum

Health Socio-Economic Study; Technology Scenarios Development - ANNEXES

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# Health Technology Scenarios

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1 Annex A – Situation Analysis

1.1 Overview
The situation analysis summarises our current understanding of the UK health sector and forms the basis for our generation of future healthcare scenarios for the development of the healthcare sector. It provides a description of the current state of the health industry, identifies current trends in healthcare provision, and details how technology (both wireless and non-wireless) is currently employed in the health sector. In undertaking this report, we have worked closely with key stakeholders in the health industry (see list in annex B) to ensure that our construct of the health sector is broadly recognised and agreed.

1.2 Scope
This document forms the basis of our understanding of the current situation, upon which we have built and iterated our scenario developments. As such, it is intended to be a broadly descriptive document. Any argument or further interpretation therefore falls outside of the scope of this report.

For the purposes of this report we take a broad definition of the current health situation in the UK, giving a high-level overview of need, utilisation and provision of health care. The structure of the document is organised according to different aspects and forces affecting the healthcare sector:

- Policy and funding, sections 3 and 4, explain the external factors which affect provision of health care in the UK. In the case of the National Health Service, these factors tend to be controlled by the government, while the independent sector is more affected by consumer demand.

- Health status of population, section 5, describes the types and prevalence of ill-health which often require medical treatment. Health problems which go largely unreported, including minor ailments such as colds, fall outside of the scope of this report as they tend to be treated at home by the individual and do not have a significant impact upon the health care system.

- Structure of the health system and of the supply chain, sections 2 and 8 respectively, describe the workforce, organisational bodies, and related supplier industries which provide equipment and pharmaceuticals to the health service.

- Provision of health services and social care, sections 6 and 7, explain the delivery of health and social care in the UK. Healthcare provision can be segmented into three tiers of care with additional healthcare provision from other sources - such as home and community-based services – also contribute to the healthcare landscape.

- Healthcare technology, section 9, looks at the applications of ICT, genetic technology and medical technology within the healthcare sector. The scope of this document includes only technologies which are currently used, in development or intended to be usable in the known future. For instance, a new application would only fall within the scope of discussion if it were certain to become available within the next five years.

The bibliography in section 11 provides a full list of the sources that have been used to construct this document.
1.3 Summary situation analysis

1.3.1 Structure of the health system
The National Health Service provides the majority of healthcare in England. The NHS was founded in 1948 on the principle that care should be available to all citizens on the basis of need, not the ability to pay. It cares for people ‘from cradle to grave’, providing routine and planned care, urgent and emergency care, and support for people living with long term conditions. The structure of the health system is highly complex, with the NHS in particular being an amalgamation of over 700 organisations.

1.3.2 Policy
The NHS is funded by the taxpayer and managed by the Department of Health, which sets overall policy on health issues. The Department of Health’s work includes setting national standards and shaping the direction of the NHS and social care services, and promoting healthier living. Devolution has allowed greater divergence in policy making to address local needs and priorities.

1.3.3 Funding
The NHS is free at the point of delivery having been founded to provide healthcare for all citizens, based on need, not the ability to pay. The NHS is funded by the taxpayer and managed by the Department of Health, which sets overall policy on health issues. The budget for the NHS is determined centrally, with 98% of the finance coming from general tax revenues, including national insurance. Less of the UK’s GDP is spent on healthcare than in some other developed countries.

1.3.4 Health status of the population
Over the last 25 years, improvements in survival have resulted in more people living longer and an increasing proportion of deaths occurring in older ages. Life expectancy at birth within the UK now stands at its highest level, 76.6 years for boys, and 81.2 years for girls for the period 2003-05. However, behaviours such as smoking and heavy drinking and increases in obesity and STDs (known risk factors for disease and poor outcomes) are not improving, particularly among young people.

1.3.5 Provision of health services
Health service provision is mainly concentrated into primary care, with GP surgeries usually being the first port of call for patients. There are approximately 10,600 GP surgeries in the UK, and in 2003-04 there were on average 4 GP consultations per person per year. Secondary care in hospitals usually stems from a GP referral. In 2005-06, there were around 14.9 million first outpatient attendances, with a ratio of 2.3 outpatient follow up attendances to every first attendance.

1.3.6 Provision of social care
In England, the responsibility to provide social care services rests primarily with local councils. More than 1.5 million people in England use social services and a similar number work in the sector, through 25,000+ organisations, at a cost to the nation of around £17.5 billion; there are also an estimated six million unpaid carers. People over 65 are the largest group of people using publicly funded social care.

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1 Has the NHS been successful?, Economics of Healthcare
1.3.7 Structure of the health supply chain
The NHS is one of the largest employers in the world. In 2005 it employed 1,366,030 medical and non-medical staff, of which 679,157 were professionally qualified clinical staff. The majority of NHS staff are employed in and around hospitals. Additionally, the independent sector, the pharmaceutical industry and the medical equipment industries contribute significantly both to the economy and to the NHS and health system supply chains.

1.3.8 Healthcare technology
As a federation of more than 700 Trusts, the NHS has many different and inconsistent policies and practices on new technology development, application and purchase. Key types of healthcare technology to consider are ICTEC (Information and communication technology), GENTEC (Genomic and proteomic technologies, gene and antisense therapies) and MEDTEC (Medical devices and biomedical technology). Within the ICTEC category, the National Programme for IT is a particularly high-profile initiative, modernising patient management at an initial cost of £6.2 billion, although this figure is now suggested to be closer to £12.4 billion².

1.3.9 Key challenges
The key challenges which are faced by the health system are structural, administrative, demographic and financial. The complexity of the NHS’ organisational system, the impact of sometimes controversial government policies, the aging and expanding population and the vast cost of providing services - the planned total public expenditure for the Department of Health is £104.077 billion in 2007-2008 – all create significant barriers to success which must be overcome if the health service is to thrive in future.

² The National Programme for IT in the NHS, National Audit Office, 2006
2 Structure of the Health System

2.1 Overview

The National Health Service provides public healthcare in England, supporting people at home, in local surgeries and health centres, and general and specialist hospitals. It cares for people 'from cradle to grave', providing routine and planned care, urgent and emergency care, and support for people living with long term conditions.

It was founded in 1948 and has become an integral part of British society, culture and everyday life. Its policies and strategies are set by the governments and governing bodies in England, Scotland, Northern Ireland and Wales.

The core principle of the NHS is to provide quality care that:

- Meets the needs of everyone
- Is free at the point of need, and
- Is based on a patient's clinical need, not their ability to pay

The NHS in England had a budget of £92 billion for the period 2007-08 and employs 1.3 million people, 5.44% of the working population of England.

The private sector provides services for self-pay and insured individuals, and provides some services for the NHS. The majority of services provided to the NHS by private and voluntary organisations are in mental health and long term care, although increasingly also in planned hospital care, as part of continued efforts to reduce NHS waiting times.

2.2 Structure of the NHS in England

The organisational structure of the NHS is akin to a federation, consisting of more than 700 different bodies, often with different and inconsistent policies and practices. The NHS has experienced numerous structural reorganisations over recent years, reflecting successive governments’ attempts to improve quality and value for money, and to meet rising public expectations.

The following diagram illustrates how the NHS organised and managed in England, with the Department of Health setting overall policy and guidance for the health service. Care is delivered by Health Trusts, governed by Strategic Health Authorities, which provide geographic decentralisation. Care Trusts are broadly classified into primary and secondary, depending on when the nature of care they deliver to the patient.

\[\text{3 NHS Core Principles, NHS Choices, July 2000}\]
\[\text{5 NHS Staff 1995-2005 NHS Information Centre, April 2006}\]
\[\text{7 The Use of New Medical Technologies within the NHS, 2005}\]
Strategic Health Authorities (SHA)

The SHAs oversee all NHS activity within the area for which they are responsible. There are 10 SHAs in England: East of England, East Midlands, London, North East, North West, South Central, South East Coast, South West, West Midlands and Yorkshire & Humber.

Strategic Health Authorities are responsible for:

- developing plans for improving health services in their local area
- ensuring local health services are of a high quality and are performing well
- increasing the capacity of local health services - so they can provide more services
- ensuring national priorities - for example, programmes for improving cancer services - are integrated into local health service plans

SHAs oversee activities of NHS Trusts which are responsible which are for providing healthcare services.

Primary Care Trusts

Primary Care Trusts are responsible for public health, providing primary - and commissioning secondary - healthcare for their populations. PCTs provide a range of community health services; including funding for GPs and medical prescriptions; but the majority of their budget is used to commission hospital and mental health services from appropriate NHS Trusts or from the private sector.

England has 152 Primary Care Trusts (PCTs), each responsible for an average population of just fewer than 330,000 people. The objectives for each PCT are set by its Strategic Health Authority.

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8 Authorities and Trusts, NHS Choices, July 2007
9 Authorities and Trusts, NHS Choices, July 2007, and Department of Health
Secondary Care Trusts
Primary Care Trusts commission Secondary Care Trusts to provide different forms of Secondary Care. Emergency and Urgent Care may be provided by both Primary and Secondary Care Services, depending on circumstances. Some care, for instance in the case of social care, may be provided by both the Secondary Care Trust and the Local Authorities. The different Secondary Care trusts provide a range of services:

NHS Trusts
NHS Trusts, sometimes known as acute trusts, are responsible for the management of general and specialist hospital services on one or more hospital sites. Some acute trusts are regional or national centres for more specialised care. Some are attached to universities or medical schools and are involved in the training of health professionals. There are 170 NHS acute trusts in England.

NHS Foundation Trusts
NHS Foundation Trusts are a new form of NHS Trust introduced in April 2004, run by local managers, staff and members of the public. Foundation Trusts are given more financial and operational freedom than other NHS Trusts; they devolve decision-making from central government control to local organisations and communities so they are more responsive to the needs of the local population. It is the intention that in due course all NHS Trusts should achieve Foundation status. Foundation Trusts remain within the NHS and its performance inspection system.

There are now 70 Foundation Trusts in England. Foundation Trusts possess three key characteristics that distinguish them from other NHS Trusts:

- Freedom to decide locally how to meet their obligations
- Accountable to local people, who can become members and Governors
- Authorised and monitored by Monitor – the independent regulator of NHS Foundation Trusts

NHS Ambulance Trusts
There are currently 13 ambulance services covering England, which provide emergency access to healthcare using ambulances and other vehicles staffed with trained paramedics. In many areas, Ambulance Trusts also provide routine transport for NHS patients.

Care Trusts
Care trusts are organisations that work in both health and social care. They may carry out a range of services, including social care, mental health services or primary care services. Care trusts are set up when the NHS and local authorities agree to work together, usually where it is felt that a closer relationship between health and social care would benefit local care services. Currently few have been set up, but more are planned.

10 Authorities and Trusts, NHS Choices, July 2007
Mental Health Trusts
Mental Health Trusts provide health and social care services for people with mental health problems. Mental health services can be provided through a GP, or other primary care services – this might include counselling and other psychological therapies, community and family support or general health screening. More specialist care is normally provided by mental health trusts or local council social services departments. Services range from psychological therapy, through to very specialist medical and training services for people with severe mental health problems.11

Other Agencies and Services
The NHS also includes national agencies and bodies which provide services both internally and to the patient, such as:

- **NHS Connecting for Health** – an agency of the Department of Health, responsible for implementing new computer systems, services linking GPs and community services to hospitals and maintaining national critical business systems
- **NHS Direct** – a special health authority delivering health advice and information via a 24/7 telephone service, a website and an interactive digital TV service
- **NHS Choices** – a public-facing resource providing authoritative and high quality health information service for patients, the public and health professionals.
- Other bodies providing more specialised national services, such as the National Blood Authority.

Regulators
The NHS is regulated by a number of national bodies, including:

- **The Healthcare Commission** – responsible for assessing and reporting on the performance of both the NHS and independent healthcare organisations to ensure that they are providing a high standard of care
- **Monitor** – the regulator of NHS Foundation Trusts, responsible for ensuring they are well-managed and financially strong
- **The Audit Commission** – the independent auditor of health and other public services, responsible for ensuring that public money is spent economically, efficiently, and effectively.
- **The Medicines and Healthcare Products Regulatory Agency** – an agency of the Department of Health, which safeguards public health by ensuring that medicines and medical products are acceptably safe and effective, and decides which medical devices can be bought by the NHS.

2.3 Professional organisations
The following bodies and organisations are important contributors to healthcare in the United Kingdom, but are not structurally part of the NHS:

- **General Medical Council** – registers doctors to practise medicine in the UK. the GMC’s purpose is to protect, promote and maintain the health and safety of the public by ensuring proper standards in the practice of medicine

11 Authorities and Trusts, NHS Choices, July 2007 and Department of Health
Health Technology Scenarios

- **Nursing and Midwifery Council** – maintains a register of qualified nurses, midwives and specialist community public health nurses, and ensures nurses and midwives provide high standards of care
- **General Dental Council** – regulates dental professionals in the United Kingdom
- **The Medical Royal Colleges** – provide and set standards in clinical practice, education and training, conduct assessments and examinations, quality assure external audit programmes, support doctors in their practice of medicine, and advise the Government, public and the profession on health care issues
- **British Medical Association** – the BMA represents doctors from all branches of medicine all over the UK and has a total membership of over 139,000
- **Royal College of Nursing** – the RCN represents nurses and nursing, promotes excellence in practice and helps shape health policies
- **Royal Pharmaceutical Society of Great Britain** – the professional and regulatory body for pharmacists in England, Scotland and Wales. It also regulates pharmacy technicians on a voluntary basis

### 2.4 The independent sector

In England, the independent sector contributes to the delivery of healthcare in four ways:

- As health insurers (e.g. BUPA, AXA PPP Healthcare, and Standard Life)
- As providers of healthcare services for private self-pay or insured patients (e.g. Nuffield Hospitals, HCA)
- As providers of healthcare services to NHS patients through contractual arrangements with the NHS
- As voluntary organisations that provide healthcare services (e.g. Meals on Wheels, the Salvation Army)

Private health insurance was taken by approximately 12.5% of the UK population in 2007, which included two and a half million people provided with private health care by their employer. The health services provided by the private sector to self-pay and insured individuals are notably more numerous in fields where the NHS tends to operate less frequently, such as elective cosmetic surgery. In 2002-03, the NHS performed 2,701 elective cosmetic surgery procedures, and while no centrally collated statistics on the number of cosmetic surgery procedures carried out in the UK are available, anecdotal evidence suggests that the number of consumers opting for cosmetic surgery (particularly breast augmentation) in the private sector is much larger, and growing.

Private health companies may provide services to the NHS as part of a contracted arrangement. For instance, private health companies are increasingly providing services in planned hospital care as part of continued efforts to reduce NHS waiting times.

The private sector also plays a highly significant role in care homes, 72.9% of all care home places are provided by independent sector providers whereas 12.6% are provided by the NHS and local authorities, and 14.5% are provided by the voluntary sector.

Many voluntary organisations, both local and national, provide health services to individuals, especially in mental health and long term care.

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12. Health Insurance FAQ, healthinsurance.co.uk, July 2007
13. Written Answers, Hansard, June 2004
14. Written Answers, Hansard, April 2001
15. Care of Elderly People, Market Survey, Laing & Buisson, 2006
**Primary Care**

Between 3 and 4% of all GP consultations in Britain are private, which is equivalent to about 10 million private GP consultations a year; a figure which appears to be quite static. There are between 200 and 300 GPs practicing exclusively privately in Britain, primarily concentrated into three areas of London – the West End, Kensington & Chelsea and the City\(^\text{16}\). Statistics on private dentistry are not collected centrally; however, most dentists do a mixture of NHS and private work.

**Secondary and Acute Care**

The value of the independent acute healthcare sector in 2005 (including but not limited to independent hospitals, NHS private treatment and specialists’ fees) was £5.414 billion. In real terms, this represents 7.9% growth in the same year, up from growth of 6.0% in 2004. Independent hospitals accounted for the largest part of the total private acute care sector revenue, generating an estimated £3.616 billion in 2005.

There is believed to be significant overcapacity in the acute independent sector; industry sources estimated that the sector was operating at just over 60% of capacity in 2006. However there has been a lack of consensus as to how uptake and capacity should be measured, so this is not an exact figure\(^\text{17}\).

The top three providers by acute medical and surgical revenue in 2005 were the General Healthcare Group, Nuffield Hospitals and BUPA hospitals respectively\(^\text{18}\).

**General Healthcare Group**

The General Healthcare Group was the market leader in the acute medical and surgical sector in 2005, with a 22.4% share of the independent healthcare market and generated revenues of £612.0 million. The group is part of Netcare (as of April 2005), and operates 49 medical/surgical hospitals with 2 402 beds\(^\text{19}\).

**Nuffield Hospitals**

In 2005, Nuffield Hospitals had a 19.2% share of the independent healthcare market and generated revenues of £523.4 million. As at mid-2006, there were 42 Nuffield Hospitals with a capacity of 1 657 beds.\(^\text{20}\) Nuffield is a not-for-profit charity whose mission statement is to provide safe, affordable and accessible healthcare to private medical insured, self-pay, or NHS patients. Nuffield's Vanguard Healthcare division comprises a fleet of mobile hospitals and operating theatres, which can be hired by the public sector to cut waiting lists and ease pressure on busy hospitals\(^\text{21}\).

**BUPA Hospitals**

In 2005, BUPA Hospitals had a 17.1% market share, generating £468.1 million of revenue. In mid-2006, there were 26 BUPA hospitals in the UK with a total of 1 401 beds\(^\text{22}\), one of which had closed by June 2007 when BUPA sold its 25 remaining private UK hospitals to private equity firm Cinven for £1.4billion\(^\text{23}\).

\(^\text{21}\) Vanguard Healthcare
\(^\text{23}\) BUPA sells hospitals to private equity firm, Guardian, June 2007
2.5 Key structural differences in Scotland

Healthcare policy and funding is the responsibility of the Scottish Executive’s Health Department. The chief civil servant in the Scottish Executive Health Department is also chief executive of NHS Scotland.

NHS Scotland is structured differently to the NHS in England; in place of the Strategic Health Authorities and Care Trusts, there are 14 NHS Boards which are responsible for the planning and provision of all health services in their own area.

In addition, there are a number of Special Health Boards in Scotland:

- NHS 24 - a 24 hour telephone helpline serving Scotland, similar to England’s NHS Direct
- NHS Education for Scotland
- NHS Health Scotland – responsible for public health and health education
- NHS Quality Improvement Scotland
- Scottish Ambulance Service
- State Hospitals Board for Scotland
- The National Waiting Times Centre Board

Additionally the Scottish Executive has set up new bodies called community health partnerships to work more closely with local authorities.

In Scotland, unlike in England where private companies are competing with the NHS to deliver services, boards follow the approach of “additionality”: they are expected to use private sector services (e.g. mobile diagnostic units) only where they provide extra benefit24.

2.6 Key structural differences in Wales

The NHS in Wales is operated and managed by the Health and Social Care Department of the Welsh Assembly which has responsibility for strategic leadership and policy implementation across Wales.

In Wales there are 22 local health boards, equivalent to English SHAs which are coterminous with the local authority boundaries. These were created by the Welsh Assembly to replace the former five health authorities, in order to better integrate health and social care.

There are 14 NHS Trusts in Wales. As well as providing community healthcare services, most are responsible for providing secondary and tertiary healthcare (that is, they run hospitals and deliver healthcare services within the hospital setting). The Welsh Ambulance Services NHS Trust provides ambulance and patient transport facilities right across Wales.

Community Health Councils are statutory bodies which represent the interest of the public and patients. There are currently 20 Community Health Councils in Wales25.

The private sector has a much more limited role compared to England. The private sector has a much more limited involvement in the Health service, for instance, Wales has not, unlike England, undertaken private finance initiative deals to build new hospitals and to create diagnostic and treatment centres26.

24 Can England learn from its neighbours?, Guardian, April 2006
25 Update on the Structure of the NHS in Wales, CAF
26 Can England learn from its neighbours?, Guardian, April 2006
2.7 Key Structural Differences in Northern Ireland

A re-organisation of health services for Northern Ireland was announced in November 2005, as part of the Review of Public Administration (RPA). Under this reform package, a Health and Social Services Authority (HSSA) was set up in place of the existing four Health and Social Service Boards. Under the HSSA there are seven primary-care led Local Commissioning Groups.

Five new integrated Health and Social Service Trusts will replace the 18 existing Trusts, and a Patient and Client Council will be set up to replace the four existing Health and Social Service Councils. In addition there is a single ambulance trust and three support agencies.

Northern Ireland’s restructuring reform is ongoing and is due to be fully completed by April 200827.

27 Department of Health, Social Services and Public Safety
3 Policy

3.1 Role of governmental bodies

Structure

The NHS is funded by the taxpayer and managed by the Department of Health, which sets overall policy on health issues. It is the responsibility of the Department of Health to provide health services to the general public through the NHS and to improve the health and wellbeing of the people of England.

The Department of Health is the government department responsible for the NHS. It is headed by the Secretary of State for Health (Alan Johnson), a Cabinet Minister, who is supported by five junior health ministers. The Ministers work with the Departmental Board and National Clinical Specialists to ensure the Department meets its objectives.

The Departmental Board’s role is to focus on high-level strategy, the most significant risks to the Department, and the overall integrity of corporate governance and decision making systems. The Board is led by three executive members; the Permanent Secretary and Chairman, Hugh Taylor, the Chief Medical Officer, Sir Liam Donaldson and the NHS Chief Executive, David Nicholson.

National clinical directors are experts that each oversee the implementation of a national service framework (policies defining standards for care). The National Clinical Directors advocate the NSFs in the NHS, and represent the NHS in the Department of Health.

Role

The Department of Health’s role is to set national standards and shape the direction of the NHS and social care services, and promote healthier living. The Department of Health is accountable to the public and the Government for the overall performance of the NHS, personal social services and the work of the Department itself.

The Department has seven key objectives:

- Improve and protect the health of the people of England;
- Enhance the quality and safety of services for patients and users;
- Deliver a better experience for patients and users; to improve the capacity, capability and efficiency of the health and social care systems;
- Ensure system reform, service modernisation, IT investment and new staff contracts deliver improved value for money and higher quality;
- Improve the service provided as a Department of State to, and on behalf of, ministers and the public, nationally and internationally;
- Become more capable and efficient in the Department.28

28 Department of Health
3.2 Current policy

Overview

The Labour government places Health and NHS reform high on their agenda. The government has endeavoured to modernise the NHS through a series of reforms, as introduced by the 1997 White Paper, *the New NHS – modern, dependable*. This was followed in July 2000 by the *NHS Plan* of which the guiding principle was the creation of a “patient-led NHS”.

According to the *NHS Plan*, a patient-led NHS would see improved patient access through NHS Direct and reductions in waiting times; improved quality of service through the establishment of the Healthcare Commission, NICE and the introduction of clinical governance and National Service Frameworks; modernised buildings through the PFI and NHS LIFT programmes; and modern IT and information systems.

Current policy is governed by the 2006, a White Paper *Our health, our care, our say* which followed a major consultation exercise, and set out key aims for health and social care in Britain, including:

- Better prevention and early intervention for improved health, independence and well-being
- More choice and a stronger voice for individuals and communities
- Tackling inequalities and improving access to services
- More support for people with long-term needs

These reforms have been supported by increases in NHS funding, with spending on the NHS in 2008 set to have nearly tripled from 2002 to over £90 billion. See section 4.1 for more on public funding of the NHS.

Main current policies

Improving access

Reducing waiting times for access to NHS services has been a key government priority for more than a decade, with substantial improvements achieved. In the fourth quarter of 2006-07, there were 700,585 patients waiting for admissions to hospital, compared to over 1.1 million patients waiting in the same quarter ten years before.

The current targets are a maximum waiting time of 13 weeks for an outpatient appointment, and 26 weeks for hospital admission, with much shorter maximum times for access to cancer and certain other specific treatments. The target maximum time for treatment or referral in an Accident and Emergency unit is 4 hours.

The latest target is a maximum of 18 weeks between referral by a GP to the start of treatment, to be achieved by the end of 2008 (this is widely regarded as a very challenging target, and currently only around half of patients are treated within this time limit).

Improving quality

National Service Frameworks (NSFs) are long-term strategies for improving specific areas of care and set out measurable goals within set time frames. The NSFs are set out by the Department of Health and have

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30 Hospital Waiting Times/List Statistics, Department of Health, 2007
31 Inpatient Waiting List 1997-present, Department of Health, 2005
32 Why are we waiting? An analysis of waiting times in the NHS, CIVITAS Institute for the Study of Civil Society, December 2007, link
been published for most of the main care areas, including disease, older people, long term conditions and mental health.

There are several bodies that govern healthcare quality and ensure delivery against agreed national standards:

- **The Healthcare Commission** – Inspects the NHS and independent sector providers of healthcare and reviews performance against a wide range of national targets, standards and indicators
- **The National Institute for Health and Clinical Excellence (NICE)** – Reviews and makes recommendations on the basis of the clinical and cost effectiveness of healthcare interventions (including drugs and other health technologies)
- **Clinical Governance** – assesses the accountability of NHS organisations to ensure that they have the appropriate processes in place to assure the quality of clinical care for patients.

**Improving the estate**

Public-private partnerships are used by the Department of Health to fund hospital building schemes. The two schemes, the Private Finance Initiative (PFI) and NHS LIFT (Local Improvement Finance Trust) have funded a programme of hospital building; since 1997.

The PFI, established May 1997, has funded 28 hospital schemes have been completed at a capital value of £2.7bn, with a further 15 schemes with a capital value of £4.5bn under construction. Another 37 schemes with a capital value of £8.9bn have been approved or are currently in procurement.

The NHS LIFT (Local Improvement Finance Trust) Programme was established in 2001 to include private sector property, design and construction expertise in development of the primary care estate. To date, 50 projects have been approved and of these, 44 schemes have reached financial close on their first developments.33

These initiatives are described in more detail in section 4.2

**Improving IT and information services**

The National Programme for IT, NPfIT, was formally established in 2002, with the aim of developing electronic health records for patients and connecting GPs to hospitals. The intention was to replace the fragmented approach to NHS IT with standardised interconnecting systems. The main elements of the programme are:

- **The NHS Care Records Service** – a system of individual electronic health records for patients linked to a national spine through which summary records can be accessed by authorised professionals
- **Choose and Book** – an electronic appointments booking service, allowing choice of hospital and appointment dates and times
- **Electronic Transfer of Prescriptions** – a system to streamline the issue, dispensing and reimbursement of prescriptions
- **N3** – a national broadband IT network for the NHS
- **Picture Archiving and Communications Systems (PACS)** – a storage database for digital images such as MRI scans and x-rays

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33 Public Private Partnerships, Department of Health, February 2008
Health Technology Scenarios

- **NHSmail** – an email system for NHS staff

NPfIT is understood to be the largest IT investment project in the world. Initially estimated to cost £2.3bn, the cost has been revised by the National Audit Office as £12.4billion\(^{34}\) over 10 years although this is an under-estimate of the cost when implementation costs are included. There have been significant delays against target implementation timescales, especially affecting the Care Records Service.

**Improving value for money**

Over the last five years a series of reforms have been introduced to create a more market-based system within the NHS that will provide incentives to improve performance and value for money. The main mechanisms are:

- **Commissioning by PCTs** – PCTs are removed or completely divested from their provider responsibilities and thus as a result have become more focussed on commissioning healthcare services from external providers. A framework contract for independent sector commissioning (the Framework for External Support for Commissioning – FESC) has been drawn up to support PCTs in this commissioning process.

- **Practice-based commissioning** – GPs can form commissioning consortia with devolved budgets from PCTs which enables the local provision of care formerly undertaken in hospital, where appropriate. The process also brings greater professional medical experience to bear on commissioning decisions.

- **Payment by Results** – Hospitals, and other service providers, are paid for their services according to a national dashboard of key performance indicators, including a condition-specific tariff. It is intended to incentivise cost control in the provision of services and places greater focus on quality of care by removing cost and price from the commissioning decision. Similarly, in primary care, the Quality and Outcomes Framework (QOF) has been used to secure service improvements through incentive payments to GPs.

- **Increased diversity of providers** – Independent and third sector providers are encouraged to play a greater role in providing NHS services. The Independent Sector Diagnostic and Treatment Centre Programmes (ISTC, DTC) has commissioned private sector providers on 5-year renewable contracts to provide ‘fast-track’ elective care and diagnostic services both to increase capacity to help reduce waiting times, and to introduce best practice treatment protocols.

- **Patient Choice** – Enables patients to choose which hospital they should be referred to, from a menu which includes local NHS hospitals, national NHS Foundation Trusts and Independent Treatment Centres, and one of 11 independent sector hospital groups.

**Providing care closer to home**

Successive governments have sought to provide a better balance between hospital and locally based care, reflecting a concern that some services provided in hospital could more appropriately – and more economically – be provided at home or in local settings. Several policy changes - such as GP fund holding, Primary Care Groups (and Primary Care Trusts) and sourcing hospital funding through primary care organisations – have proved insufficient to deliver any significant change.

\(^{34}\) Department of Health: The National Programme for IT in the NHS, Department of Health: The National Programme for IT in the NHS, March 2007, link
The case for providing care at home has strengthened - set out in the White Paper *Our health, our care, our say* - notably through developments in technology, increasing concerns about hospital acquired infections. A review of services in London undertaken by the Health Minister Professor Sir Ara Darzi more recently proposed the establishment of a network of ‘polyclinics’, providing a much wider range of services than a conventional health centre including outpatients, urgent care services, minor surgery facilities and greater provision of care in the home.

### 3.3 Future policy

The NHS Next Stage Review, led by Lord Ara Darzi, was launched in July 2007 to advise on how to meet the challenges of delivering health care over the next decade. The final report is due before July 2008.

Following extensive consultation, Lord Darzi published an interim report in October 2007, laying out the core principles for his vision for the NHS:

- **Fair** – equally available to all regardless of circumstances – and making best use of resources;
- **Personalised** – to the needs and wants of each individual, especially the most vulnerable; providing access to the health services most suited to every individual at the time and place of their choice; and with clinicians and individuals working closely together in partnership to improve health as well as treat illness;
- **Effective** – focused on delivering outcomes for patients that are among the best in the world – saving more lives and improving the quality of life;
- **Safe** – giving patients and the public the confidence they need in the care they receive; and
- **Locally accountable** – empowering staff locally to lead change and innovate, ensuring that change is based on the best clinical evidence and meets local needs, with patients and the public consulted to ensure they shape and champion their own local services.\(^{35}\)

#### 3.3.1 Scotland

The current Scottish health policy direction was set out in Professor David Kerr’s 2005 report, *Building a Health Service Fit for the Future* which recommends an NHS that is proactive, modern, safe and embedded in communities. The Scottish Executive’s response, *Delivering for Health*, places emphasis on primary care, managing long-term conditions, treating people close to home and separating, where possible, elective and unscheduled care.\(^{36}\)

#### 3.3.2 Wales

In May 2005 the Welsh Assembly Government (WAG) set out a strategy for the future of health and social care in Wales in the white paper *Designed for Life - Creating World Class Health and Social Care for Wales in the 21st century*. The white paper describes the means by which, by 2015, the people of Wales will benefit from “world class healthcare and social services in a healthy, dynamic country”. The strategy encapsulates the government’s vision of transforming the NHS “from the national illness service it currently is into a truly national health service”, and is underpinned by the following three aims:

- **Lifelong health**
- **Fast, safe and effective services**

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\(^{35}\) 2007 Pre-budget Report and Comprehensive Spending Review, HM Treasury, 2007, [link](#)

\(^{36}\) Delivering for Health, Executive Summary, Scottish Executive, 2005
• World class care\textsuperscript{37}

3.3.3 Northern Ireland

The regional strategy for health and wellbeing, \textit{A Healthier Future}, was published for consultation in December 2004. The strategy is a vision for health and wellbeing in Northern Ireland over the next twenty years and it is intended to give direction for health and social services.

The strategy places a strong emphasis on:

• Promoting public health
• Engagement with people and communities to improve health and wellbeing
• Development of responsive and integrated services which will aim to treat people in communities rather than in hospital
• New, more effective and efficient ways of working through multi-disciplinary teams
• Measures to improve the quality of services
• Flexible plans, appropriate organisational structures and effective, efficient processes to support implementation of the strategy\textsuperscript{38}

\textsuperscript{37} Designed for Life, NHS Wales
\textsuperscript{38} Department of Health, Social Services and Public Safety
4 Funding

4.1 Public

Current economic situation

The NHS is funded by the taxpayer. It is free at the point of delivery and provides healthcare for all citizens.

The budget for the NHS is determined centrally, by the Department of Health, with 98% of its finance coming from general tax revenues, including national insurance[39]. The UK spent 6.94% of Gross Domestic Product, or £82 211 million on public health care in 2004, and a further £13 004 million on private care, totalling 8.04% of GDP. Of the total UK spending on healthcare in 2005 (the most recent data available), which totalled £101 509 million, public funding of the NHS accounted for £88 373 million[40].

However the UK has since then increased healthcare spending. The NHS in England had a budget of £92 billion for the period 2007-08[41].

Despite several recent funding increases, the NHS in England amassed a net deficit of £570 million in 2005-06. However, the health service's finances improved in 2006-07; the NHS repaid earlier deficits and also generated a surplus of over £500 million. It is also expected to generate a similar surplus in the current financial year, which started in April (see chart). It is worth noting that these variances represent significantly less than 1% of the budget.

![NHS net balance per year, £m, England, 1997-2007](chart)

Source: Economist[42], 2007 figure based on forecast

On the other hand, a fifth of all NHS organisations ran a shortfall in 2006-7, though that is down from a third in 2005-06[43].

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[39] Has the NHS been successful?, Economics of Healthcare
[40] OECD, July 2007
[42] Health-service finances: On the mend, Economist, June 2007
[43] Health-service finances: On the mend, Economist, June 2007
Allocation

PCTs are responsible for identifying the health needs of, and securing health services for, their respective communities. Health and social care services may be provided directly or commissioned from care bodies in the voluntary or private sectors.\(^{44}\)

The Department of Health allocates funding to primary care trusts (PCTs) on the basis of the relative needs of their populations. A weighted capitation formula determines each PCT’s target share of available resources, to enable commissioning of appropriate health services according to the population’s need.

PCT revenue allocations are made after the Spending Review. The Department of Health allocated £64 billion to PCTs in 2006-07 and £70 billion in 2007-08; PCTs thus have control of over 80% of the NHS revenue budget.\(^{45}\)

The diagram below shows how NHS resources were allocated for 2006-07:

Disposition of NHS resources, 2006-7:

\(^{44}\) Specific Functions, Department of Health, 2007
\(^{45}\) NHS Allocations, Department of Health, July 2007
Relative UK Healthcare Spending

Since 1997, UK annual economic growth has averaged 6.6 per cent. Since NHS conception in 1948, spending on public healthcare has consistently increased; between 1949/50 and 1999/2000 annual spending on the NHS increased by an average of 3.4 per cent of UK GDP in real terms. By 2005/6, UK health spending had reached projected average spending levels of the EU 15 countries.

EU Healthcare Spending, % GDP, 1960 – 2005 (please note EU data after 2003 is not included due to the enlargement which took place in 2004):

Source: Department of Health Departmental Report\textsuperscript{46}

\textsuperscript{46} Departmental Report 2007, Department of Health, May 2007
However, the UK spends a smaller percentage of its GDP on healthcare than some other OECD countries; a report by the US Congressional Research Service ranked the UK as 16th in terms of the percentage of GDP spent on healthcare in 2004. The United States, Luxemburg and Switzerland were ranked as the top three spenders on healthcare. The USA spent 15.34% of GDP, or $1,791,876m and France spent 10.54% of GDP, or €173,878m, while the UK spent 8.1% on healthcare.

Furthermore, US healthcare is largely paid for through insurance with premiums being paid by companies; this structure may well inflate the cost and thus percentage of GDP spent on healthcare.

### 4.2 Combined funding

**Foundation Trusts**

Foundation trusts—hospitals with greater financial freedom—made efficiency gains of 3% in 2006-07.

NHS Foundation Trusts NHS Trusts with greater financial freedom, generate most of their income through services commissioned by PCTs. Foundation Trusts have more power to manage their own budgets to shape the healthcare services they provide to better reflect local needs and priorities.

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47 Health and Ten Years of Labour Government, Kings Fund, 2007
48 U.S. Health Care Spending: Comparison with Other OECD Countries, Congressional Research Service, September 2007, link
49 OECD Health Data interpreting Office of National Statistics data
50 Health-service finances: On the mend, Economist, June 2007
NHS Foundation Trusts also have the freedom to retain surpluses, invest in the delivery of services and access a wider range of options for capital funding based on ability to service borrowing. These freedoms are balanced by safeguards designed to ensure that NHS Foundation Trusts treat NHS patients according to NHS principles and standards\textsuperscript{51}.

**PPPs**

There are two main forms of public-private partnerships used by the Department of Health: the NHS Local Improvements Finance Trust (LIFT) and the Private Finance Initiative (PFI).

**NHS LIFT**

NHS LIFT is a vehicle for improving and developing frontline primary and community care facilities. LIFT companies are set up as a joint venture between local PCTs, the Department of Health and a private sector partner appointed through a competitive process. NHS LIFT allows PCTs to invest in new premises in new locations, working in partnership with private sector property and funding partners. Its aim is to provide patients with modern integrated health services in high quality, fit for purpose primary care premises.

Joint venture companies (collectively known as LIFTCos) are established between the Department of Health (Partnerships for Health agency), local PCTs and a private sector partner. The private sector partner is appointed on the basis of expertise by a competitive process. In such a development, the LIFTCo purchases the site, designs and constructs the required facilities within an agreed affordability limit, and then leases the facility back to the PCT usually on a 25 year RPI-linked lease, which includes responsibility for lifecycle and maintenance costs.

To help launch LIFT, £210 million of central funding was made available to PCTs to support the cost of improved services. The first tranche of schemes represents investment of around £1 billion. To date, 50 projects have been approved and of these, 44 schemes have reached financial close on their first developments\textsuperscript{52}.

**PFIs**

The private finance initiative (PFI) provides a way of funding major capital investments, without immediate recourse to the public purse. In healthcare, PFI has been largely used to build new hospitals and run non-clinical services such as facilities management (FM), cleaning and catering. Private consortia, including large banks, construction firms and FM firms are contracted to finance, design and build new hospitals. Contracts typically last for 30 years, during which time the building is leased by a public authority\textsuperscript{53}. Most new hospitals built in the UK since 1997 have employed this funding model.

**Private**

In 2005, the most recent year for which complete data is available, the UK spent 1.1% of its GDP on private healthcare, a total of £13 136 million\textsuperscript{54}.

\textsuperscript{51} Policy and Guidance: Foundation Trusts, Department of Health, February 2007

\textsuperscript{52} Public Private Partnerships, Department of Health, February 2008

\textsuperscript{53} Private Finance Initiatives, Department of Health, 2007

\textsuperscript{54} OECD, July 2007
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Insurance
The volume of demand for private medical insurance in the UK has been decreasing since 2000; at the end of the calendar year 2005, there were an estimated 6.536 million people in the UK (including dependents) with private medical insurance, 10.9% of the population – down from 11.7% in 2000. A further 997 000 people are covered by self-insured medical expenses schemes (via their employers); thus the total penetration of private medical insurance is 12.5% of the population. In 2005, £3.156 billion was spent on private medical insurance in the UK, and benefits paid to policyholders totalled £2.432 billion.55

Self pay
In 2005, an estimated 19% of independent medical/surgical hospital revenue was derived from self-paying British patients, with cosmetic surgery and obesity surgery representing the largest areas of the market.56

For further details on the independent sector refer to section 2.4

4.3 Key funding differences in Scotland, Wales and Northern Ireland

Scotland
Scotland spends more on the NHS than England. In 2003-04, Scotland spent £1 456 per capita, compared to £1 225 in England and £1 345 in Wales.57

Wales
Wales has not increased private involvement in its Health service and thus has not engaged in private finance initiative deals to build new hospitals; the three current build projects will be publicly funded. In Wales, the debt for the 2005-06 financial year was more than £70 million, or 0.5% of the total budget.58

Northern Ireland
In Northern Ireland, the Department of Finance and Personnel allocates budget to the Department of Health, Social Services and Public Safety which were £610 million in 2006-07 and £654 million in 2007-08.59 The Department will realise total annual efficiencies of £239.2 million by 2007-08 of which at least £124.2 million will be resource releasing.

57 Public Finances: Can England learn from its neighbours?, Guardian, April 2006
58 Public Finances: Can England learn from its neighbours?, Guardian, April 2006
59 Budget 2006-08, NI Department of Finance and Personnel, April 2006
5 Health Status of the Population

5.1 Overview

This section seeks to outline the health of the UK population as a whole and highlight differences between England, Scotland, Northern Ireland and Wales, for key health indicators such as life expectancy and obesity prevalence.

Over the last 25 years, improvements in survival have resulted in more people living longer and an increasing proportion of deaths occurring in older ages. However, there remain substantial social and geographical variations in health status, with people who are disadvantaged in terms of their educational, employment and socio-economic background having higher rates of reported poor health and limitations in daily activities.

Trends in behaviour such as smoking and heavy drinking and increases in obesity and sexually transmitted diseases which are known risk factors for disease and poor outcomes are not improving, particularly among young people60.

Life expectancy at birth within the UK has been increasing and now stands at its highest level, 76.6 years for boys, and 81.2 years for girls for the period 2003-5. The increase in life expectancy among older adults has been particularly dramatic in recent years. Between 1980-82 and 2003-05 life expectancy at age 65 in the United Kingdom increased by 3.7 years for males and 2.5 years for females. There is however significant regional variation within the UK, with England having the highest life expectancy and Scotland the lowest:

<table>
<thead>
<tr>
<th></th>
<th>At birth</th>
<th>At age 65</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>England</td>
<td>76.9</td>
<td>81.2</td>
</tr>
<tr>
<td>Wales</td>
<td>76.3</td>
<td>80.7</td>
</tr>
<tr>
<td>Scotland</td>
<td>74.2</td>
<td>79.3</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>76.0</td>
<td>80.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>76.6</td>
<td>81.0</td>
</tr>
</tbody>
</table>

Source: Office of National Statistics61

There are also variations within regions and even within cities; for example in London, travelling east from Westminster to Canning town, each tube stop on the Jubilee Line represents on average nearly one year of life expectancy lost62.

Healthy life expectancy in the UK, the number of years in full health that a newborn can expect to live based on current rates of ill-health and mortality, was 69 years for men and 72 years for women in 200263.

In the 2001 Census, 40.3 million people living in the UK rated their general health as ‘good’ and a further 13 million rated it as ‘fairly good’. These 53.3 million people represent over 90% of the total UK population while

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60 Focus on Health, Office of National Statistics, 2006
61 Life expectancy at 65 reaches record level, Office of National Statistics, November 2006
62 Analysis by London Health Observatory using Office for National Statistics data
63 Healthy life expectancy, World Health Organisation, 2002
just 9% (or 5.5 million people) rated their health over the last year as ‘not good’. Children (aged 0–15) had the highest rate of ‘good’ general health at over 91%, with an additional 8% with general health rated ‘fairly good’.

Rates of ‘good’ health decrease steadily with age with corresponding increases in rates of ‘fairly good’ and ‘not good’ health:

Source: Focus on Health

The 2001 Census also showed a steady increase in rates of limiting long-term illnesses (an illness, health problem or disability which limits activities or work) with age for both males and females:

Source: Focus on Health
5.2 Mortality

The death rate in 2001 was as follows:

<table>
<thead>
<tr>
<th>Deaths by sex and age, UK, 2001</th>
<th>Under 1</th>
<th>1-14</th>
<th>15-44</th>
<th>45-64</th>
<th>65-84</th>
<th>85 and over</th>
<th>Number of deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.7%</td>
<td>0.3%</td>
<td>4.9%</td>
<td>16.6%</td>
<td>57.2%</td>
<td>20.4%</td>
<td></td>
<td>286,757</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5%</td>
<td>0.2%</td>
<td>2.3%</td>
<td>9.8%</td>
<td>46.9%</td>
<td>40.4%</td>
<td></td>
<td>315,510</td>
</tr>
<tr>
<td><strong>Persons</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.6%</td>
<td>0.3%</td>
<td>3.5%</td>
<td>13.0%</td>
<td>51.8%</td>
<td>30.8%</td>
<td></td>
<td>602,267</td>
</tr>
</tbody>
</table>

Source: Focus on Health66

Circulatory diseases (which include heart disease and stroke) have been the most common cause of death in England and Wales for the last 90 years amongst both males and females. The death rate from circulatory disease is higher in males than in females, the rate in 2003 stood at 300 per 100,000 males and 190 per 100,000 females. Within these, death rates from heart disease were higher than those from strokes.

Cancers are the second most common cause of death among males and females. The table provides a more detailed breakdown of cause of death:

<table>
<thead>
<tr>
<th>Selected causes of death, by sex and age, England and Wales, 2003</th>
<th>Rates per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0-14</td>
</tr>
<tr>
<td><strong>Males</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>2</td>
</tr>
<tr>
<td>Cancers</td>
<td>3</td>
</tr>
<tr>
<td>Injury and poisoning</td>
<td>4</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>2</td>
</tr>
<tr>
<td>Circulatory diseases</td>
<td>1</td>
</tr>
<tr>
<td>All causes</td>
<td>20</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>2</td>
</tr>
<tr>
<td>Cancers</td>
<td>3</td>
</tr>
<tr>
<td>Injury and poisoning</td>
<td>3</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>1</td>
</tr>
<tr>
<td>Circulatory diseases</td>
<td>1</td>
</tr>
<tr>
<td>All causes</td>
<td>17</td>
</tr>
<tr>
<td><strong>All</strong></td>
<td></td>
</tr>
<tr>
<td>Respiratory diseases</td>
<td>2</td>
</tr>
<tr>
<td>Cancers</td>
<td>3</td>
</tr>
<tr>
<td>Injury and poisoning</td>
<td>3</td>
</tr>
</tbody>
</table>

66 Focus on Health, National Statistics, 2006
66 Focus on Health, National Statistics, 2006
Mortality rates by cause of death vary with age and sex. In 2003, for young people aged 15 to 29, mortality rates were highest for injury and poisoning (40 per 100,000 population for men and 10 per 100,000 for women).

In adults aged 30 to 44, the major cause of death differed for men and women. Injury and poisoning was the leading cause of death for men (43 per 100,000 population) and cancers the leading cause of death for women (30 per 100,000 of the population).

In adults aged 45 to 64, cancers were the leading cause of death among both men and women, with mortality rates of 240 per 100,000 for men and 213 per 100,000 for women. Injury mortality rates among men aged 45 to 64 were lower than for those aged 15 to 29 and 30 to 44.

In older people aged 65 to 84, circulatory diseases were the leading cause of death, for both men and women, although rates for all the causes shown in the table were higher than those at younger ages. The highest mortality rates were in people aged 85 and over, with circulatory diseases having the highest mortality rates, followed by respiratory diseases and cancers.

5.3 Morbidity

Chronic Heart Disease

The term CHD covers a number of specific conditions that include myocardial infarction (heart attack) and angina. In the 2003 sample the rate more than doubled for men in Great Britain aged 65–74 (184 per thousand population), compared to those aged 55–64 (84 per thousand population). The corresponding rates for women were 124 and 56, respectively.

Source: Office of National Statistics \(^67\)

\(^67\) Circulatory diseases - leading cause group, National Statistics, 2006

\(^68\) Focus on Health, National Statistics, 2006
Coronary heart disease accounts for about one in five deaths in men and one in six deaths in women. In addition, the British Heart Foundation estimate that there are over 1 million men living in the UK who have or have had angina (heart-related chest pain), and over 840 000 women.

Cancer

Cancer is a major cause of morbidity and mortality in England and Wales. One in three people are diagnosed with cancer during their lifetime, and one in four people die from cancer. All cancers are now the second most common cause of death among males and females, after circulatory diseases.

In England and Wales in 2001, there were around 240 000 newly diagnosed cases of malignant cancer: 120 400 in males and 119 500 in females. The directly age-standardised incidence rate of all cancers was about 400 per 100 000 population in males and 340 per 100 000 in females. Cancer is, however, predominantly a disease of older people:

Source: Focus on Health^{69}

In 2003, cancer accounted for about 28% of all deaths in males and 23 per cent in females. The age-standardised mortality rate from cancer was about 220 per 100 000 in males and 160 per 100 000 in females. The pattern of age-specific mortality was broadly similar to that for incidence, increasing steeply with age:

Source: Focus on Health^{70}

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^{69} Focus on Health, National Statistics, 2006
^{70} Focus on Health, National Statistics, 2006
Mortality from all cancers, by age at death and sex, England and Wales, 2003

The most common causes of cancer death in 2003 were lung, prostate and colorectal cancer in males, and breast, lung and colorectal in females. Together these cancers accounted for 48% and 45% of all cancer deaths in males and females, respectively.

**Hypertension**

Hypertension, also known as high blood pressure, occurs when blood is forced through the arteries at an increased pressure. Hypertension has a similar prevalence pattern to CHD as far as age is concerned but generally it is more common in women than in men. In 2003 the condition was found to be more prevalent in women for every age group except the 45–54 group:

Source: Focus on Health\(^{71}\)

\(^{71}\) Focus on Health, National Statistics, 2006

\(^{72}\) Focus on Health, National Statistics, 2006
COPD

Chronic obstructive pulmonary disease is the medical term for chronic bronchitis once the damage to the lungs results in airflow restriction.

The prevalence pattern is similar to that for CHD and stroke but the rates are much lower than those for CHD: COPD rates were 14 or less for all age groups under 65 in Great Britain. The male rate for both the age groups over 64 was 28 per thousand of the population. For females the highest prevalence, 19 per thousand, was found among women aged 65–74, followed by a fall to 13 per thousand for the oldest age group. Smoking is the most important cause of COPD but air pollution and allergy can also exacerbate the condition. COPD accounts for about 7% of all working days lost due to sickness\(^7^3\).

Diabetes

Diabetes is a condition where the blood sugar level is higher than normal. There are two main types: type 1, which usually onsets in youth, and type 2, usually seen in adults over 40 and the overweight. Type 2 Diabetes often has few symptoms in the early stages and it is estimated that up to half of those with the disease are as yet undiagnosed.

The disease is generally more common among males than females and its prevalence increases with age. In 2006 its prevalence was estimated as follows:

<table>
<thead>
<tr>
<th>Diabetes prevalence, by country, 2006</th>
<th>Prevalence</th>
<th>Number of people</th>
</tr>
</thead>
<tbody>
<tr>
<td>England</td>
<td>3.60%</td>
<td>1,891,000</td>
</tr>
<tr>
<td>Northern Ireland</td>
<td>3.06%</td>
<td>55,000</td>
</tr>
<tr>
<td>Scotland</td>
<td>3.40%</td>
<td>165,000</td>
</tr>
<tr>
<td>Wales</td>
<td>4.10%</td>
<td>127,000</td>
</tr>
<tr>
<td>UK</td>
<td>3.54%</td>
<td>2,238,000</td>
</tr>
</tbody>
</table>

Source: Diabetes UK\(^7^4\)

Diabetes is a major issue, with 9% of the NHS budget spent on treating diabetes and its complications; this is expected to rise to 10% by 2011\(^7^5\).

Stroke

A stroke occurs when the blood supply to the brain is disturbed in some way. As a result, brain cells are starved of oxygen causing some cells to die and leaving others damaged.

The condition shows a similar pattern of prevalence to CHD, although the rates are much lower. The 2003 General Health Survey found prevalence rates for stroke of 11 or less per thousand of the population for all age groups under 65 in men and women in Great Britain. Beyond the age of 64 rates rose rapidly for both sexes, reaching 37 per thousand for men aged 75 and over and 27 for women in this age group. The after-effects of a stroke vary widely, depending on how much and which part of the brain is damaged. However it

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\(^7^3\) Diabetes Prevalence 2006, Diabetes UK, 2006
\(^7^4\) Focus on Health, National Statistics, 2006
\(^7^5\) Diabetes: State of the Nations, 2005
is the largest single cause of severe disability in England and Wales with over 250 000 people being affected at any one time.\footnote{Focus on Health, National Statistics, 2006}

### Dementia

Statistics on dementia, of which Alzheimer suffers make up a major part, are available on a European basis and show that 5.4\% of 65+s had dementia in 2001. It is however important to note that prevalence rates of dementia increase massively with age, from 0.9\% amongst 60-64 year-olds in the Euro A region (a group of 25 European countries) to 24.8\% amongst the 85+.\footnote{Global prevalence of dementia: a Delphi consensus study, Lancet, 2005}

In the UK Alzheimer’s affects 741 042 people of those aged 30-94, the vast majority of whom will be over 65.\footnote{Alzheimer Europe}

### Mental health

About a tenth of adults worldwide, an estimated 450 million people, are affected by mental disorders at any one time. The World Health Organisation’s Global Burden of Disease Study (2001) reported that depression, schizophrenia, alcohol-related disorders and bipolar affective disorder (manic depression) were all among the 10 disorders accounting for most years lived with disability.

A 2000 study into the prevalence of mental health problems found that neurotic disorders were more common in women, except for panic disorder which is equally common in men and women. They were most likely to occur in middle age, and were less common in young men and older people:

#### Weekly prevalence of neurotic disorders, by sex, GB, 2000

![Graph showing the prevalence of neurotic disorders by sex.](image)

Source: Focus on Health\footnote{Focus on Health, National Statistics, 2006}

People with ‘personality disorders’ have patterns of behaviour or experience resulting from their particular personality characteristics that differ from those expected by society, and lead to distress or suffering for them or others. In a 2000 study just over one in 20 men and one in 30 women had a personality disorder:

\footnote{Alzheimer Europe}

\footnote{Focus on Health, National Statistics, 2006}
5.5 Risk factors

Smoking

Among adults aged 16 and over in GB, one in four (26%) were cigarette smokers in 2003, with a slightly higher proportion of men (28%) than women (24%):

Source: Focus on Health\(^{80}\)

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\(^{80}\) Focus on Health, National Statistics, 2006
\(^{81}\) Focus on Health, National Statistics, 2006
Deaths in the UK estimated to be attributable to smoking between 1998 and 2002 were twice as high for men than for women; standing at 23% of male deaths and 12% of female deaths. Death rates from smoking were highest in Scotland (26% of male deaths and 14% of female deaths) and lowest in Northern Ireland (21% of male deaths and 10 per cent of female deaths):

Deaths attributable to smoking, by sex and country, 1998-2002

Source: Focus on Health

Drinking

In 2003, three quarters of men and three out of five women in Great Britain had drunk alcohol in the previous week. Men were more likely than women to exceed the daily benchmarks (the advice for men is not to consistently drink more than three to four units per day, and for women two to three units per day) on at least one day during the previous week, 40% of men compared with 23% of women:

Adults drinking more than the recommended guidelines on at least one day last week: by age and sex, GB, 2004

Source: Focus on Health

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82 Focus on Health, National Statistics, 2006
83 Focus on Health, National Statistics, 2006
Drugs

Results from the 2003/04 British Crime Survey show that 12% of people aged between 16 and 59 reported having taken illicit drugs in the last year. Young people aged 16–24 were more likely to have used drugs than older people, with 28% of them reporting using drugs during the last year. Prevalence was far higher among young men (33%) than among young women (23%):

Drug use in the last year, by age and drug type, England and Wales, 2003/04

Source: Focus on Health

Obesity

In recent years the proportion of men and women who are obese or overweight has risen. In 2001 over a fifth of adults in England were classified as obese. This compares with around a sixth in 1993. In 2001, nearly half of men were considered overweight compared with a third of women.

Obesity is responsible for more than 9 000 premature deaths per year in England. Obesity is an important risk factor for a number of chronic diseases such as heart disease, stroke, some cancers, and type 2 Diabetes. A Department of Health publication forecasting obesity predicts that by 2010, if current trends are unchanged, 13 million people in England will be obese.

The most recently available survey estimates for obesity and overweight prevalence in England, Scotland and Northern Ireland illustrate the relatively high level of obesity in the UK. The rates are not directly comparable because the surveys were conducted in different years and obesity prevalence is changing rapidly. However, the figures suggest that English men and Scottish women are most overweight. In all three constituent countries obesity rates are lower for men than for women:

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84 Focus on Health, Office of National Statistics, January 2006
85 Forecasting obesity to 2010, Department of Health, August 2006
Obesity and overweight prevalence estimates (age-standardised), England, Scotland and Northern Ireland

Source: Focus on Health

Obesity, defined as those who were in the top 5% of boys or girls based on 1990 UK BMI measurement, overweight as those who were in the 10% below the top 5%.

**Exercise**

The Chief Medical Officer recommends that all adults (including older people) should achieve a total of at least 30 minutes a day of at least moderate-intensity physical activity on five or more days of the week. Currently less than four in 10 English men (39%) and one in four women (26%) meet these recommendations (age-standardised estimates).

About one in three men (29%) and over one in three women (36%) fall into the sedentary category; that is they engage in activities of moderate intensity for less than 30 minutes a week.

The proportions of adults meeting the physical activity recommendations in Wales were 36% for men and 22% for women (unstandardised estimates). The decreases in physical activity occurring in childhood and adolescence continue into adulthood for both sexes. The proportion of English and Welsh men who meet the physical activity recommendations decreases steadily with age:

| Meeting physical activity recommendations, by country, age and sex, 2003/04 |
|---------------------------------|-----------------|----------------|----------------|----------------|
|                                 | England         | Wales          |                |                |
|                                 | Men             | Women          | Men            | Women          |
| 16-24                           | 53              | 30             | 45             | 25             |
| 25-34                           | 44              | 29             | 45             | 24             |
| 35-44                           | 41              | 30             | 41             | 25             |
| 45-54                           | 38              | 31             | 37             | 25             |
| 55-64                           | 32              | 23             | 32             | 23             |
| 65-74                           | 17              | 13             | 24             | 15             |
| 75+                             | 8               | 3              | 15             | 8              |

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Focus on Health, Office of National Statistics, January 2006
6 Provision of Health Services

6.1 Overview of health provision

Health provision can be segmented into primary (usually local), secondary (typically hospital-based) and tertiary (more specialist) care, with additional home-based, community-based and education-based healthcare provision also representing a significant aspect of the UK health landscape.

Healthcare employment resources in the UK are somewhat scarcer than in other developed countries, notably Germany.

<table>
<thead>
<tr>
<th>Healthcare resources in 2004, per 1,000 of population, in five developed countries</th>
<th>UK</th>
<th>US</th>
<th>France</th>
<th>Germany</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total health employment</td>
<td>33.3</td>
<td>38.0</td>
<td>32.2</td>
<td>46.5</td>
<td>n/a</td>
</tr>
<tr>
<td>General practitioners</td>
<td>0.7</td>
<td>1.0</td>
<td>1.7</td>
<td>1.1</td>
<td>n/a</td>
</tr>
<tr>
<td>Practising dentists</td>
<td>0.5</td>
<td>n/a</td>
<td>0.7</td>
<td>0.8</td>
<td>0.7</td>
</tr>
<tr>
<td>Practising pharmacists</td>
<td>n/a</td>
<td>n/a</td>
<td>1.1</td>
<td>0.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Practising nurses</td>
<td>9.2</td>
<td>n/a</td>
<td>7.5</td>
<td>9.6</td>
<td>9.0</td>
</tr>
<tr>
<td>Hospital beds</td>
<td>4.1</td>
<td>3.3</td>
<td>7.5</td>
<td>8.6</td>
<td>14.2</td>
</tr>
</tbody>
</table>

Source: OECD Health Data 2006

Data for 2004 is used as it is the most recent data which could be obtained across all the countries compared.

6.2 Primary care

Primary care is a community based service that is usually the first, and often the only, point of contact that patients make with the health service. This includes services that play a central role in the local community, such as GPs, health visitors, district nurses, pharmacists, dentists and midwives87. Primary care accounts for around 90% of all contacts with the NHS.

GP practices

The GP practice is one of the first contact points people have with health care services, and provides care throughout people’s lives. GP surgeries offer a range of services including prevention, investigation, diagnosis and treatment. The GP can also refer patients to other health professionals for more specific diagnosis and treatment. There are approximately 10 60088 GP surgeries in the UK, with overlapping local catchment areas.

The clinical services provided by GP practices are now classified into one of three categories: essential, additional or enhanced:

- **essential** services, cover care of patients during an episode of illness, the general management of chronic disease and care for the terminally ill; these services have to be provided by all practices

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87 Primary Care, Department of Health, 2007
88 Removal of patients from GP lists, BMA, April 2005
• **additional** services, such as contraceptive services and child health surveillance, are voluntary, but are provided by most practices

• **enhanced** services, such as minor surgery and childhood immunisations are optional for individual practices, although they have to be provided by primary care organisations (PCOs) in the local area. Not all enhanced services are obligatory.

**In the UK in 2003/04 there were on average four NHS GP consultations per person per year**

Consultations are time-limited in an effort to prevent long delays. The table below shows the average number of NHS GP consultations per person per year, by age and sex, in 2003.

<table>
<thead>
<tr>
<th>Number of consultations per person per year, by age and sex, UK, 2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age group</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td>0 to 4</td>
</tr>
<tr>
<td>5 to 15</td>
</tr>
<tr>
<td>16 to 44</td>
</tr>
<tr>
<td>45 to 64</td>
</tr>
<tr>
<td>65 to 74</td>
</tr>
<tr>
<td>75 and over</td>
</tr>
<tr>
<td>All ages</td>
</tr>
</tbody>
</table>

Source: Department of Health

**In the UK in 2006/07, high levels of patient satisfaction with NHS GPs was reported**

A Department of Health study into patient satisfaction reported that:

• 86 per cent of people reported that they were satisfied with their ability to get through to their doctor’s surgery on the phone

• 86 per cent of people who tried to get a quick appointment with a GP said they were able to do so within 48 hours.

• 75 per cent of people who wanted to book ahead for an appointment with a doctor reported that they were able to do so.

• 88 per cent of people who wanted an appointment with a particular doctor at their GP surgery thought they could do this.

• 84 per cent of people said they were satisfied with the current opening hours in their practice.

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89 Information about local GP services, BMA, June 2007
90 Focus on Health, Office of National Statistics, January 2006
92 GP patient survey: your doctor, your experience, your say, Department of Health, July 2007
Situation in Scotland, Wales and Northern Ireland

The role of the GP practice in Northern Ireland, Scotland and Wales is the same as it is in England. GP consultation figures for Northern Ireland, Scotland and Wales are included in the above statistics.

NHS Walk-in Centres

NHS Walk-in Centres provide easy access to health advice and treatment on a local basis for the general public. These centres are typically open every day of the year (early morning to late evening), and the general public can ‘drop in’ without requiring an appointment.

NHS Walk-in Centres are seen as complementary to local GP and hospital services; the key services which they provide are:

- Information – e.g. about local GPs and local pharmacy services
- Check-ups – e.g. blood pressure checks
- Advice – e.g. on contraception, quitting smoking, joint injuries, exercising
- Treatment – e.g. for hay fever, coughs, colds, stings

Treatment within NHS Walk-in Centres is given by NHS nurses, who are also able to prescribe medications including the pill, painkillers and antihistamines.

There are 73 Walk-in Centres open across England, with a further 15 sites currently being developed in major towns and cities around the country.93

Situation in Scotland, Wales and Northern Ireland

Northern Ireland currently has only one equivalent facility, called a 'health and care centre', but a further 41 are planned to open over the next ten years. There are no NHS walk-in centres in either Scotland or Wales at present.94

Pharmacists

Service overview

Pharmacists, also called chemists, play a key role in providing quality healthcare to patients. Working in the community, primary care and hospitals, pharmacists use their clinical expertise together with their practical knowledge to ensure the safe supply and use of medicines by patients and members of the public.

The primary function of pharmacies is the dispensing of prescription medication – the majority of prescriptions written in the UK are dispensed by community pharmacists95 – but increasingly many pharmacies are used by patients for advice, and retail pharmacies offer a wide range of non-prescription medical items such as dietary supplements, painkillers and cold remedies.

The services that may be available from a pharmacy are: prescription dispensing; emergency contraception; Diabetes testing; blood pressure monitoring; pregnancy testing; truss fittings; incontinence supplies; stoma; needle exchange; oxygen

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93 Health Encyclopaedia, NHS Direct, June 2007
94 Out-of-hours med care, Which?, May 2006
95 Focus on Health, Office of National Statistics, January 2006
Pharmacists can also advise on minor ailments, including minor injuries, allergies and stomach complaints; they can also help patients decide whether to see a doctor.

A pharmacist has to be registered with the Royal Pharmaceutical Society of Great Britain and have worked for at least a year under the supervision of an experienced and qualified pharmacist, either in a hospital or community pharmacy (local chemist's shop).

**Situation in Scotland, Wales and Northern Ireland**

Prescriptions have been free in Wales since 1st April 2007. Statistics are integrated with English statistics.

In Northern Ireland in 2004 (the most recent data available), 27.318 million prescriptions were prescribed for a population of 1.710 million\(^{96}\).

Information on differences in Scotland is not currently available.

**Dentists**

An NHS dentist is a dentist who has agreed with their local PCT to provide NHS dental services. Dentists can choose how much or how little NHS work they do and most do a mixture of NHS and private work. PCTs are responsible for managing and funding local dental services; they are also responsible for urgent and out-of-hours care in the local area.

NHS dentistry is limited to clinical treatment, i.e. that which is necessary to secure and maintain oral health, and dentures. This treatment is free if a patient meets certain exemption criteria, otherwise the treatment will be charged at one of three rates (as of 1 April 2007): £15.90; £43.60; £194.

Cosmetic treatments (e.g. tooth whitening, white crowns on back teeth) must be paid for privately.

As at 30 September 2006, over 28 million patients were seen by an NHS dentist in the last 24 months. This means that for every 1 000 people, 557 patients were seen by an NHS dentist in the last 24 months.

There are 20 285 dentists (performers) on open NHS contracts as at the end of September 2006; that is one dentist (on an open contract) for every 2 486 population\(^{97}\).

At the end of February 2004, 44.3% of adults and 60.7% of children in the United Kingdom were registered with a general dental service (GDS) dentist.

**Situation in Scotland, Wales and Northern Ireland**

In Wales, patients who are under 25 and patients who are 60 and over are entitled to free dental check-ups, but patients who do have to pay are charged at the same rate as in England.

In Northern Ireland, the patient is required to pay 80% of the gross cost of the treatments up to a maximum of £384 (1 April 2007)\(^{98}\).

Information on differences in Scotland is not currently available.

\(^{96}\) Pharmaceutical Statistics, NI Central Services Agency, 2004

\(^{97}\) NHS Dental Statistics for England, NHS Information Centre, November 2006

\(^{98}\) Dental Charges, NI Central Services Agency, April 2007
Opticians

Service overview
Opticians is a general term that covers both optometrists and dispensing opticians. Optometrists carry out sight tests to check the quality of vision and eye health. They look for signs of eye disease which may need treatment from a doctor or eye surgeon and prescribe and fit glasses and contact lenses. Dispensing opticians fit glasses and contact lenses, but do not test eyes. They can give advice on types of lens, such as single-vision or bifocal, and help patients to choose frames.

When patients visit an optician they may have their sight tested by an optometrist or an ophthalmic medical practitioner. These professionals are trained to recognise abnormalities and diseases in the eye, such as cataract and glaucoma. After the sight test the optician will give the patient a prescription and may, where appropriate, offer to fit the patient with spectacles or contact lenses.

In the year to 31 March 2006, there were 9,242 practising optometrists in Great Britain, of whom 6,079 were full time and 3,163 were part-time.

5.32 million sight tests were paid for by Primary Care Trusts (PCTs) in England between April to September 2006.

Situation in Scotland, Wales and Northern Ireland

337 thousand sight tests were paid for by Local Health Boards (LHBs) in Wales in the period April to September 2006.

Family planning clinics
Family planning clinics offer free, confidential advice and information on contraception and sexual health. They can be used by women, men and young people (including the under 16). Patients can refer themselves or be referred by a GP or another health worker.

Clinics provide a range of services, potentially including but not limited to:

- Advice about contraception
- The combined oral contraceptive pill
- Limited supplies of free condoms
- Free pregnancy tests

Some family planning clinics may also offer specialist services such as sexual abuse counselling and vasectomy procedures.

Information on utilisation of family planning clinics is not currently in the public domain.

Situation in Scotland, Wales and Northern Ireland

In Scotland, the website www.dropincentre.co.uk is aimed at teenagers and lists clinics, sexual health advice and other sources of help and information.

The situation in all three regions is broadly the same as in England.
**Polyclinics**

Polyclinics are community clinics that host many different health services, including providing some outpatient services normally found in hospitals, specialist health services, groups and health classes. They effectively represent a bridge between primary and secondary care, providing more specialised health services in a local setting.

Currently numbers of polyclinics are limited, but recent government policy has initiated work on building more, including a planned 150 polyclinics in London, as part of the Darzi plan.

**Situation in Scotland, Wales and Northern Ireland**

A limited number of polyclinics exist in Scotland, Wales and Northern Ireland.

**NHS Direct**

NHS Direct is a 24-hour service providing health information and redirection services to the general public via telephone (0845 4647); internet (www.nhsdirect.nhs.uk); and digital TV (available on Freeview and Sky digital).

The website receives 22 million unique visits per year, and is mainly used by younger people looking up health information; the telephone service receives 6.5 million calls per year, and is increasingly used by people seeking advice on specific health issues\(^9\).

**Situation in Scotland, Wales and Northern Ireland**

In Scotland the service is called NHS 24 and, whilst broadly similar, is designed with the health needs of Scottish people in mind.

6.3 Secondary care

**Hospitals**

Hospitals offer services which cannot be carried out in GP surgeries, such as scans, X-rays and surgery, emergency medicine, intensive care, and a variable range of clinic-based treatments such as cardiology, neurology, antenatal, ear nose and throat (ENT), orthopaedics (including fracture clinics), paediatrics and gynaecology.

Hospitals provide services to three types of patient:

- **Outpatient** – if referred to see a hospital consultant for a specialist opinion, the visit is an outpatient appointment; the patient does not need to stay in hospital
- **Day patient or day case** – if the patient needs a hospital bed for tests or surgery, but does not need to stay overnight for surgery,
- **Inpatient** – if the patient needs a hospital bed because in order to stay in hospital for tests or surgery, the patient will have an inpatient appointment\(^10\).

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\(^9\) Interview with Ronnette Lucraft and Murray Bain, NHS Direct, June 2007

\(^10\) Health Encyclopaedia, NHS Direct, June 2007
Health Technology Scenarios

Patients who need to see a specialist can now choose with their GP where and when they see the specialist from a list of hospitals or clinics. This will include local hospitals, NHS foundation trust hospitals across the country and a number of independent sector treatment centres and hospitals that have been contracted from the private sector to provide services to NHS patients. Criteria for patient choice include: waiting lists, MRSA rates and bus routes. By April 2008, patients will be able to choose from any hospital that meets the standards set by the NHS.

Bed numbers have been falling almost continuously since the 1950s as the NHS becomes better at treating people, meaning patients spend less time in hospital or have treatment at GP surgeries, clinics or even at home. The number of hospital beds in the UK in 2006 was 175,646 with bed occupancy rates at about 85%. In 1984 there were 211,617 hospital beds\(^\text{101}\).

**Secondary care utilisation**

In 2005-06, there were around 14.9 million first outpatient attendances. Of these 8.7 million resulted from GP referral, 1.0 million from referral from an accident and emergency department, 2.5 million from other consultants, and the remainder from other sources\(^\text{102}\).

Overall, there was a ratio of 2.3 outpatient follow up attendances to every first attendance.

Trauma and orthopaedics accounted for the highest proportion of activity with 12 per cent of all attendances:

<table>
<thead>
<tr>
<th>Top 10 causes for attendance</th>
<th>Attended first appointment</th>
<th>Percentage of all attendances</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma &amp; Orthopaedics</td>
<td>2,068,029</td>
<td>12.0%</td>
</tr>
<tr>
<td>General Surgery</td>
<td>1,428,537</td>
<td>7.2%</td>
</tr>
<tr>
<td>Ophthalmology</td>
<td>1,375,152</td>
<td>10.2%</td>
</tr>
<tr>
<td>Gynaecology</td>
<td>1,129,524</td>
<td>5.7%</td>
</tr>
<tr>
<td>Ear, Nose &amp; Throat (ENT)</td>
<td>1,030,348</td>
<td>5.1%</td>
</tr>
<tr>
<td>General Medicine</td>
<td>927,223</td>
<td>6.9%</td>
</tr>
<tr>
<td>Dermatology</td>
<td>788,799</td>
<td>4.8%</td>
</tr>
<tr>
<td>Obstetrics</td>
<td>566,679</td>
<td>3.5%</td>
</tr>
<tr>
<td>Cardiology</td>
<td>548,658</td>
<td>2.9%</td>
</tr>
<tr>
<td>Urology</td>
<td>480,571</td>
<td>3.2%</td>
</tr>
</tbody>
</table>

Source: Hospital Episode Statistics\(^\text{103}\)

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\(^{101}\) BBC News: http://news.bbc.co.uk/1/hi/health/5370336.stm


\(^{103}\) Main specialty: summary 2005-06, Hospital Episode Statistics, 2006
In terms of operations: in 2005-06 there were 6.8 million admissions for operations. The top 10 categories were as follows:

<table>
<thead>
<tr>
<th>Top 10 operations</th>
<th>Admissions</th>
<th>Mean waiting time (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miscellaneous operations</td>
<td>1 062 328</td>
<td>28</td>
</tr>
<tr>
<td>Miscellaneous operations B</td>
<td>1 045 849</td>
<td>25</td>
</tr>
<tr>
<td>Other bones and joints</td>
<td>623 716</td>
<td>134</td>
</tr>
<tr>
<td>Female genital tract associated with pregnancy, birth &amp; puerperium</td>
<td>578 253</td>
<td>17</td>
</tr>
<tr>
<td>Induction and delivery</td>
<td>567 767</td>
<td>31</td>
</tr>
<tr>
<td>Urinary</td>
<td>543 982</td>
<td>61</td>
</tr>
<tr>
<td>Lower digestive tract</td>
<td>521 248</td>
<td>71</td>
</tr>
<tr>
<td>Eye</td>
<td>463 156</td>
<td>73</td>
</tr>
<tr>
<td>Upper digestive tract</td>
<td>431 299</td>
<td>50</td>
</tr>
<tr>
<td>Stomach pylorus &amp; general upper gastrointestinal tract endoscopy</td>
<td>393 551</td>
<td>48</td>
</tr>
</tbody>
</table>

Source: Hospital Episode Statistics

**Situation in Scotland, Wales and Northern Ireland**

In the year March 2005 – March 2006, there were approximately 385 000 acute specialty day case discharges, 390 000 acute specialty routine inpatient discharges and 495 000 acute specialty non-routine (emergency) inpatient discharges in Scotland.

In the same year, there were approximately 4.5 million total outpatient attendances (all specialties) and 1.4 million first outpatient attendances (all specialties) in Scotland.

In Northern Ireland in 2005/2006, 500 223 inpatients were treated in NI hospitals. Of these 342 559 (68%) were ordinary inpatients and the remaining 157 664 (32%) were treated as day cases. Overall there were 8,238 beds available with an 84% occupancy rate. The total number of attendances at NI Accident & Emergency Departments in 2005/2006 was 698 656.

Recent statistics for Wales were unavailable.

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104 Main operations: summary 2005-06, Hospital Episode Statistics, 2006
105 Health Service Provision - Acute Hospital Care, Scottish Executive, March 2006
106 Northern Ireland Hospital Statistics, Department of Health, Social Services and Public Safety, 2006
**ISTCs**

Independent sector treatment centres (ISTCs) are facilities where private companies have contracts with the NHS to run routine booked medical and surgical services. Typically these will involve ‘fast-track’ surgical procedures in orthopaedics, ENT and ophthalmology for patients without other complications. By focusing on the relatively fitter group of patients and a limited scope of specialised service in a dedicated unit, the successful ISTCs are achieving much shorter lengths of stay than the average for all NHS patients.

At 16 February 2006, 21 ISTC schemes were open and a further 11 were scheduled to open over the next 18 months. Over 250 000 patients had been either been treated by or received a diagnostic service from the independent sector\[107\].

### 6.4 Tertiary care

Tertiary care is the third and highly specialised stage of treatment, usually provided in a hospital centre which may not be local. A patient will generally be referred to tertiary treatment through secondary treatment, for example by a consultant in a hospital.

Some examples of tertiary care include:

- Organ transplantation – donation of organs from one person to another. Kidney transplants are most common
- Intensive care – intensive care units (ICUs), also known as critical care units, are located in hospitals and provide treatment and monitoring for people who are in a critically ill or unstable condition
- Growth and puberty disorders – e.g. patients with anorexia nervosa are likely to receive psychological treatments provided by a specialist in psychological treatment for eating disorders

**Number and type of providers**

There are 28 transplant hospitals in the UK.

In 2004 (the most recent data available) there were 218 000 acute care in-patient beds in the UK\[108\], at an average cost per occupied bed day of £924.20. Specialised types of intensive care unit include intensive therapy/care units, burns, neurosurgical, spinal injuries, renal, cardiac, high dependency, paediatric, and two levels of neonatal intensive care\[109\].

**Service utilisation**

Around 50 heart-lung transplants and 650 liver transplants are carried out every year. Approximately 2 700 organ transplants are carried out each year in the UK. More than 7 000 people in the UK are waiting for an organ transplant\[110\].

Intensive care utilisation is less clear but an estimate can be made using available statistics which suggests that utilisation of intensive care services in 2004 was approximately 98.6%\[111\]. (This estimate is based calculating the average number of available acute care in-patient beds from two data snapshots in January and July 2004)

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107 Independent sector treatment centres report, DH, February 2006
108 OECD Health Data 2006
109 Written Answers, Hansard, November 2005
110 Organ Transplant, NHS Choices
111 Hospital Activity Statistics, DH, March 2007
Situation in Scotland, Wales and Northern Ireland

Transplant data for the whole of the UK is discussed above.

The European Observatory on Health Systems and Policies identifies a need for increased for intensive care capacity in Northern Ireland112, and a need for greater coherency in the organisational structure of the provision of tertiary care in Wales113.

In Scotland, the NHS considers one of its primary functions to be tertiary prevention, to reduce the impact or complications of illness, and to provide good quality treatment and care114.

6.5 Health education

Overview

The Department of Health has repeatedly expressed a commitment to improve the health and health behaviour of Britons, particularly emphasising children’s health, nutrition, anti-smoking measures and anti-binge-drinking measures.

A key commitment of the Choosing Health and Our Health, our Care, our Say White Papers was to develop a comprehensive social marketing strategy for health in England. Health-related social marketing is the systematic application of marketing alongside other concepts and techniques to achieve specific behavioural goals, to improve health and reduce inequalities. In December 2006, the National Social Marketing Centre was launched by Caroline Flint, the then Minister for Public Health.

The Department of Health Annual Report 2007 places key emphases on health education, including:

- Children's diet and exercise - National Healthy Schools Programme; a long term initiative that helps young people and their schools to be healthy
- Smoking – various stop smoking services offered
- Alcohol consumption – including campaigns to cut binge drinking and drink driving
- Nutrition - a key feature of the Government's prevention strategy to reduce early deaths from diseases such as cancer and coronary heart diseases is action to improve diet and nutrition; for example the 5 a day campaign promotes consumption of 5 pieces of fruit and vegetables a day115.

Regional variations

Scotland

Health Scotland, NHS Scotland’s health improvement agency, aims to provide leadership and work with partners to improve health and reduce health inequalities in Scotland.

The Scottish diet is often identified as being unhealthy, for example it is high in saturated fat, a key risk factor for heart disease and obesity. The Scottish Diet Action Plan was commissioned by the Food and Health Council of the Scottish Executive in July 2005. A September 2006 report highlighted areas of educational success: an improvement in breastfeeding rates; an improvement in food and diet in schools; support for

113 Health Systems in Transition: the Welsh report, European Observatory, 2004
114 Deprivation: General Discussion and Conclusions, NHS Scotland
115 Departmental Report, Department of Health, May 2007
community food initiatives; and the production of health education resources and marketing campaigns. However there were also areas identified where further improvement was required\textsuperscript{116}.

**Wales**

Health Challenge Wales is the national focus of efforts to improve health and well-being. It recognises that a wide range of factors - economic, social and environmental - have an impact on health, so that action in all these areas can help create a healthier nation. The key themes are smoking, nutrition, fitness, accidents and injuries, alcohol and substance misuse, infections and mental health & well-being\textsuperscript{117}.

**Northern Ireland**

The Northern Ireland Health Promotion Agency aims to make healthy living a priority for people in Northern Ireland. Its website contains information and advice (including links to further, more specific resources) about subjects such as stopping smoking, breast feeding, physical activity, sexual health, nutrition, alcohol and substance misuse and mental health\textsuperscript{118}.

6.6 **Community and home care**

Community care often bridges the gap between primary care and the home.

Examples of community care include:

- Health visitors - a qualified and registered nurse or midwife who has undertaken further training in order to visit patient’s at their homes, for example to monitor babies’ progress or to assist older people with tasks they can no longer manage on their own, such as cooking, cleaning or washing
- Community matrons - experienced nurses who use case management techniques to help patients requiring very high intensity use of healthcare

**Situation in Scotland, Wales and Northern Ireland**

Community care in Scotland, Wales and Northern Ireland is broadly the same as in England.

6.7 **Public safety**

**Pandemics**

The risk of an outbreak of avian or seasonal influenza in the UK has led the government to produce a national framework for responding to an influenza pandemic, providing strategic guidance for healthcare professionals in identifying and responding to a pandemic\textsuperscript{119}.

**The Health Protection Agency**

The Health Protection Agency (HPA) is an independent body that plays a critical role in protecting people from infectious diseases and in preventing harm when hazards involving chemicals, poisons or radiation
occur. The HPA also prepares for new and emerging threats, such as a bio-terrorist attack or virulent new strain of disease\textsuperscript{120}.

\textsuperscript{120} Health Protection Agency
7 Provision of Social Care

7.1 Overview

Provision

The term 'social care' covers a wide range of services, which are provided by local authorities and the independent and voluntary sectors. Social care comes in many forms, such as care at home, in day centres or by way of residential or nursing homes. The term also covers services such as providing meals on wheels to the elderly, home help for people with disabilities and fostering services.

Social care services are normally run by local councils, sometimes in conjunction with local NHS providers and organisations. Many councils often work together to run social care services. A limited number of care trusts (see section 7.5) have been set up, which look to bring together health and social care.

In England, the responsibility to provide social care services within the NHS rests primarily with local councils. Social care services also make a major contribution to tackling social exclusion, an important focus of government policy.

In England, more than 1.5m people use social services and around the same number work in the sector, through 25,000 plus organisations: public, private and voluntary. This cost the nation around £17.5 billion in 2005. There are also an estimated six million unpaid carers. (Some of the main groups using the services include children or families who are under stress, people with disabilities, people with emotional or psychological difficulties, people with financial or housing problems and older people who need help with daily living activities.

People over 65 are the largest group of people using publicly funded social care and this group is predicted to grow in size as people live longer and rates of diseases connected to ageing, such as Alzheimer's, increase.

Regulation

The Commission for Social Care and Inspection inspects and reports on adult social care services in England.

The General Social Care Council (GSCC) is a public body which has responsibility for registering and regulating Social Workers and Social Care Workers in England. Its responsibilities include setting and promoting high standards of social care, and ensuring that all workers in the Social Care sector adhere to high professional standards.

It has three sister organisations which have similar responsibilities in the other parts of the United Kingdom; these are the Scottish Social Services Council (SSSC), the Care Council for Wales (CCW) and the Northern Ireland Social Care Council.

A major responsibility of the GSCC and other councils is the maintenance of a professional register of Social Workers. Since April 2005, it is required by law that social workers require formal qualifications, must re-

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121 The Guardian, 2005, [link](#)
122 Focus on Health, National Statistics
123 Commission for Social Care and Inspection
register every three years and undertake a certain amount of professional training each year. In this way the GSCC hopes to raise the standards and reputation of the social care workforce. The Government’s vision for social care is set out in the White Paper *Our Health, Our Care, Our Say* which is described in section 3.2.

**Classification**

Services provided through local authorities are broadly classified in terms of residential/nursing care; domiciliary care (support for people in their own homes), and day care (services and activities which are available to support people in other settings)\(^{124}\).

The following sections details types and examples of social care provision.

### 7.2 Formal care

#### Residential care

A ‘care home’ in the UK is communal accommodation offering care and support, typically for older people, which can range from help with tasks - such as washing or preparing a meal - to more intensive medical and nursing care\(^{125}\). Care homes are either managed publicly, privately or by charitable organisations in the UK (for more details on proportional split of market, see below).

In 2006, there were 18,718 registered care homes in the UK, providing 441,335 places. There were 715,696 places in sheltered housing. This represents a reduction on a 1996 peak of 571,300 places\(^{126}\). The Commission for Social Care Inspection reports that the average size of residential care homes for adults is continuing to increase. At 31 March 2006, the average size of homes that are registered for people over the age of 65 stood at 34 places\(^{127}\).

The residential elderly care market was worth £11.8 billion in the year to April 2006. £8 billion of this total was private sector earnings. 22.1% of the market is owned by four private operators. The market has seen consolidation of private providers in recent years, a trend that is likely to continue\(^{128}\).

The volume of demand is down (421,000 places in April 2006, not at full capacity\(^{129}\)) but the value of the market is still growing (due to factors such as a 2002-4 above-inflation fee increases and increased occupancy rates).

Capacity and value of UK residential care homes (private, voluntary, NHS)\(^{130}\):

<table>
<thead>
<tr>
<th>Form of care</th>
<th>Number of places</th>
<th>£ million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private nursing care</td>
<td>161,000</td>
<td>4,526</td>
</tr>
<tr>
<td>Private residential (personal care only)</td>
<td>180,100</td>
<td>3,488</td>
</tr>
</tbody>
</table>

\(^{124}\) Wanless Social Care Review – Securing Good Care for Older People, King’s Fund, 2006

\(^{125}\) From People aged 65 and over…results of a study carried out …as part of the 2001 General Household Survey, National Statistics © Crown Copyright 2003, cited in Older People in the UK: Key Facts and Statistics – Age Concern 2006

\(^{126}\) Care of Elderly People, Market Survey, Laing & Buisson, 2006


\(^{128}\) Care of Elderly People, Market Survey, Laing & Buisson, 2006

\(^{129}\) Care of Elderly People, Market Survey, Laing & Buisson, 2006

\(^{130}\) Care of Elderly People, Market Survey, Laing & Buisson, 2006
Labour costs are a significant proportion of costs and fees: they make up just over half of the weekly ‘fair price’ for residential homes, and two-thirds for nursing homes\(^{131}\).

**Funding**

Long term care in England is means-tested, which is a controversial feature of care provision. The report of the Royal Commission on Long Term Care in 1999 made the key recommendation, although not supported unanimously, to remove means-testing from personal care and that co-payment should be made to cover living and housing costs. This recommendation was rejected in England and Wales but adopted in Scotland.

**Sheltered housing**

Sheltered housing is a complex of unfurnished self-contained homes, specially designed or adapted for elderly residents. These homes provide independent secure accommodation with additional social and domestic facilities available close by. Residents must have a certain level of physical and mental independence, as normally wardens do not provide care services for residents or carry out daily tasks like shopping or cleaning. Residents of sheltered accommodation can typically apply to social services for any additional support required, for example, ‘meals on wheels’.

The UK government information site, Directgov, describes the facilities thus: “Sheltered housing is different from other housing because a scheme manager or warden lives on the premises or nearby. They can be contacted through an alarm system if necessary. Some schemes are designed specifically for people with disabilities and may have specialised facilities and specially trained staff to provide care”\(^{132}\).

There are 4 different levels of sheltered housing, based on the level of attendance by a sheltered housing officer. The relative independence of sheltered housing, compared to more institutionalised care, means it is often considered a more attractive option for older people that are fully fit and active.

**Extra-care housing**

Extra-care housing is a model based on sheltered housing, offering similar levels of care to a nursing home, in a more independent setting. “Generally it is used to describe flats and bungalows for older people that are self-contained… but with some communal facilities and at least one meal provided everyday”\(^{133}\).

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\(^{131}\) Wanless Social Care Review – Securing Good Care for Older People, King’s Fund, 2006

\(^{132}\) Sheltered Housing, Directgov

\(^{133}\) Curtains for care homes? Journal title: Community Care, issue 1567, April 2005 (by Katie Leason)
There are around 26,300 places in extra care schemes in England. Real estate costs appear to be the main constraint on further development.134

**Domiciliary care**

Currently 85% of care is within people’s own homes.135 ‘Home care’, for example could be providing routine support with personal care needs, or could be part of an intensive package of support associated with intermediate care. In England, from 1 April 2004 to 31 March 2005, 319,000 clients over the age of 65 received home help or home care services, 100,000 received day care and 110,000 received meals.136

The Department of Health is investing £80 million between 2006 and 2008 into telecare technology, in the form of the Preventative Technology Grant. This fund has been made available to local authorities for investment in technologies that enable old people to live at home, safely and without isolation. Although no firm funding commitments have been outlined by the government, there is a general expectation that these resources will increase steadily in the future, especially due to the low costs relative to residential and hospital care.

**Intermediate care**

Intermediate care is a relatively new policy area which has been adopted as part of the National Service Framework for Older People. Intermediate care is designed primarily to work at the interface of health and social care.137 In 2000, the National Beds Inquiry showed that significant numbers of older people stayed in acute hospital longer than was necessary or desirable.138 In response, the concept of intermediate care was developed which also intends to maximise older people’s independence on returning home.

Intermediate care aims to offer an integrated service to help older people recover from illness, prevent unnecessary hospital admission and support faster discharge based on co-operation between the NHS, local councils and the community and voluntary sector.

Intermediate care episodes can encompass a range of services including: rapid response, hospital at home, residential rehabilitation, supported discharge and day rehabilitation. Intermediate care services were, by 2004, providing active convalescence for more than 331,271 people a year, 80% of whom were older people.139

**Child care**

Children's social services seek to promote the well-being of children in need and looked-after children. They work in partnership with key agencies, service users and the community, to pursue continuous improvements in quality, efficiency and cost through best value. Nearly 400,000 children receive social care.

Until now, children's social services have generally been provided jointly with services for adults, via social services departments within local authorities. However, structural changes in response to the Children Act 2004 mean that, from April 2006, education and social care services for children will be brought together under a director of children's services in each local authority.

134 A Guide to ‘Extra Care’ Sheltered Housing in England, Elderly Accommodation Counsel, 2005
135 ‘Who should pay for care?’ – Paying for Care in Later Life” Age concern report – April 2006
136 Older People in the UK: Key Facts and Statistics – Age Concern 2006
137 King's Fund: Wanless Social Care Review – Securing Good Care for Older People, 2006
138 Department of Health 2000
139 Better Health in Old Age, Department of Health, 2004
Social services provide a range of care and support for children and families, including families where children are assessed as being in need (including disabled children), children who may be suffering 'significant harm', children who require looking after by the local authority (through fostering or residential care) and children who are placed for adoption.\(^\text{140}\)

### 7.3 Individual budgets

An Individual Budget is designed to provide individuals who currently receive services greater choice and control over their support arrangements. The government is committed to piloting individual budgets with a view to rolling them out nationally should they prove successful. The individual budgets pilot project is a cross government initiative led by the Department of Health working closely with the Department for Work and Pensions and the Department of Communities and Local Government.

Key features of the scheme include:

- A transparent allocation of resources, giving individuals a clear cash or notional sum for them to use on their care or support package
- A streamlined assessment process across agencies
- Collating streams of support and/or funding, from more than one agency
- Enabling individuals to utilise their budget in a way that best suits their own particular requirements
- Support from a broker or advocate, family or friends, as the individual desires

Thirteen local authorities are piloting Individual Budgets in order to develop an evidence base for potential national roll out. In particular, the project evaluation will explore whether and, if so, how individual budgets can improve outcomes for people and expand choice and control within existing resources. The results of the pilot projects are expected in April 2008.\(^\text{141}\)

### 7.4 Informal care

The UK gives legal recognition and associated rights and services to family carers, enshrined in the Carers' (Equal Opportunities) Act 2004.

There is a clear age pattern to care-giving, with people aged 45-64 most likely to be giving care to their elderly parents. There is also a gender divide with women more likely to be providing care than men:

\(^{140}\) Every Child Matters
\(^{141}\) Individual Budgets, Department of Health, 2007
A recent SAGA report identified “supercarers” as a new breed of carer with the dual responsibilities of looking after both children under 16 and elderly parents. There are around 2.5 million supercarers in the UK today, and this figure is set to rise by 50% to 3.9 million people by 2020. The majority are aged between 45 and 55, and almost four fifths, 78%, are women.

7.5 Care trusts

A new development in recent years has seen the establishment of care trusts as organisations that work in both health and social care. They may carry out a range of services, including social care, mental health services and primary care services.

Care trusts are set up when the NHS and local authorities agree to work together, usually where it is felt that a closer relationship between health and social care would benefit local care services.

Currently there are only a small number of care trusts, though more will be set up in the future.

7.6 Mental health trusts

Mental health was established as a key priority in the NHS Plan. The National Service Framework for Mental Health, published in 1999, provides a structure for the development of mental health services in England. There is a focus on management of mental disorders in primary care and in the community rather than in hospital where possible, and Crisis Resolution Teams have been introduced to prevent the need for hospital admission by responding quickly to people in crisis. The Scottish Executive and the Welsh Assembly Government have also produced documents outlining plans for their national mental health services development.
Mental Health Trusts provide health and social care services for people with mental health problems. Mental Health Trusts cover the different regions of England, and work closely with local PCTs (primary care trusts) and social services.

Mental health services may be provided by local government authorities or voluntary organisations. Services offered vary between the different trusts, but may include the following:

- counselling
- psychological therapies
- family support
- addictions
- cognitive and behavioural therapy
- eating disorder service
- old age psychiatry

Mental health services can help people suffering bereavement, depression, stress, or anxiety. Support for these types of problems is often available from community support groups. Some Mental Health Trusts also produce self-help leaflets for people with mental health problems.

People with more serious mental health problems may need long-term help. These cases are usually referred for specialist care, which is also provided by Mental Health Trusts or social services departments in local councils. This type of service may include community nursing, day care and rehabilitation

Differences in Scotland, Wales and Northern Ireland

Scotland
In Scotland, ‘personal care’ (defined as non-medical assistance to the person, rather than the home, etc.) is not means tested. In England, only medical care is received for free without any means testing.

The Scottish Social Services Council is responsible for raising standards in the Scottish social service workforce.

Wales
The Care Standards Inspectorate for Wales (CSIW) is responsible for supporting the improvement of care, early years and social services in Wales by raising standards, improving the quality of services and promoting best practice through regulation, inspection and development work.

CSIW is an operationally distinct division of the Department of Public Services and Performance in the Welsh Assembly Government

Northern Ireland
The Northern Ireland health service is unusual in the UK because it integrates health and social care in one structure. Northern Ireland has 19 health and social services trusts responsible for the day-to-day running of health and social care services as commissioned by the regional health and social care boards and the local health and social care groups.

145 NHS Direct
Northern Ireland is currently debating free personal care, as per a similar system to Scotland.

The Northern Ireland Social Care Council (NISCC) is the regulatory body for the social care workforce in Northern Ireland. Its aim is to increase the protection of those using social care services, their carers and the public. NISCC was legally established on October 1, 2001.
8 Structure of the Health Supply Chain

8.1 Labour force

Overview

The NHS is one of the largest employers in the world. In 2005 it employed 1,366,030 medical and non-medical staff, of which 679,157 were professionally qualified clinical staff. The following chart demonstrates the distribution of NHS staff working in the principle medical and non-medical areas:

![NHS employment breakdown, 2005](chart)

Source: Information Centre

Primary Care

At 30th September 2005, there were 35,302 GPs, 22,904 practice nurses and 89,190 other practice staff employed by the NHS. In September 2002 there were 18,400 dentists but only 47% of the population was registered with a dentist.

At 31st December 2005, there were 8,999 ophthalmic practitioners in England and Wales, of which 8,522 were optometrists and the remaining 477 were ophthalmic medical practitioners.

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146 Staff in the NHS 2005, NHS Information Centre, 2006
147 General practitioners, dentists and opticians by region and NHS Strategic Health Authority, Office of National Statistics, September 2002
10 462 pharmacies were in contract with PCTs/LHBs in England and Wales at March 2004, compared with 10 452 at March 2003; 9 759 of these were in England. The percentage of pharmacies in chains of more than 5 rose from 52% in 2002-03 to 53% in 2003-04.

**Secondary care**
In September 2005, there were 90 630 hospital doctors of all grades and specialities, 381 257 qualified nursing, midwifery and health visiting staff and 134 534 scientific, therapeutic and technical staff employed by the NHS. In addition there were 18 117 qualified ambulance staff and 10 063 ambulance support staff.

**NHS infrastructure**
In September 2005, there were 220 387 staff employed in the NHS infrastructure, of which 105 565 were classified as performing “Central functions”, 75 431 were in “Hotel, Property and Estates” and 39 391 were managerial or senior managerial staff.

**Scotland and Northern Ireland**
In 2005 around 159, 00 staff were employed by NHSScotland. These included more than 67 000 nurses, midwives and health visitors and over 3 800 consultants. In addition there were over 4 500 doctors working in general practice and more than 12 000 allied health professionals such as physiotherapists, radiographers, and speech and language therapists working throughout the service.\(^{148}\)

The Northern Ireland Health and Personal Social Services Workforce in June 2007 was 6 279. This figure included more than 16 000 nurses and 3 800 medical and dental staff.\(^{150}\)

**Private Care**
In 2003, 1.109 million people were employed in the private sector health care and social work industries, compared to 1.770 million in the public sector health care and social work industries.\(^{151}\)

BUPA has around 40 000 staff in the UK.\(^{152}\)

### 8.2 Pharmaceuticals

**Overview**
The pharmaceutical industry researches, develops, produces, markets and distributes drugs for the healthcare market and as such integrates into every level of healthcare provision. It produces both brand-name and generic drugs on a commercial basis and is regulated by central government.

Pharmaceuticals are one of Britain’s leading manufacturing sectors, bringing in a trade surplus of £3.4 billion in 2004. The value of UK pharmaceutical exports in 2005 was £12.2 billion, more than £166 000 per employee.\(^{153}\)

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\(^{149}\) National Workforce Plan 2006, Scottish Executive Health Department, 2006

\(^{150}\) Key Facts Workforce* Bulletin, Department of Health, Social Services & Public Safety, June 2007

\(^{151}\) Jobs in the public sector, Office of National Statistics, 2003

\(^{152}\) BUPA

\(^{153}\) Facts & Statistics from the pharmaceutical industry, ABPI
**Labour force**

There were approximately 73,000 people employed in the pharmaceutical industry in the UK in 2004, of which 27,000 were research and development staff\(^\text{154}\). 

**Connections**

The pharmaceutical industry has a supplier relationship with all levels of NHS and private healthcare provision (excluding NHS Direct) from hospitals, to GPs to supermarkets and other retailers that sell generic and brand-name non-prescription medications.

### 8.3 Non-ICT equipment

**Overview**

Non-ICT equipment includes a wide and diverse range of items including but not limited to X-ray equipment, electromedical equipment, sterilizers, syringes, needles, therapy equipment, orthopaedic equipment, medical furniture, dressings and sutures\(^\text{155}\). 

All medical devices must be certified in accordance with the 1993 European Medical Device Directive\(^\text{156}\).

**Connections**

The medical equipment industry has a supplier relationship with all NHS and private hospitals, GP surgeries and other primary care practices, clinics and walk-in centres including dental and ophthalmology, but not NHS Direct. This is often undertaken through the NHS Purchasing and Supply Agency (NHS PASA), an executive agency of the Department of Health whose role is to ensure that the NHS in England makes the most effective use of its resources by getting the best possible value for money when purchasing goods and services.

### 8.4 ICT equipment

**Overview**

ICT equipment includes computers, networks, communications technologies, databases, software and services. The role of ICT and ICT equipment in the NHS is discussed further in section 8.4.

Under the National Programme for IT, ICT equipment and systems used in the NHS are undergoing standardisation – for example Patient Administration Systems are now streamlined across the NHS.

**Connections**

The ICT medical equipment industry has a supplier relationship with all NHS and private hospitals, GP surgeries and other primary care practices, clinics and walk-in centres including dental and ophthalmology, including NHS Direct.

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\(^{154}\) Facts & Statistics from the pharmaceutical industry, ABPI

\(^{155}\) Market Development Report, UK Medical Equipment, June 2006

\(^{156}\) Medical Devices Sector, EU Enterprise and Industry
Health Technology Scenarios

9 Healthcare Technology

9.1 Overview

As a federation of more than 700 Trusts, the NHS has many different and inconsistent policies and practices on new technology development, application and purchase. Broadly healthcare technology can be broken down into three key types:

- **Information and communication technology (ICTEC)** – this comprises all information and communication technologies relevant for the healthcare sector
- **Genomic and proteomic technologies, gene and antisense therapies (GENTEC)** – this comprises all technologies that are based on the application of genetic or genomic information
- **Medical devices and biomedical technology (MEDTEC)** – this comprises all other technologies which are used in the course of medical and biomedical processes and procedures

Cutting across all three technology categories, *wireless technologies* play an important and increasing role in enabling and mobilising healthcare technologies and applications.

9.2 ICTEC

**Overview**

Information and communication technology (ICTEC) comprises all information and communication technologies relevant for the healthcare sector. This includes:

- Electronic health records (EHR)
- Medical imaging (PACS)
- Telecare and telemedicine
- Bio-informatics
- Computer-assisted surgery

The National Programme for IT is an initiative by the National Health Service to move towards an electronic care record system for patients, accessible by authorised professionals (and thus providing connectivity and enhanced communications between primary, secondary and tertiary care) and the patient.

**The National Programme for IT**

**Overview**

The NHS has launched a £6.2 billion IT upgrade to install patient-administration systems. The National Programme for IT (NPfIT) is an initiative to connect England’s 30 000 GPs to 300 hospitals, allowing access to all patient records by health professionals and patients. In April 2005 a new agency called NHS Connecting for Health (NHS CFH) was formed to deliver the programme

It is claimed that it is the largest non-military information technology programme in the world. Ultimately it is planned that patients will also have access to their records online through a service called HealthSpace.

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157 The Use of New Medical Technologies within the NHS, House of Commons Health Committee, April 2005
Health Technology Scenarios

Patient-administration software is one of the first building blocks of the NPfIT. It handles appointments and patient movements around hospitals. There are no NPfIT clinical systems installed as yet.

Some of the key features of the NPfIT project include:

- The NHS Care Records Service (NHS CRS)
- Choose and Book, an electronic booking service
- A system for the Electronic Transmission of Prescriptions (ETP)
- A new national broadband IT network for the NHS
- Picture Archiving and Communications Systems (PACS)

Companies implementing the programme include BT, CSC, iSoft and Fujitsu.

The programme has been subject to a number of delays, such as to the installation of patient-administration computer systems at acute hospital trusts. Accenture, which had been heavily involved in implementation of NPfIT, withdrew from the project citing problems with iSoft.

NHS Connecting for Health’s chief executive, Richard Granger, in explaining the delays that have hit the programme, described the healthcare software market as “an immature marketplace”. Richard Granger announced his resignation in June 2007, and is to leave “in the next few months”.

There has also recently been considerable controversy over iSoft and the company has come under repeated investigation for accounting irregularities. It is currently being investigated by the Accountancy Investigation and Discipline Board (AIDB).

In January 2005, a Medix survey of doctors’ views about the NPfIT found that only 41% of GPs thought it was an important NHS priority and 21% were enthusiastic about it. Only 5% thought they had had adequate consultation and 71% had had none, although 86% of GPs thought that consultation on the project was important.

The NPfIT has also been criticised for inadequate attention to security and patient privacy, although advocates of the NPfIT note that these concerns must be set alongside the necessity of care professionals having access to personal medical data if they are to deliver safe, high quality care.

**N3, the NHS IP network**

N3 will provide every NHS site in England with fast broadband networking services, to enable programs such as the NHS Care Records Service, Choose and Book and the Electronic Transmission of Prescriptions.

N3 will be the largest Virtual Private Network in Europe – the NHS needs flexible provision of bandwidth to cope with future demand, as well as satisfying the current needs.

N3 should provide substantial savings on the cost of telephony by enabling NHS organisations to converge their voice and data networks. N3 will also provide support for NHS organisations in implementing innovative new services – for example, the use of video conferencing for appointments with consultants.

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159 Boss of troubled £12bn NHS computer project quits, Sunday Times, June 2007
160 Doctor's support of NHS National Programme for IT declines, Medix Survey quoted on Publictechnology.com, September 2005
N3 is being delivered by the N3 Service Provider (N3SP), which is managed by BT and is responsible for integrating an end-to-end network and service to N3 customers. Implementation of N3 began in April 2004.  

**Databases and services**

**HealthSpace**

“[Patients] can use HealthSpace to record all sorts of personal health information, such as recording [their] weight over a period of time, to storing a list of health providers in [a] personal address book”.

**ContactPoint**

ContactPoint is a planned government database that will hold information on all children under 18 in England and Wales. The proposals were made in response to the abuse and death of eight-year-old Victoria Climbié in 2000 in England, to improve child protection by improving the way information about children is shared between services.

The database, created under the Children Act 2004, will cost £224 million to set up and £41 million a year to run. It will be operating in 150 local authorities, and be accessible to at least 330,000 users. The database has gone through the pilot phase and will be fully operational by the end of 2008.

**Choose and Book**

Choose and Book is a national electronic booking service which gives patients a choice of place, date and time for their first outpatient appointment in a hospital or clinic. Patients can choose their hospital or clinic, and then book their appointment to see a specialist with a member of the practice team at the GP surgery, or at home by telephone or over the internet.

**Telecare and Telemedicine**

In the UK around 1.5 million older people already use community alarms to contact a control centre which can summon help, one of the more basic possibilities for telecare. A key part of government policy is to keep older people in their own homes for as long as possible. Telecare is seen as an important means of achieving this because it can increase the independence of older people whilst providing a safety net in case of emergency.

The recent White Paper promotes telecare as a means of enabling people ‘to feel constantly supported at home, rather than left alone, reliant on occasional home visits or their capacity to access local services’ and plans ‘intensive use of assistive and home monitoring technologies’.

The Department of Health’s ‘Preventative Technology Grant’ is providing £80 million over two years from April 2006 to promote the use of new technology as a way of reducing avoidable admissions to hospital and residential care. The money is not ring-fenced, but the government expects councils to invest in telecare with the goal of helping an additional 160,000 older people to live at home (equating to £500 for each of those people). A number of local authorities are also spending money from their own social care budgets to

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161 N3 website  
162 Securing Good Care for Older People, Kings Fund, 2006  
163 Securing Good Care for Older People – Background paper 7, Kings Fund, 2006
Health Technology Scenarios

develop telecare services, for example the London Borough of Newham, which now has over 3,000 users of its telecare services.

The Department’s own IT targets aimed to provide telecare to 20% of homes requiring the service by the end of 2007, and to all homes requiring the service by the end of 2010. These are ambitious targets unless a very low definition of telecare need and service is used. The expectation is that increased use of telecare will reduce the number of care home places needed, whilst increasing the need for domiciliary care.

In June 2007 the Department of Health announced that three local authorities (Cornwall, LB Newham and Kent) had been selected to receive funding for telecare ‘whole system demonstrators’, focusing on patients with chronic conditions such as COPD and CHF.

Scotland has recently announced that telecare will be rolled out nationally, with an £8 million investment. The aim is to see 75,000 people, including 9,000 dementia sufferers, benefiting from telecare.

The Department of Health's Older People and Disability Division is leading a project ‘Partnerships for Older People Projects’ (POPP). The strategic aim of the project is to test and evaluate (through pilots to be established during 2006/07 and 2007/08) innovative approaches that sustain prevention work in order to improve outcomes for older people. Some of these projects include a telecare component.

It has been argued that telecare development should be focused on those in the middle, rather than high frailty groups, in order to have an impact on subsequent moves into care homes. This means that the associated cost benefits will take some time to be realised, which in turn demands a realistically long-term investment horizon. If the aim is to improve quality of care, then technology may not actually reduce the amount of care worker hours needed because of the demands of older people who remain in their homes for longer.

Telecare and telemedicine systems typically use a range of connectivity methods, including Bluetooth or Infrared wireless to connect peripheral medical devices to a central hub, and broadband or a standard telephone line to connect the home to the healthcare provider or monitor.

Medical imaging (inc. PACS)
The NHS Picture Archiving and Communications System (PACS) “enables access to the right image, in the right place, at the right time all at the touch of a button”.

In practice, PACS enables images such as x-rays and scans (e.g. CAT scans, ultrasound) to be stored electronically and viewed on screens, so that doctors and other health professionals can quickly access the information and compare it with previous images.

By March 2007, the NHS completed 100% installation of PACS across London and the South, affecting some 20 million NHS patients and 56 trusts across these regions.

164 Securing Good Care for Older People, Kings Fund, 2006
165 Securing Good Care for Older People, Kings Fund, 2006
Clinical Decision Support Systems

Overview

Clinical Decision Support Systems were developed to perform diagnosis and make therapy recommendations. Unlike medical applications based on other programming methods, such as statistical and probabilistic methods, medical DSS programs are based on symbolic models of disease entities and their relationship to patient factors and clinical manifestations.

Intelligent systems today are used to support medication prescribing, in clinical laboratories and educational settings, for clinical surveillance, or in data-rich areas like the intensive care setting\(^\text{166}\).

Provision and utilisation

In September 2000 the government announced a seven year partnership with AXA Assistance to provide a clinical decision support system for NHS Direct and NHS 24 in Scotland. The computer system was intended to be the standard system for all nurses working in NHS Direct / NHS 24 and was also available for use in NHS walk-in centres and A&E departments\(^\text{167}\).

In May 2005, AXA Assistance sold its shares in the company which provided the systems used by the NHS, CAS Services Ltd. NHS Direct upgraded its systems to Clinical Assessment System (CAS) Functional Version 10, which was designed to offer enhanced technical functionality and enhanced communication capabilities\(^\text{168}\).

Calls to NHS Direct and NHS 24 are handled using this Clinical Decision Support System.

Emergency (Ambulance) technology

In the UK, emergency ambulance technology includes:

- **Two Way Radio** – This is arguably one of the most important pieces of equipment in modern emergency medical services as it allows for the issuing of jobs to the ambulance, and enables the ambulance crew to pass information back to control or to the hospital (such as a priority ASHICE message to alert the hospital of the impending arrival of a critical patient.) More recently many services worldwide have moved from traditional UHF/VHF sets, which can be monitored externally, to more secure systems, such as those working on a GSM system, such as TETRA.

- **Mobile Data Terminal** - Many ambulances are fitted with Mobile Data Terminals (or MDTs), which are connected wirelessly to a central computer, usually at the control centre. These terminals can function instead of or alongside the two way radio and can be used to pass details of jobs to the crew, to log the time the crew was mobile to a patient, arrived, and left scene, or to fulfil any other computer based function.

- **Evidence gathering CCTV** - Many ambulances are now being fitted with video cameras used to record activity either inside or outside the vehicle. They may also be fitted with sound recording facilities. This can be used as a form of protection from violence against ambulance crews, or in some cases (dependent on local laws) to prove or disprove cases where a member of crew stands accused of malpractice.

\(^{166}\) The Guide to Health Informatics, Coiera, October 2003
\(^{167}\) New National NHS Direct Computer System To Benefit Patients, Department of Health, September 2000
\(^{168}\) NHS Direct
Tetra Airwave system – Airwave is a national cellular network dedicated for public safety organisations, and designed for status messaging, alert paging, resource/incident location and mobilisation messaging. Currently it is primarily used by the police, but is being rolled out to Ambulance Trusts in England, with Essex having been the first Trust to go live with the service, in Spring 2007.

In Wales, O2 (one of Airwave’s partners) offer a range of products and services including radio terminals to ambulance staff, providing Integrated Communications Control Systems (ICCS) for their three control rooms and installing radios in 827 vehicles, including 454 emergency vehicles and three helicopters.

Surgery assisted by computer

In recent years, electronic tools have been developed to aid surgeons. Some of the features include:

- Visual magnification - use of a large viewing screen improves visibility
- Stabilization - electromechanical damping of vibrations, due to machinery or shaky human hands
- Simulators - use of specialized virtual reality training tools to improve physicians’ proficiency in surgery
- Reduced number of incisions

Robotic surgery has been presented as a solution for underdeveloped nations, whereby a single central hospital can operate several remote machines at distant locations. The potential for robotic surgery has had strong military interest as well, with the intention of providing mobile medical care while keeping trained doctors safe from battle.

Patient administration systems (PAS)

NHS staff use a Patient Administration System which contains patient details, together with a record of each outpatient appointment or inpatient stay. This information is used when contacting patients or sending letters. It is therefore crucial that the system is up to date and accurate.

Patient Administration Staff play a key role in maintaining patient confidentiality and ensuring data protection. The PAS system stores unique identifier numbers for patients, which ensure the correct medical records can be traced. The NHS number is particularly important as it enables information to be sent electronically without any identifying details such as patient name or address.

Strict controls exist about who can see personal and treatment related information about individual patients. As a general rule, named details are not normally revealed other than to assist with the direct care of a patient.

Information about treatment is also held in paper form within patient case notes.

Across the NHS in England there are numerous PAS systems in operation, systems which are rarely connected to other patient information systems either locally or nationally. As part of the National Programme for IT, PAS systems are being integrated into the NHS Care Records Service.

169 Airwave website
170 Patient Administration Services, Leeds Teaching Hospitals, September 2004
171 Data Flows, NHS Scotland Data Protection and Confidentiality
172 SHIFT Programme, Connecting for Health Salford, January 2007
173 NHS Care Records Service
Health use of generic ICTs

Broadband
Both NHS Choices and NHS Direct offer a range of services online, and many NHS and private hospitals provide websites featuring news, contact details, feedback features and other services.

Breathe Radio is an independent online radio station designed to help listeners give up smoking via tips, encouragement and input from health professionals. It also offers downloadable podcasts.

Telephone
NHS Direct was originally launched as a telephone service, on the shortcode number 0845 4647.

Patientline is a console device aimed at patients, and providing telephone, internet, television, radio and games services through a telephone line at the patient’s bedside. While not specifically a health use of these ICTs, it is only used in hospitals and provides a (commercial) alternative to mobile phones, use of which is not allowed in most hospitals.

TV
NHS Direct broadcasts a TV channel called NHS Direct Interactive, broadcasting digitally on Freeview and Sky Digital.

The channel contains information on conditions and tests, frequently asked health questions and a guide to healthy living. It also includes a guide to the NHS, featuring information on registering with a GP and finding an NHS dentist. Topics on the service include diabetes, asthma, quitting smoking, sexually transmitted infections, diet, pregnancy exercise and childhood illnesses.

The service on Sky Digital also includes photos, illustrations and video clips. Subjects covered by the videos include pregnancy and childbirth, healthy eating recipes, exercise, anger management and talking to children about sex. This version of NHS Direct Interactive can also be viewed online, link.

An interactive service which allows patients to book, change and cancel GP appointments through digital TV (Freeview, cable or Sky) and mobile phone has recently been launched after successful pilots in South Yorkshire174.

9.3 GENTEC

Overview
Genomic and proteomic technologies, gene and antisense therapies (GENTEC) comprise all technologies that are based on the application of genetic or genomic information.

Genes, which are carried on chromosomes, are the basic physical and functional units of heredity. Although all of the cells in the human body contain identical genetic material, the same genes are not active in every cell. Studying which genes are active and which are inactive in different cell types helps scientists to

174 Digital TV booking scheme for GPs, BBC News, July 2007
understand both how these cells function normally and how they are affected when various genes do not perform properly.176

The increase in understanding of genetic information is arguably the great scientific advance of our time, and its application has major consequences for healthcare provision. For example:176

- **Prevention** – information from genomics should help to inform healthy living approaches; develop highly specific vaccines; correct aberrant gene expression
- **Diagnosis** – knowledge of the genetics of pathogens will aid disease diagnosis and identify the sources of new pathogens
- **Drugs** – genetic technology is revolutionizing drug development, in terms of targeted drug discovery, enhanced drug validation, and drug manufacturing (e.g. through genetic expression)

However GENTEC is not without controversy. Stem cell research using embryonic stem cells has angered religious groups, pro-life groups and several political parties, particularly in the US, as it involves the destruction of a potentially viable embryo. However supporters of the technology argue that these cells offer the most significant medical potential of all three types of stem cell to cure disease. Genetic screening carries the potential risk of discrimination when the patient is seeking employment or health or life insurance (although this discrimination is currently prohibited in the UK), and some critics have argued that it may lead to eugenics through the selection of embryos based on positive genetic attributes.

**Key technologies**

**DNA microarrays**

DNA microarray technology is used by scientists to examine how active thousands of genes are at any given time. DNA microarrays are created by robotic machines that arrange minuscule amounts of hundreds or thousands of gene sequences on a single microscope slide.

In the UK as elsewhere, microarray technology is currently in its research phase; it may allow scientists to learn more about many different diseases, including heart disease, mental illness, infectious diseases and cancer.177

**Gene therapy**

Gene therapy is a technique for correcting defective genes responsible for disease development. In most gene therapy studies, a "normal" gene is inserted into the genome to replace an "abnormal," disease-causing gene.

Recent gene therapy has been primarily experimental and has not always proven very successful in clinical trials – with no revolutionary breakthroughs having been made since the first gene therapy clinical trial began in 1990, although some discoveries have been made which may lead to therapies for diseases such as bipolar disorder, coronary heart disease, Crohn's disease, hypertension, arthritis and diabetes.179

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175 Gene Therapy, Human Genome Project, November 2005
177 DNA Microarray Fact Sheet, US National Human Genome Research Institute, January 2007
178 Gene Therapy, Human Genome Project, November 2005
179 Gene findings: Disease-by-disease, BBC News, June 2007
Stem cells
Adult bone marrow stem cells have been successfully used in bone marrow transplants and other cancer treatments. In response to this success, and future potential, private and public umbilical cord blood banks have been established, including the Virgin Health Bank and Future Health.

In the UK there are strict regulations on the storage of cord blood stem cells. These regulations are currently overseen by the Human Tissue Authority (HTA).

Genetic screening
Genetic screening tests are used both before and after the appearance of disease symptoms. Tests to diagnose rare inherited disorders, such as cystic fibrosis and Huntington’s disease, constitute the vast majority of current services.

Market
Gene technologies are currently still in development and consequently not yet commercially deployed. However at 1 April 2005, 96 UK trials had been carried out, with 40% of European gene therapy clinical trials being carried out in the UK.

Research and Development
The Government announced in 2004 £3 million to fund, for the first time, research into clinical trials for three single gene disorders - haemophilia, muscular dystrophy and childhood blindness. A further £1m was announced to support research into the long-term safety of some techniques used in gene therapy.

The funding was part of a wider £50m strategy to harness the potential of advances in genetics to the benefit of NHS patients, announced in 2003’s Genetics White Paper.

Key bodies

Human Genetics Commission
HGC was established following a comprehensive review in May 1999 by the UK Government of the regulatory and advisory framework for biotechnology. HGC is an independent source of advice for the government looking to derive maximum benefit from advances in human genetics, while also addressing the attendant ethical, legal and social implications.

GeneWatch UK
GeneWatch UK is an independent policy research group in voluntary sector which was established in 1998. GeneWatch believes that public interest, environmental protection and animal welfare must be at the forefront of decision-making about genetic technologies.

180 Stem Cell Initiative, Department of Health, November 2005
181 NHS Genetic Testing, Parliamentary Office of Science and Technology, 2004
182 UK leads Europe in gene therapy trials, Department of Health, April 2005
183 Chief Scientific Officer Bulletin: Issue 1, Department of Health, May 2004
184 Human Genetics Commission website, July 2007
185 GeneWatch website, July 2007
9.4 MEDTEC

Overview
Medical devices and biomedical technologies (MEDTEC) comprise all other technologies which are used in the course of medical and biomedical processes and procedures.\textsuperscript{186}

The MEDTEC technology industry in the UK is extensive, diverse and innovative. It covers a wide range of medical consumables, hospital supplies and equipment, devices used in the community and services.\textsuperscript{187}

Among the areas of focus for MEDTEC providers are:\textsuperscript{188}

- Innovations in drug development
- Tissue engineering
- Miniaturisation and integrated Microsystems
- Hybrid and artificial organs
- Prosthetics

Key technologies

Medical equipment and instruments
Medical equipment and instruments encompasses diagnostic equipment, such as X-ray machines, stethoscopes or laboratory equipment; and therapeutic equipment such as medications, prosthetics or pacemakers. It also encompasses hospital and medical supplies such as surgical instruments, disposable gloves or hospital beds. The design, testing and manufacture of these equipments and instruments, as well as these equipments and instruments themselves, comprise one strand of medical technology.

Biomedical technology
Biomedical technology can include research into technologies such as vaccines and antibiotics, and is often used by the pharmaceutical industry in developing new drugs. There is some overlap with genetic technologies as techniques such as Polymerase Chain Reaction involve performing genetic manipulations on a non-living organism (such as E-Coli) DNA in order to refine treatments.

Market
Medical and biotechnology is a significant component of the UK economy and has potential for considerable growth. The industry in the UK consists of approximately 4 800 companies, with 85% having a turnover of less than £5 million per year. It employs in excess of 55 000 people, has combined annual sales of £6 billion and accounts for £3 billion of export earnings.\textsuperscript{189}

However the UK lags other developed markets in its expenditure on medical technologies.\textsuperscript{190}

\textsuperscript{186} Healthcare Technologies Roadmapping: The Effective Delivery of Healthcare in the Context of an Ageing Society, JRC/IPTS-ESTOO, August 2003
\textsuperscript{187} The Use of New Medical Technologies within the NHS, House of Commons Health Committee, April 2005
\textsuperscript{188} Technologies Roadmapping: The Effective Delivery of Healthcare in the Context of an Ageing Society, JRC/IPTS-ESTOO, August 2003
\textsuperscript{189} The Use of New Medical Technologies within the NHS, House of Commons Health Committee, April 2005
\textsuperscript{190} The Use of New Medical Technologies within the NHS, House of Commons Health Committee, April 2005
Expenditure on medical technologies by selected countries, as a proportion of total healthcare expenditure and Gross Domestic Product, 2005

Medicaments were the biggest source of imports in 2005 at over £6.6 million, with instruments (e.g. ophthalmic and dental) the next biggest at over £2 million.  

**Research and Development**

The industry spends approximately £380 million per annum on research and development, of which the government provides a large part.

The Department of Health’s budget for NHS research and development is over £600 million in 2004-05, of which £480 million is allocated to NHS providers. 75% of the money from these allocations meets the service costs to the NHS of research funded by research councils and charities.

**Key bodies**

**The Medical Technology Group (MTG)**

The Medical Technology Group (MTG) is a coalition of patients, patient groups, medical professionals and the industry keen to widen the availability of medical technologies in the UK.

**Association of British Healthcare Industries**

Association of British Healthcare Industries is the leading trade association for the medical systems industry. Its aims are to advance and promote medical systems (devices, equipment, technologies and services)

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191 The Use of New Medical Technologies within the NHS, House of Commons Health Committee, April 2005
192 The Use of New Medical Technologies within the NHS, House of Commons Health Committee, April 2005
193 Medical Technology Group website, July 2007
within the UK and globally, and to provide a forum for policy discussion with the industry’s customers, legislators, public bodies and interested groups.194

The Healthcare Industries Task Force (HITF)
The Healthcare Industries Task Force (HITF) was a year-long initiative between the Department of Health and the healthcare products industry, launched in October 2003. The aim of the HITF was to bring benefits for patients, service users, the NHS and social carers; and also to help improve the healthcare industry’s performance.195

9.5 Health-related use of the wireless spectrum

Overview
Currently the health system makes substantial use of the wireless spectrum, through generic technologies such as broadcast radio, RFID tracking, GPRS, 3G and Wi-Fi. Virtually all health professionals use a mobile phone, and many also use laptops, notebooks and PDAs which have the potential for wireless connectivity.

Use of dedicated spectrum falls into three main categories: in-hospital, ambulance to hospital and small short range devices such as hearing aids, implants and telecare alarms.

RFID
Radio-frequency identification (RFID) is an automatic identification method, relying on storing and remotely retrieving data using devices called RFID tags.

RFID tags are small devices that store data that identifies the object to which they are attached. They have been called "smart barcodes". The data onboard an RFID tag can be read at a distance via radio.

This information can be sent back to a server which can model the movement of the tag depending on the shift in signal strength detected across wireless access points196.

There are two types of RFID tags: passive and active.

Passive tags have no battery onboard but the current generated when they are scanned with a radio reading device powers the tiny circuit and makes it emit a signal. Because of this the data in passive tags can only be read over small distances - up to a few metres.

Active tags are bigger, always have an antenna and are fitted with their own battery. These tags can be read over distances of hundreds of metres and have a lifetime of about a decade. They hold much more data about the object or objects to which they are attached.

The spectrum requirement per RFID tag varies, depending on whether the tag is active or passive, what range it is intended to cover and the purpose for which it is used. Currently, the type of RFID tag used for supply chain tracking operates on ten channels at 2 Watts Effective Radiated Power (ERP) in the band from 865.6MHz to 867.6MHz, and has a range of <3.0m. There are an additional five lower-powered channels and one higher-powered channel for other types of RFID tags.197

194 Association of British Healthcare Industries website, July 2007
195 Department of Health: Healthcare Industries Task Force definition, July 2007
196 Wi-Fi and RFID used for Tracking, BBC News, May 2007
197 RFID futures in western Europe, Juniper Research, January 2005
Health Technology Scenarios

Healthcare is predicted to be one of the major growth areas for RFID. Recent research from analyst house Frost and Sullivan found that the revenue from RFID within healthcare and pharmaceuticals will rise almost six-fold in the coming years, from 2004’s total of $370 million to $2.3 billion in 2011.\(^{198}\)

**Hospitals**

Hospitals have, in recent years, begun to use RFID asset tracking to manage expensive mobile machinery, clinicians, drugs and sometimes patients.

Currently exact statistics regarding hospital usage of RFID networks are not in the public domain, but anecdotally it seems that this technology is largely still in its pilot phase.

Some examples include:

- Nottingham University Hospitals NHS Trust is testing RFID technology to track equipment and staff, with a view to extending the trial to babies. The trust is testing RFID readers at Queen’s Medical Centre to investigate whether the technology can track equipment successfully and reduce unnecessary purchases.\(^{199}\)

- Birmingham Heartlands Hospital has become the first NHS hospital to radio-tag patients. The hospital has installed a radio tracking system throughout the hospital and can find and identify patients using standard RFID tags.\(^{200}\)

- The Klinikum Saarbrücken in Germany, is conducting a trial that has tagged 1,000 people in an effort to improve administration and reduce clinical errors.
  - Patients wear tagged wristbands, which are scanned by hospital staff using PDAs or tablet PCs connecting to patients’ data using a WLAN. The wristband carries a unique patient code that tallies with the encrypted patient records, providing information on which drugs and what dosages the patient requires.
  - Patients are able to check their own records by scanning their wristbands using information terminals.
  - Intel, Fujitsu-Siemens and Siemens Business Services provide the technology.\(^{201}\)

**The pharmaceutical industry**

The pharmaceutical industry is a key user of RFID tags for asset tracking. Although precise and detailed data on counterfeit medicines is difficult to obtain, estimates range from around 1% of sales in developed countries to over 10% in developing countries, depending on the geographical area.\(^{202}\) It is therefore crucial both for patient protection and for revenue protection that pharmaceutical companies are able to track and verify products.

Currently high-value, frequently counterfeited or stolen drugs such as Pfizer’s Viagra and Perdue Pharma’s OxyContin are the most likely drugs to be tracked by RFID. Each tag costs about US$0.30 for...

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\(^{198}\) Healthcare RFID to track blood, Silicon.com, February 2006
\(^{199}\) RFID trial tracks hospital, Computing, November 2006
\(^{200}\) Birmingham Heartlands RFID-tags patients to avoid litigation, British Journal of Healthcare Computing & Information Management, February 2005
\(^{201}\) RFID hospital trials reach Europe, ZDNet, April 2005
\(^{202}\) Counterfeit Medicines Factsheet, World Health Organisation, November 2006
pharmaceutical products and effectively acts as a passport that tracks items at various checkpoints as they make their way through the supply chain, from manufacturer to end consumer\textsuperscript{204}.

European Markets for RFID in Pharmaceuticals earned revenues of US$18.0 million in 2005 and this is estimated to reach US$464.8 million in 2012\textsuperscript{205}, suggesting that around 60 million pharmaceutical products were tagged in Europe in 2005, which, according to revenue projections, could potentially rise 25-fold to around 1.5 billion in 2012. No data is currently publicly available specifically for the UK market, although it seems likely that a similarly rapid rate of adoption as that throughout Europe will occur.

The worldwide market for pharmaceutical tagging at item level - a possible scenario 2006-2010:

<table>
<thead>
<tr>
<th>Year</th>
<th>Main Location</th>
<th>Item</th>
<th>Approximate number of tags, millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>USA</td>
<td>Some prescription drugs</td>
<td>35</td>
</tr>
<tr>
<td>2007</td>
<td>USA, Europe</td>
<td>Some prescription drugs</td>
<td>270</td>
</tr>
<tr>
<td>2008</td>
<td>USA, Europe, East Asia</td>
<td>Many prescription drugs</td>
<td>1,083</td>
</tr>
<tr>
<td>2009</td>
<td>USA, Europe, East Asia</td>
<td>All prescription drugs in the USA. Many prescription drugs elsewhere.</td>
<td>5,250</td>
</tr>
<tr>
<td>2010</td>
<td>USA, Europe, East Asia</td>
<td>All prescription drugs in the USA. Many prescription drugs elsewhere. Possibly some over the counter drugs.</td>
<td>16,000</td>
</tr>
</tbody>
</table>

Source: IDTechEx\textsuperscript{206}

This table suggests that currently, RFID tagging is somewhat limited in terms of scope, but nevertheless is used to tag a significant number of pharmaceutical products. It seems likely in the near future that RFID tagging will expand in both scope and number of products.

In 2005, a UK trial of RFID technology with pharmacists aimed to reduce dispensing errors. Dual barcode and RFID readers were placed in several locations across the UK - 37 were placed in community pharmacists, nine in hospitals and a further four were used in dispensing GP surgeries.

The dual scanners were able to recognise eight drugs from six different manufacturers. Using the passive code read from the RFID-tagged bottle, pharmacists were able to verify drugs given to patients against drugs prescribed, check medicine expiry dates and ensure the drug was not subject to a recall or counterfeit warning.

\textsuperscript{204} Busting the myths of pharma RFID, A.T.Kearney, 2006
\textsuperscript{205} European Radio Frequency Identification Tags Markets, Frost & Sullivan, December 2006
\textsuperscript{206} Pharmaceutical RFID - Fast Forward, IDTechEx, January 2006
The pilot claimed a 100 per cent success rate in stopping the dispensing of dummy fake packs and after the 120 day trial was concluded, one in four pharmacists asked to keep their scanner.\(^{207}\) This suggests that there are currently 12 pharmacists, hospitals or dispensing GP surgeries in the UK using RFID technology to verify a small number of pharmaceutical products from six manufacturers.

Currently, the type of RFID tag used for supply chain tracking by the pharmaceutical industry operates on ten channels at 2 Watts Effective Radiated Power (ERP) in the band from 865.6MHz to 867.6MHz, and has a range of <3.0m. There are an additional five lower-powered channels and one higher-powered channel for other types of RFID tags.\(^{208}\)

The home

A study into the viability of RFID tags for modelling the activities of daily living, such as oral hygiene, use of toilet, washing, housework, safe use of appliances, use of heating, taking medication, preparing food and use of telephone was conducted\(^{209}\), suggesting that the technology may be used for telecare monitoring of elderly, ill or vulnerable people in the home.

GPRS

The East of England Ambulance Service has recently launched an ambulance-based mobile computing system that uses GPRS to help link paramedics with local hospitals.

The system uses a specially adapted (for robustness) handheld computer into which paramedics can input data at the patient’s side. Once docked back in the vehicle, the information is sent ahead so that it is accessible by A&E via a Web browser interface ready for when the patient arrives.

The system is seven months into its pilot [at July 2007], with 75 vehicles equipped with the new technology by March 2007, a figure intended to reach 300 by the end of the year.

The devices are based on Panasonic CF-18 hardware and use the Lifenet EMS package from supplier Medusa.\(^{210}\)

3G

The use of SMS to remind patients to attend appointments or come in for checkups or flu jabs is evident in a number of PCTs, hospitals and GP surgeries. Addenbrooke's Hospital NHS Trust in Cambridge, Glasgow's Royal Hospital for Sick Children and 26 GP surgeries in LB Hammersmith & Fulham\(^{211}\), have all adopted SMS reminder systems, which have cut non-attendances by up to 30%\(^{212}\).

More generally, mobile phone technology enables clinicians to access clinical data and information more easily. Wireless healthcare may make it far easier for health professionals to access and record patient information and clinical knowledge resources at the point of patient care, and consequently mobility forms part of the NHS IT modernisation programme\(^{213}\).

\(^{207}\) RFID on drugs: Who will pay?, Silicon.com, March 2005
\(^{208}\) RFID futures in western Europe, Juniper Research, January 2005
\(^{209}\) Context-Aware Sensing, Body sensor networks, Guang-Zhong Yang (Ed.) and Surapa Thiemjarus, November 2005
\(^{210}\) New ambulance technology could save lives, East of England Ambulance Service NHS Trust
\(^{211}\) iPlato website
\(^{212}\) Unreliable patients most likely to ask for SMS reminders, E-Health Insider, April 2005
\(^{213}\) Wireless isn’t the future, it’s already with us, E-Health Insider, January 2006
In the US, 3G networks are already being used in hospitals to allow clinicians to review a patient’s clinical notes, x-rays, CT scans, labs and real-time feeds from bedside monitoring equipment without having to go into the hospital\textsuperscript{214}.

In the pharmaceutical and medical device industries, sales representatives use mobile phones and PDAs to demonstrate data to and communicate with doctors.

**Wi-Fi**

Several hospitals in the UK have used Wi-Fi networks to track patients, who upon their admission have their photograph taken digitally and are tagged with a transmitter, both of which are logged to the patient’s electronic records. Benefits cited include a reduction in the possibility of human error (and therefore the possibility of litigation) and an increase in operating theatre efficiency\textsuperscript{215}.

The Royal Hospitals group in Belfast has used Wi-Fi to provide a wireless solution for its material management system, since March 2005. Wi-Fi tags within the network allow staff to locate people and assets in real-time, more quickly and efficiently. The tags feature an emergency alert button for both staff and patients, sending instant distress-signals or messages via a location and map tool. This allows patients to move more freely around the hospital campus. The RH group is also piloting a prescription solution whereby doctors post prescriptions to the pharmacy in real-time via tablet PCs. This has reduced administration time.

Staff use PDAs to access information and applications from the hospital network from anywhere within a ward. The hospitals have also deployed a new voice communication system called Vocera, which when integrated with the Royal’s new IP Telephony system and also with external sites, allows staff to communicate more efficiently across the site\textsuperscript{216}.

**UWB**

UWB is a generic term for technologies typically characterised by the emission of very low power radiation spread over a very large radio bandwidth\textsuperscript{217}. It allows the transfer of large amounts of data (up to 2 Gb/s) over relatively short distances (around 30 metres)\textsuperscript{218}.

UWB equipment operates in the bands between 3.1 to 10.6 GHz. Currently UWB technology is not yet as widespread in the UK as technologies such as Bluetooth, having only been licensed recently (13\textsuperscript{th} August 2007)\textsuperscript{219}. The most common application of UWB technology is indoor, short-range Personal Area Networks, particularly for entertainment – such as wirelessly connecting personal computers, DVD players, portable music players and digital cameras. As such there is currently no evidence of widespread use within the health sector, but could be applied in future although there has been some study into the potential for UWB to be used in radar-style breast cancer detection\textsuperscript{220}.

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\textsuperscript{214} Global Care Quest Get Qualcomm 3G Healthcare Award, Wireless Healthcare

\textsuperscript{215} Birmingham Heartlands Hospital Pilots World's First Wi-Fi Patient Tracking System to Improve Patient Care, ZDNet.co.uk, November 1999

\textsuperscript{216} Wi-Fi in Belfast hospital bags award, Techworld, June 2006

\textsuperscript{217} Decision to make The Wireless Telegraphy (Ultra-Wideband Equipment) (Exemption) Regulations 2007, Ofcom, July 2007

\textsuperscript{218} Enabling new wireless technologies in the UK, Ofcom, August 2007

\textsuperscript{219} Enabling new wireless technologies in the UK, Ofcom, August 2007

\textsuperscript{220} Ultra-Wideband Breast Cancer Detection Radar, Modha, Dimitrakis, Hayes-Gill, and Harrison, 2007
Bluetooth
Bluetooth wireless technology operates in the 2.4GHz to 2.485GHz range (one of the unlicensed Industrial, Science and Medical (ISM) bands); with a maximum power output of 100 mW, although the most commonly used Bluetooth class uses 2.5mW. Telehealth systems often use Bluetooth to connect peripheral medical devices to a central hub. Cost-effectiveness and the globally-used specification were cited by telehealth manufacturers as important considerations in choosing the technology. On the other hand, Bluetooth may not be efficient for use in body sensor networks, in part due to its relatively high use of power (compared to alternative solutions) and the limited size of each Bluetooth area network.

NHS Connecting for Health is investigating the possibility of using Bluetooth in “contactless” Smartcard readers that allow standard "contact" Smartcards to communicate with a clinician's computer through a Bluetooth wireless connection. NHS Connecting for Health claims that this technology will work for both desktop computers and laptops, and involves minimal physical contact, thereby reducing the possibility of cross infection.

While the use of Bluetooth technologies in the UK health sector is already significant and growing, it is dwarfed by the use of Bluetooth technologies such as mobile phone hands-free devices and file push services.

Infrared
Infrared is often used in PDAs and computer peripherals, and in addition to its use in telecare and telehealth systems, can be applied in hospitals when short-range wireless communications are required. Furthermore, infrared does not penetrate walls which is conducive to use in hospitals as it does not interfere with other devices or technologies in the area. Infrared is used in some telehealth systems to connect peripheral medical devices to a central hub, although less frequently than Bluetooth, perhaps due to the lower cost and lower power requirements of Bluetooth.

ZigBee
ZigBee is a technology currently being deployed for wireless sensor networks. A sensor network is an infrastructure comprised of sensing, computing and communications elements that allows the administrator to instrument, observe and react to events and phenomena in a specified environment.

Sensor networks are seen as an important technology that is expected to be deployed widely in the next few years. For example, observers expect the number of ZigBee-compliant nodes to increase from fewer than 1 million today to 100 million in 2008.

ZigBee is used for low power wireless control products, including data collection, monitoring, surveillance and home controls, but it is also used within the health sector for wearable external body sensors. This use currently remains relatively minor, but is considered likely by some wireless health experts to become increasingly widely used due to the lower power requirements of ZigBee technology than many wireless

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221 Bluetooth website
222 What If Digital research
224 Collaborative research helps to ensure clean health care, NHS Connecting for Health, May 2007
225 What If Digital research.
226 ZigBee update: what's in it for me?, Techworld, December 2005
227 ZigBee update: what's in it for me?, Techworld, December 2005
alternatives. Like RFID devices, ZigBee operates in one of the ISM bands of the wireless spectrum, 865.6MHz to 867.6MHz.

**Other wireless communications**

**Telecare**

Telecare systems, including environmental controls, such as movement sensors, falls detectors or alarm call systems, use in-home wireless radio networks, typically Infrared. As well as in an elderly or vulnerable person’s home, sheltered accommodation and care homes are often networked for telecare systems.

Telehealth systems typically use a range of connectivity methods to connect peripheral medical devices to a central hub.

There are over 1.5 million users of basic telecare technology in the UK, of which the majority are using social alarms equipment. This number is likely to increase due to demographic changes, increasing numbers of people living with long-term conditions, and changing government policy to enable elderly, disabled and vulnerable people live independently in the community for as long as possible.

**Hospital radio**

Hospital radio stations are typically run by volunteers rather than by hospitals themselves, and broadcast either via the PatientLine system or via a low-power AM or FM license, often a Restricted Service License (RSL). There are currently 55 hospital radio stations with long-term RSLs and one with a short-term RSL, and an estimated total of 230 hospital radio stations in total, down from approximately 700 hospital radio stations in the 1980s.

**Dedicated spectrum**

**Short range devices**

**Alarms: For the elderly and infirm**

Defined as wireless telegraphy apparatus designed or adapted to generate or indicate an alarm condition, or to arm or disarm the alarm system, so as to be capable of use on one of more of the frequencies, and at a radiated level not exceeding the maximum for such frequencies as specified in the table below:

<table>
<thead>
<tr>
<th>Frequency / Band</th>
<th>Radiated Level</th>
<th>Channel Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>27.450, 34.925, 34.950, 34.975 MHz</td>
<td>500µW e.r.p.</td>
<td>12.5 kHz</td>
</tr>
<tr>
<td>869.2 – 869.25 MHz</td>
<td>10mW e.r.p.</td>
<td>≤25 kHz</td>
</tr>
<tr>
<td>169.4750 – 169.4875 MHz</td>
<td>10mW e.r.p.</td>
<td>12.5 kHz</td>
</tr>
</tbody>
</table>

---

228 Interview with Omer Aziz of Imperial College, London, conducted August 2007.
229 Securing Good Care for Older People, Kings Fund, 2006
230 Building telecare in England, Department of Health, June 2005
231 Radio Restricted Service Licenses, Ofcom, July 2007
232 History, Hospital Broadcasting Association
Radio hearing aids

Defined as wireless telegraphy apparatus designed or adapted for Telephony, for the purpose of hearing aids for the handicapped, so as to be capable of use on one or more of the frequencies within the frequency bands and at a radiated level not exceeding the maximum for such Frequency / Bands, for each category of apparatus, specified in the table below and subject to the following sub-paragraphs:

- In category i channel numbers 1 to 5 and 7 to 9 are the preferred channels, channels 10 to 35 may be used as an alternative but are shared with other applications including radio microphones. The channel centre frequency is equal to 173.3 MHz + (Channel Bandwidth x channel number)

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency / Band</th>
<th>Radiated Level</th>
<th>Channel Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>173.325 to 175.075 MHz</td>
<td>2mW e.r.p</td>
<td>50 kHz</td>
</tr>
<tr>
<td>ii</td>
<td>169.4000 – 169.4750 MHz</td>
<td>10mW e.r.p</td>
<td>50 kHz</td>
</tr>
<tr>
<td>iii</td>
<td>169.4875 – 169.5875 MHz</td>
<td>10 mW e.r.p</td>
<td>50 kHz</td>
</tr>
</tbody>
</table>

Source: Ofcom\textsuperscript{234}

Medical and Biological Applications including Ultra Low Power Active Medical Implants

Defined as wireless telegraphy apparatus designed or adapted for Telemetry and Telecommand, so as to be capable of use on one or more of the frequencies or within one of the frequency bands, and at a radiated level no exceeding the maximum for such Frequency / Bands, for each category of apparatus, specified in the table below and subject to the following sub-paragraphs:

- In category iii, channel numbers 1 to 24 are available with channel centre frequency of 173.7 MHz + (Channel Bandwidth x channel number)
- In category iv, channel numbers 1 to 11 are available with channel centre frequency of 173.7 MHz + (Channel Bandwidth x channel number)
- In category vi, for use with ultra low power active medical implants only. Individual transmitters may combine adjacent channels for increased bandwidth with advanced mitigation techniques
- In category vii and viii, channel numbers 37 to 47 are available with channel centre frequency of 458.5 MHz + (Channel Bandwidth x channel number)
- In category ix and x, channel numbers 19 to 23 are available with channel centre frequency of 458.5 MHz + (Channel Bandwidth x channel number)

\textsuperscript{233} UK Interface Requirement 2030, Ofcom, November 2006
\textsuperscript{234} UK Interface Requirement 2030, Ofcom, November 2006
• In categories iii, iv, vii and ix, these bands may also be used for the tracking of birds

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency / Band</th>
<th>Radiated Level</th>
<th>Channel Bandwidth</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>300 kHz – 30 MHz</td>
<td>9 dBμA/m @ 10m</td>
<td>-</td>
</tr>
<tr>
<td>ii</td>
<td>30 – 37.5 MHz</td>
<td>1 mW e.r.p.</td>
<td>-</td>
</tr>
<tr>
<td>iii</td>
<td>173.7 – 174 MHz</td>
<td>10 mW e.r.p.</td>
<td>12.5 kHz</td>
</tr>
<tr>
<td>iv</td>
<td>173.7 – 174 MHz</td>
<td>10 mW e.r.p.</td>
<td>25 kHz</td>
</tr>
<tr>
<td>v</td>
<td>173.7 – 174 MHz</td>
<td>10 mW e.r.p.</td>
<td>-</td>
</tr>
<tr>
<td>vi</td>
<td>402 – 405 MHz</td>
<td>25 μW e.r.p.</td>
<td>25 kHz</td>
</tr>
<tr>
<td>vii</td>
<td>458.9625 – 459.1000 MHz</td>
<td>10 mW e.r.p.</td>
<td>12.5 kHz</td>
</tr>
<tr>
<td>viii</td>
<td>458.9625 – 459.1000 MHz</td>
<td>500 mW e.r.p.</td>
<td>12.5 kHz</td>
</tr>
<tr>
<td>ix</td>
<td>458.9625 – 459.1000 MHz</td>
<td>10 mW e.r.p.</td>
<td>25 kHz</td>
</tr>
<tr>
<td>x</td>
<td>458.9625 – 459.1000 MHz</td>
<td>500 mW e.r.p.</td>
<td>25 kHz</td>
</tr>
<tr>
<td>xi</td>
<td>9 – 135 kHz</td>
<td>30 dBμA/m @ 10m</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Ofcom\textsuperscript{235}

**Ambulances**

NHS Ambulance services in England and Wales use the following frequency ranges:

<table>
<thead>
<tr>
<th>Lower edge band (MHz)</th>
<th>Upper edge band (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>166-09375</td>
<td>166-10625</td>
</tr>
<tr>
<td>166-19375</td>
<td>166-20625</td>
</tr>
<tr>
<td>166-26875</td>
<td>166-41875</td>
</tr>
<tr>
<td>166-43125</td>
<td>166-44375</td>
</tr>
<tr>
<td>166-45625</td>
<td>166-61875</td>
</tr>
<tr>
<td>166-74375</td>
<td>166-75625</td>
</tr>
<tr>
<td>166-79375</td>
<td>166-80625</td>
</tr>
<tr>
<td>170-89375</td>
<td>170-90625</td>
</tr>
</tbody>
</table>

\textsuperscript{235} UK Interface Requirement 2030, Ofcom, November 2006
### Health Technology Scenarios

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Frequency (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>170.99375</td>
<td>171.00625</td>
</tr>
<tr>
<td>171.06875</td>
<td>171.21875</td>
</tr>
<tr>
<td>171.23125</td>
<td>171.24375</td>
</tr>
<tr>
<td>171.25625</td>
<td>171.41875</td>
</tr>
<tr>
<td>171.54375</td>
<td>171.55625</td>
</tr>
<tr>
<td>171.59375</td>
<td>171.60625</td>
</tr>
</tbody>
</table>

Source: Ofcom\textsuperscript{236}

\textsuperscript{236} Frequency Allocation Table, Ofcom, 2007
10 Key Challenges

Size and complexity

The NHS is an enormous organisation, by world standards. Employing some 5.5% of the working population with a budget exceeding 8% of GDP, it provides a personally tailored service to every person in the land. This size and the sheer range and scope of the services it provides – and its public visibility and accountability – presents a formidable management challenge, in ensuring it can innovate and ‘move with the times’ while at the same time delivering the highest quality of service for patients and the public, and value for money for taxpayers. The scale of this challenge is reflected in (and to some extent exacerbated by) frequent structural reorganisations as successive governments struggle to find new organisational forms to deliver improved performance. How to provide the right incentives in the right place to secure the best from a committed but sometimes over-stressed workforce is the question every government has wrestled with since the inception of the NHS 60 years ago.

An ageing population

Almost 16% of the UK population is over 65, and there are currently more people in the UK aged over 60 than there are children under 16. The old population is itself ageing: people aged 85 and over represented only 1.6% of people aged 50+ in 1951 (13.8m), but this proportion had risen to 5.5% in 2003 (20.0m) and is projected to be 9.1% in 2031 (27.2m).

Older people are key users of health and social care services: in 2002/03 people aged 65+, comprising 16% of the population, accounted for 47% of total spending on hospital and community health services in England237. The cost of an increasing number of older people who are living longer is a key cost driver for the health service.

The ageing population poses significant challenges for health and social care services, particularly around the ability of services to meet the increasing prevalence of long term conditions. An Age Concern debate in June 2007 identified four key challenges for older people in relation to healthcare: the postcode lottery in service provision, access to health care, personal responsibility and public health, specialisation and reorganisation of hospital services238.

Changing morbidity

A further problem for healthcare services is posed by changing lifestyles, especially the impact of the proportion of men and women who are obese or overweight. In 2001 over a fifth of men and women (aged 16 and over) in England were classified as obese. This compares with around a sixth of both in 1993. In 2001, although obesity was at similar levels for both men and women, nearly half of men were considered overweight compared with a third of women239.

The Department of Health identifies obesity as being responsible for more than 9 000 premature deaths per year in England. Obesity is an important risk factor for a number of chronic diseases such as heart disease, stroke, some cancers, and Type 2 diabetes. The Health Select Committee has estimated that the cost of obesity is £3.3 - £3.7 billion per year and of obesity plus the cost of those who are overweight at £6.6 - £7.4

237 Older People, Office of National Statistics, 2005
238 Building the modern NHS, Age Concern, June 2007
239 Health Related Behaviour, Office of National Statistics, January 2004
billion. One million fewer obese people in this country could lead to around 15 000 fewer people with coronary heart disease, 34 000 fewer people developing Type 2 diabetes, and 99 000 fewer people with high blood pressure\textsuperscript{240}.

Long term conditions are closely allied to aging populations, changing morbidities and increasing levels of obesity. This aspect of demographic change incurs high use of resources by the patient and high financial cost to the health service. Currently 15 million people have a long term condition and LTCs take up approximately 50% of all GP consultations and 75% of inpatient days\textsuperscript{241}.

**Technological advance**

Technological advance – new drugs, new devices, new kinds of intervention, new diagnostic tools – can bring huge benefits to patients but at the same time more often than not represent a significant cost driver. Even where they could deliver economic benefit over the long term – for example a drug therapy replacing the need for in-patient stay – the cost benefits are often difficult to realise in the short term, given the relative inflexibility in the hospital cost structure. New technologies also sometimes extend the range of what the health service can do for patients – effectively increasing the scope and therefore the total cost of the offer, albeit to the advantage of the individual.

The massive investment in NHS IT (see section 8.4) will itself bring cost and implementation challenges. Most of the focus to date has been on system specification and national procurement, with less attention paid to the task of local implementation – especially the changes in working practice which the new technology will enable, and which will be required to realise the full benefit of the investment.

**Public expectations**

Public expectations always seem to advance faster than the health sector’s ability to respond to them, despite continuing above-inflation annual funding increases. Expectations of service levels and responsiveness are shaped by experience in other sectors, which over the last two decades have seen significant advance on both counts in a more consumerist and demanding social context. The public’s unwillingness to tolerate waiting and delay has fuelled the very strong political drive to deliver a massive improvement in access to services. The latest target – for a maximum 18 weeks delay between GP referral and treatment in hospital by 2008 is proving very challenging.

At the same time the government has recognised that increasingly patients want to exercise more choice, about where they are treated, by whom, and when, and even to become more involved in choice of treatment options, where these exist. The ‘patient choice’ initiative (enabling patients to choose their hospital of treatment from a list) is a partial response to this, although it is seen by some commentators more as a market mechanism to drive improved performance. On the other hand, the widespread availability of information on the internet – both about treatment options and comparative performance – is leading to more informed and therefore empowered patients.

**Service redesign**

Alongside the organisational restructuring aimed at improving the management of the service (section 2.2), there is a strong move for a more radical restructuring of the way the service is delivered, especially focused

\textsuperscript{240} Health risk and costs of obesity, Department of Health, March 2007
\textsuperscript{241} Our Health, Our Care, Our Say: A new direction for community services, Community Hospitals Association / Department of Health
on an evidence-based approach to the optimum patient pathway for given conditions or patient groups. This seeks to move away from an institutional focus on patients’ needs to a more comprehensive focus on the total patient experience, through the ‘lifetime’ of the condition – or in the case of chronic or terminal illness, the lifetime of the patient. These approaches are based on ensuring that the right treatment is provided in the right place at the right time – for example by reducing inappropriate use of Accident and Emergency facilities, increasing the range of services provided in local settings, and restricting hospital treatment to those conditions and circumstances where the back-up of specialist skills and equipment of a hospital are genuinely required. New service models are likely to see a concentration of specialist hospitals with trauma centres capable of dealing with major emergencies; a network of more local hospitals (perhaps less intensive than current district general hospitals; and the development of ‘polyclinics’ (large health centres including most GPs, together with diagnostic, urgent care and other locally based services).

These developments will require new roles for institutions and changed working practice for professional staff, and will require effective leadership to align clinical, managerial and public support behind them.

Funding pressures

The NHS has enjoyed substantial growth in funding during Labour’s period in government, averaging 6.6% in real terms, taking the planned total public expenditure for the Department of Health to £104 077 million in 2007-08. The growth rate is predicted to reduce to about 3.5% from 2008/09. Given the inherent growth pressures reviewed above – especially an ageing population, technology advance and public expectation – this reduction in the rate of growth will be extremely challenging.

The Wanless Report acknowledges a need for a greatly increased level of spending on the health service in the next twenty years\(^2\), while a report commissioned by BUPA predicted an £11 billion funding shortfall by 2015 which it said could lead to longer waiting lists, staff cuts and low employee morale\(^3\).

The NHS has always experienced difficulty in managing its budget performance within the very tight requirements imposed on it as a taxpayer-funded and publicly accountable organisation. In 2005-06 the NHS overspent by some £570 million, resulting in media and political criticism. The following year it achieved a surplus of around £500 million, this time met by claims that services had been unnecessarily cut back. To put these swings in context, they represent around 0.75% of the budget in each year – a variance many businesses would be pleased to achieve.

While hitting a precise financial year-end outturn target will continue to preoccupy financial managers, the bigger challenge will be how to manage demand within the overall budget, given the growth pressures and the reduced rate of funding growth. Bringing health inflation back into line with national inflation will become increasingly important in a publicly funded health system.

\(^2\) Chapter 5: Resource Requirements, Securing our Future Health: Taking a Long-Term View, Derek Wanless, 2002
\(^3\) Report warns of £11 billion NHS funding gap, BUPA / NERA / Frontier, October 2006
### 11 Annex B – List of Interviewees and Workshop Attendees:

#### 11.1 Interviewees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverly Castleton</td>
<td>Consultant Geriatrician</td>
<td>St Peter’s hospital</td>
</tr>
<tr>
<td>Bob Heile</td>
<td>Chairman</td>
<td>Zigbee Alliance</td>
</tr>
<tr>
<td>Bob Hughes</td>
<td>Chair</td>
<td>Bluetooth Medical Devices Working Group</td>
</tr>
<tr>
<td>Bob Sang</td>
<td>Professor</td>
<td>South Bank University</td>
</tr>
<tr>
<td>Charles Leadbetter</td>
<td>Futurologist</td>
<td>Freelance</td>
</tr>
<tr>
<td>Cyril Chantler</td>
<td>Chair</td>
<td>Kings Fund</td>
</tr>
<tr>
<td>Dave McCarron</td>
<td>UK technical account manager</td>
<td>Intel</td>
</tr>
<tr>
<td>David Fish</td>
<td>Professor of Neurology &amp; Neurosurgery</td>
<td>UCLH</td>
</tr>
<tr>
<td>Geoff Royston</td>
<td>Futures</td>
<td>Department of Health</td>
</tr>
<tr>
<td>Gordon Peterkin</td>
<td>Director</td>
<td>Scottish Centre for Telehealth</td>
</tr>
<tr>
<td>Jan Rigby</td>
<td>-</td>
<td>University of Sheffield</td>
</tr>
<tr>
<td>Jennifer Dixon</td>
<td>Director of Policy</td>
<td>King’s Fund</td>
</tr>
<tr>
<td>Jeremy Thorp</td>
<td>Director of business requirements, technology office</td>
<td>Connecting for health</td>
</tr>
<tr>
<td>Julie Fleischer</td>
<td>Chair</td>
<td>USB Medical Devices Working Group</td>
</tr>
<tr>
<td>Kevin Doughty</td>
<td>-</td>
<td>York University</td>
</tr>
<tr>
<td>Kevin Warwick</td>
<td>Professor of Cybernetics</td>
<td>University of Reading</td>
</tr>
<tr>
<td>Lee Phillips</td>
<td>Marketing and Communications Director</td>
<td>Humana</td>
</tr>
<tr>
<td>Lord Hunt</td>
<td>Parliamentary Under Secretary of State for Justice, formerly minister in the Department of Health</td>
<td>Ministry of Justice</td>
</tr>
<tr>
<td>Mark Outhwaite</td>
<td>Managing director</td>
<td>Othnetics</td>
</tr>
<tr>
<td>Matthew Chapman</td>
<td>-</td>
<td>Quotec</td>
</tr>
<tr>
<td>Name</td>
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<td>Organisation</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>---------------------------------------------------</td>
</tr>
<tr>
<td>Mike Short</td>
<td></td>
<td>O2</td>
</tr>
<tr>
<td>Muir Gray</td>
<td>Director of the national electronic library for health</td>
<td>Connecting for Health</td>
</tr>
<tr>
<td>Murray Bain</td>
<td></td>
<td>NHS Direct</td>
</tr>
<tr>
<td>Murray Bywater</td>
<td>Managing director</td>
<td>Silicon Bridge Research</td>
</tr>
<tr>
<td>Nat Billington</td>
<td>Managing Director</td>
<td>Medic to Medic – Map of Medicine</td>
</tr>
<tr>
<td>Nick Penlington</td>
<td>ICT services manager</td>
<td>Kings College Hospital</td>
</tr>
<tr>
<td>Nick Timmins</td>
<td>Healthcare Journalist</td>
<td>Financial Times</td>
</tr>
<tr>
<td>Omer Aziz</td>
<td>Clinical Research Fellow</td>
<td>Imperial College</td>
</tr>
<tr>
<td>Paul Hodgkin</td>
<td>GP and Founder</td>
<td>Patient Opinion</td>
</tr>
<tr>
<td>Peter Bradley</td>
<td>Chief Executive</td>
<td>London Ambulance NHS Trust</td>
</tr>
<tr>
<td>Peter Morgan</td>
<td>Business Development</td>
<td>McKesson</td>
</tr>
<tr>
<td>Rebecca Rosen</td>
<td>Medical Director and GP</td>
<td>Humana</td>
</tr>
<tr>
<td>Rob Davies</td>
<td>Senior Scientist</td>
<td>Philips Research</td>
</tr>
<tr>
<td>Roger Killen</td>
<td>Managing Director</td>
<td>The Learning Clinic</td>
</tr>
<tr>
<td>Ronnette Lucraft</td>
<td>Director of Strategy</td>
<td>NHS Direct</td>
</tr>
<tr>
<td>Simon Eggleton</td>
<td>Managing Director</td>
<td>Airwave Solutions</td>
</tr>
<tr>
<td>Simon Gill</td>
<td>Commercial Product Manager</td>
<td>iSoft</td>
</tr>
<tr>
<td>Tobias Alpsten</td>
<td>Managing Director</td>
<td>iPlato</td>
</tr>
<tr>
<td>Tom Loosemore</td>
<td>Architect, web 2.0</td>
<td>BBC</td>
</tr>
<tr>
<td>Will Cavendish</td>
<td>Director of Strategy</td>
<td>Department of Health</td>
</tr>
<tr>
<td>William Heath</td>
<td>Founder</td>
<td>Kable; Ideal Government</td>
</tr>
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### 11.2 External workshop attendees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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</tr>
</thead>
<tbody>
<tr>
<td>George MacGinnis</td>
<td></td>
<td>Connecting for Health</td>
</tr>
<tr>
<td>Jeremy Thorp</td>
<td>Director of business requirements, technology office</td>
<td>Connecting for Health</td>
</tr>
<tr>
<td>Name</td>
<td>Position</td>
<td>Organization</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td>David Colin-Thome</td>
<td>GP</td>
<td>-</td>
</tr>
<tr>
<td>Angela Coulter</td>
<td>-</td>
<td>Picker Institute</td>
</tr>
<tr>
<td>Greg Partson</td>
<td>-</td>
<td>Accenture Institute for Public Value</td>
</tr>
<tr>
<td>Nat Billington</td>
<td>Director</td>
<td>Map of Medicine</td>
</tr>
<tr>
<td>Geoff Royston</td>
<td>-</td>
<td>Department of Health</td>
</tr>
<tr>
<td>Sadie Creese</td>
<td>Director of e-Security</td>
<td>Warwick Digital Laboratory</td>
</tr>
<tr>
<td>Paul Hodgkin</td>
<td>Chief Executive</td>
<td>Patient Opinion</td>
</tr>
<tr>
<td>Mike Short</td>
<td>-</td>
<td>O2</td>
</tr>
<tr>
<td>Vinesh Raja</td>
<td>Informatics Group</td>
<td>Warwick University</td>
</tr>
<tr>
<td>Mourad Ameziane</td>
<td>Managing Director</td>
<td>Public Service – Health Europe</td>
</tr>
</tbody>
</table>

**11.3 BT Health workshop attendees:**

- Sir Jonathon Michael
- Trevor Fitchett
- Dave Heatley
- Justin Whatling
- Sue Davis
- Terry Hodgkinson
- Steve Wright
- Steve Whittaker

**11.4 Department of health workshop attendees:**

- Gavin Roberts
<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eileen Lawrence</td>
</tr>
<tr>
<td>Bobb Gann</td>
</tr>
<tr>
<td>Peter Dick</td>
</tr>
<tr>
<td>David Halsall</td>
</tr>
<tr>
<td>Gourie Bhattacharjee</td>
</tr>
<tr>
<td>Tom Skrinar</td>
</tr>
<tr>
<td>Pamela Chapman</td>
</tr>
<tr>
<td>David Buck</td>
</tr>
<tr>
<td>Michael Wright</td>
</tr>
<tr>
<td>Zoltan Bozoky</td>
</tr>
<tr>
<td>Bryn Shorney</td>
</tr>
<tr>
<td>John Brittain</td>
</tr>
<tr>
<td>Sunita Berry</td>
</tr>
<tr>
<td>Geoff Royston</td>
</tr>
</tbody>
</table>
12 Annex C – Long List of Forces for Change

12.1 Table X to show the long list of drivers / barriers / shocks

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Description</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NHS Innovation Strategy</td>
<td>The NHS includes organisations such as the Institute for Innovation and Improvement which promote innovation within the NHS, including technological innovation.</td>
<td>Driver</td>
</tr>
<tr>
<td>2</td>
<td>The Ageing Population</td>
<td>The population of the UK is living longer. Ill-health is associated with the elderly, in particular the oldest old (85+), and this section of the population is consequently more resource-hungry in terms of clinicians, carers, medications and time. This could drive uptake of telehealth.</td>
<td>Driver</td>
</tr>
<tr>
<td>3</td>
<td>The Ageing Population</td>
<td>The population of the UK is living longer. Ill-health is associated with the elderly, in particular the oldest old (85+), and this section of the population is consequently more resource-hungry in terms of clinicians, carers, medications and time. This could cost money that could otherwise be used to drive telehealth.</td>
<td>Barrier</td>
</tr>
<tr>
<td>4</td>
<td>Changing Morbidities</td>
<td>The types of diseases experienced by the UK population are changing - more people are suffering from long-term &quot;chronic&quot; conditions (as opposed to short-term &quot;acute&quot; conditions), which are resource-hungry in terms of clinicians, medications and time. This could drive uptake of telehealth</td>
<td>Driver</td>
</tr>
<tr>
<td>5</td>
<td>Changing Morbidities</td>
<td>The types of diseases experienced by the UK population are changing - more people are suffering from long-term &quot;chronic&quot; conditions (as opposed to short-term &quot;acute&quot; conditions), which are resource-hungry in terms of clinicians, medications and time. This could cost money that could otherwise be used to drive telehealth</td>
<td>Barrier</td>
</tr>
<tr>
<td>6</td>
<td>Obesity</td>
<td>The population of the UK is getting fatter. Obesity is associated with a range of resource-hungry long-term morbidities such as diabetes, heart disease and cancers. This could inhibit uptake of telecare due to its high cost and resource requirements</td>
<td>Barrier</td>
</tr>
<tr>
<td>7</td>
<td>Obesity</td>
<td>The population of the UK is getting fatter. Obesity is associated with a range of resource-hungry long-term morbidities such as diabetes, heart disease and cancers. This could drive uptake of telecare as a cost-effective means of treatment</td>
<td>Driver</td>
</tr>
<tr>
<td>8</td>
<td>Risky health behaviours</td>
<td>Smoking, binge &amp; heavy drinking, drug abuse, unprotected sex and poor nutrition all cause health problems which use health service resources. This could inhibit uptake of telecare due to its high cost and resource requirements</td>
<td>Barrier</td>
</tr>
<tr>
<td>9</td>
<td>Funding pressures - government funding of the NHS with public money</td>
<td>The NHS is vastly expensive - the budget this year is £84.4 billion, 98% of which comes from tax revenues. Can this level of government spending be sustained? Adoption of wireless healthcare would require huge investment, which may not be possible</td>
<td>Barrier</td>
</tr>
<tr>
<td>No.</td>
<td>Scenarios</td>
<td>Description</td>
<td>Type</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>10</td>
<td>Funding pressures - government funding of the NHS</td>
<td>The NHS is vastly expensive - the budget this year is £84.4 billion, 98% of which comes from tax revenues. Can this level of government spending be sustained? Adoption of wireless healthcare would require huge investment, but this may be mitigated by savings due to increased efficiency.</td>
<td>Driver</td>
</tr>
<tr>
<td>11</td>
<td>Pandemic - e.g. avian influenza</td>
<td>A pandemic could increase the need for remote monitoring of patients in isolation to reduce the risk of spreading infection, thus driving uptake of wireless.</td>
<td>Shock</td>
</tr>
<tr>
<td>12</td>
<td>Pandemic - e.g. avian influenza</td>
<td>A pandemic could reduce GDP and therefore disposable income = less money to spend on communication technologies</td>
<td>Shock</td>
</tr>
<tr>
<td>13</td>
<td>Size and complexity</td>
<td>The NHS consists of over 700 organisations and bodies.</td>
<td>Barrier</td>
</tr>
<tr>
<td>14</td>
<td>Public expectations</td>
<td>Public expectations always seem to advance faster than the health sector’s ability to respond to them, despite continuing above-inflation annual funding increases. This could drive uptake of wireless technologies if they are publically perceived to be beneficial.</td>
<td>Driver</td>
</tr>
<tr>
<td>15</td>
<td>Public expectations</td>
<td>Public expectations always seem to advance faster than the health sector’s ability to respond to them, despite continuing above-inflation annual funding increases. This could inhibit uptake of wireless technologies if other advances are perceived to be of greater benefit</td>
<td>Barrier</td>
</tr>
<tr>
<td>16</td>
<td>Technological advances - ICTEC</td>
<td>Technological advance – new drugs, new devices, new kinds of intervention, new diagnostic tools – can bring huge benefits to patients but at the same time more often than not represent a significant cost driver. Even where they could deliver economic benefit over the long term – for example a drug therapy replacing the need for in-patient stay – the cost benefits are often difficult to realise in the short term, given the relative inflexibility in the hospital cost structure.</td>
<td>Driver</td>
</tr>
<tr>
<td>17</td>
<td>Climate change - flooding</td>
<td>Recent floods across England and Wales prevented many affected regions from accessing safe drinking water. Contaminated drinking water can contain e-Coli as well as cholera, diphtheria &amp; other potentially fatal diseases.</td>
<td>Shock</td>
</tr>
<tr>
<td>18</td>
<td>Climate change - warming</td>
<td>Heatstroke, sunburn, widespread fires (e.g. in Greece this summer). European heat wave of 2003 claimed an estimated 35,000 lives. Re-emergence of diseases that were considered not to be a problem in UK such as malaria</td>
<td>Shock</td>
</tr>
<tr>
<td>19</td>
<td>Technological advances - MEDTEC</td>
<td>Technological advance – new drugs, new devices, new kinds of intervention, new diagnostic tools – can bring huge benefits to patients but at the same time more often than not represent a significant cost driver. Even where they could deliver economic benefit over the long term – for example a drug therapy replacing the need for in-patient stay – the cost benefits are often difficult to realise in the short term, given the relative inflexibility in the hospital cost structure.</td>
<td>Driver</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Description</td>
<td>Type</td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>20</td>
<td>Technological advances - GENTEC</td>
<td>Technological advance – new drugs, new devices, new kinds of intervention, new diagnostic tools – can bring huge benefits to patients but at the same time more often than not represent a significant cost driver.  Even where they could deliver economic benefit over the long term – for example a drug therapy replacing the need for in-patient stay – the cost benefits are often difficult to realise in the short term, given the relative inflexibility in the hospital cost structure.</td>
<td>Driver</td>
</tr>
<tr>
<td>21</td>
<td>Fixed communication technologies</td>
<td>If high-speed fixed communication technologies become more widespread - especially with the roll out of fibre optics to hospitals, they may reduce the requirement for wireless communication technologies</td>
<td>Barrier</td>
</tr>
<tr>
<td>22</td>
<td>Patient attitudes</td>
<td>Do patients want to be RFID tagged? Could they feel a bit like prisoners whilst in hospital? Risk of patients becoming a number rather than a name?</td>
<td>Barrier</td>
</tr>
<tr>
<td>23</td>
<td>User acceptance</td>
<td>The general public are concerned about the security of digital medical records and the use of technology to store medical records</td>
<td>Barrier</td>
</tr>
<tr>
<td>24</td>
<td>Spaghetti Syndrome</td>
<td>A reduction in wires could make patients more comfortable / safe</td>
<td>Driver</td>
</tr>
<tr>
<td>25</td>
<td>High supply chain costs</td>
<td>An increased use of RFID (wireless) technology could continue to reduce supply chain costs within the pharmaceutical industry</td>
<td>Driver</td>
</tr>
<tr>
<td>26</td>
<td>Increased no. of healthcare professionals working from home or from a mobile location</td>
<td>The NHS is actively encouraging more teleworking which could increase the number of people using wireless technologies such as mobile phones and PDAs.</td>
<td>Driver</td>
</tr>
<tr>
<td>27</td>
<td>Fuel crises / oil price shock</td>
<td>Could lead to an increase in the number of health employees working from home</td>
<td>Driver</td>
</tr>
<tr>
<td>28</td>
<td>Fuel crises / oil price shock</td>
<td>A fuel crises may reduce the amount of health tourism, saving the NHS money which could be spent on other things such as health tech</td>
<td>Driver</td>
</tr>
<tr>
<td>29</td>
<td>Climate change</td>
<td>Significant climate change could reduce GDP and therefore disposable income = less money to spend on communication technologies</td>
<td>Barrier</td>
</tr>
<tr>
<td>30</td>
<td>Natural disaster</td>
<td>Health professionals may need the ability to communicate / and access information from a number of ad-hoc locations</td>
<td>Shock</td>
</tr>
<tr>
<td>31</td>
<td>Consumerist behaviours</td>
<td>Patients are becoming increasingly consumerist in their attitude to healthcare. They are becoming more demanding and will often have access to more information using the internet.</td>
<td>Driver</td>
</tr>
<tr>
<td>32</td>
<td>Increasing technological literacy</td>
<td>Patients are increasingly digital natives and will therefore not be as adverse to technology as digital immigrants</td>
<td>Driver</td>
</tr>
<tr>
<td>33</td>
<td>Emotional resistance to telecare equipment</td>
<td>The 'hospitalisation' of a home can mean that it no longer feels like a home for the patient, defeating much of the rationale for the older person being assisted to remain in their house</td>
<td>Barrier</td>
</tr>
<tr>
<td>34</td>
<td>User acceptance</td>
<td>Users will often reject technology if they think that their privacy is being invaded</td>
<td>Barrier</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>User acceptance</td>
<td>There are increasing numbers of elderly people and people social isolation. Telecare solutions could make them feel looked after in their homes and less isolated</td>
<td>Driver</td>
</tr>
<tr>
<td>36</td>
<td>Increase in diabetes and other chronic diseases</td>
<td>Chronic illnesses such as diabetes could potentially benefit from in body sensors which would utilise wireless technologies. Because the level of diabetes is increasing rapidly because of high obesity rates in the UK more funding may be directed towards research into these areas</td>
<td>Driver</td>
</tr>
<tr>
<td>37</td>
<td>The demand for improved safety within hospitals and the risks of mistakes are higher</td>
<td>Patient expectations are increasing with time - they expect fewer mistakes or errors which IT can reduce. Also, hospitals run at higher capacity than before and patients are more likely to be moved between wards</td>
<td>Driver</td>
</tr>
<tr>
<td>38</td>
<td>Increasing size and complexity of hospitals &amp; polyclinics</td>
<td>Larger hospitals and more staff, valuable equipment and high-cost pharmaceuticals could increase the need for hospitals to monitor the locations of assets with RFID tagging.</td>
<td>Driver</td>
</tr>
<tr>
<td>39</td>
<td>Falling cost of wireless technologies</td>
<td>As technologies such as RFID, ZigBee, Bluetooth and Wi-Fi become cheaper to produce and use, usage could increase, particularly if they become significantly better value than fixed alternatives.</td>
<td>Driver</td>
</tr>
<tr>
<td>40</td>
<td>NHS Connecting for Health &amp; the NPfIT - N3</td>
<td>The NHS N3 fibre network may negate the need for certain types of wireless connectivity (eg WiFi) as it provides a fast and reliable broadband infrastructure</td>
<td>Barrier</td>
</tr>
<tr>
<td>41</td>
<td>NHS Connecting for Health &amp; the NPfIT - ePrescribing</td>
<td>&quot;ePrescribing systems will support the whole medicines use process: they will enable medications (and other prescribed therapies) to be managed electronically at every stage, from prescribing through to supply and administration.&quot; - this could drive uptake of wireless tagging &amp; tracking technology RFID</td>
<td>Driver</td>
</tr>
<tr>
<td>42</td>
<td>NHS Connecting for Health &amp; the NPfIT - NHSMail</td>
<td>The NHS email and directory service is designed for both fixed and wireless use to enable clinicians to communicate on the move.</td>
<td>Driver</td>
</tr>
<tr>
<td>43</td>
<td>Cost</td>
<td>If it is a lot cheaper to use a wireless solution this may lead to increased uptake by CIOs</td>
<td>Driver</td>
</tr>
<tr>
<td>44</td>
<td>Cost</td>
<td>If the benefits of a wireless solution do not outweigh the costs it is unlikely that CIOs will take them up</td>
<td>Barrier</td>
</tr>
<tr>
<td>45</td>
<td>Interference with machines</td>
<td>New evidence to suggest that mobile phones do interfere with patient monitoring machines in hospitals</td>
<td>Barrier</td>
</tr>
<tr>
<td>46</td>
<td>DH policy.</td>
<td>This is to &quot;provide care in the minimum intensity setting for as long as possible&quot; Care settings include the community and the home. Part of the strategy is to develop self management and self care and ultimately support for wellness maintenance and prevention.</td>
<td>Driver</td>
</tr>
<tr>
<td>47</td>
<td>Patient Safety</td>
<td>One of the most important uses of ICT is to improve information flow – &quot;the right information, in the right place at the right time&quot;. This has a huge impact on patient safety ensuring for example less accidents and errors, correct handover between staff, decision support to care professionals.</td>
<td>Driver</td>
</tr>
</tbody>
</table>
### Health Technology Scenarios

<table>
<thead>
<tr>
<th>#</th>
<th>Scenario</th>
<th>Description</th>
<th>Driver/Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Workforce</td>
<td>The skilled workforce in the UK is contracting and by 2015 there will be as many people in retirement as in employment. The old model of care delivered exclusively by one individual to another in a face-to-face setting is unsustainable into the future.</td>
<td>Driver</td>
</tr>
<tr>
<td>49</td>
<td>Globalisation</td>
<td>Care provision can be provided to the UK from non-UK sources. Eg radiography</td>
<td>Driver</td>
</tr>
<tr>
<td>50</td>
<td>Accidents and poor surveillance</td>
<td>Release of pathogens into UK</td>
<td>Shock</td>
</tr>
</tbody>
</table>
13 Annex D – Detailed List of Health Applications

This annex provides detailed descriptions of the applications that may be used in healthcare within the next 20 years as identified in section 5 of the report. For each application we have included:

- A detailed description of the application or service
- Evidence/examples of the technology in use or detail of similar applications
- Drivers and barriers that contribute to and impact the application’s potential uptake
- The maximum addressable market which refers to the potential maximum market in which the health application could be used. This is independent of scenarios (or would be uptake under the Age of Abundance scenario)

The maximum addressable market for each application has been estimated using current healthcare data and appropriate proxies. For each application we have provided an explanation or rationale as to how we arrived at the addressable market estimation.

As assumptions and proxy figures were used in the estimations, we have not disclosed potential uptake as quantitative data. Instead, we have created a classification system which is intended to provide more granularity on identifying maximum addressable market without necessitating complex methodology. The classification system is explained in the table below:

<table>
<thead>
<tr>
<th>Potential number of application users (estimate)</th>
<th>Addressable market classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 million (whole population)</td>
<td>universal</td>
</tr>
<tr>
<td>30-60 million</td>
<td>significant</td>
</tr>
<tr>
<td>1-30 million</td>
<td>moderate</td>
</tr>
<tr>
<td>&lt;1 million</td>
<td>niche</td>
</tr>
</tbody>
</table>

13.1 Individual / anywhere

These are applications which could be used anywhere. This includes in the settings elaborated below (home, hospital, ambulance) as well as “out of home”.

13.1.1 Administrative

Appointment reminders via mobile phone (I1)

Patients are automatically sent reminders of their appointment a week in advance. It includes the appointment day and time as well as the cancellation number. Where these have been introduced they have reduced the number of missed appointments dramatically. Patients can also be sent SMS notifications when their prescriptions are ready, for example.
## Evidence:
- Missed appointments cut by 27% across sixteen surgeries, [link](#)
- Lloyds Pharmacy customers are contacted by text when their prescription is ready, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increasing levels of mobile penetration</td>
<td>• Digital inclusion – not everyone (particularly the elderly) has a mobile phone</td>
</tr>
<tr>
<td>• Easy set up process</td>
<td>• Initial set up costs</td>
</tr>
<tr>
<td>• Text to speech translations offered</td>
<td></td>
</tr>
</tbody>
</table>

### Drivers
- Increasing levels of mobile penetration
- Easy set up process
- Text to speech translations offered

### Barriers
- Digital inclusion – not everyone (particularly the elderly) has a mobile phone
- Initial set up costs

### Maximum addressable market
- Universal

### Rationale
- Assumes every individual will require a healthcare appointment or prescription service at some point in their lifetime

## Medication alerts (Including “intelligent pill dispensers”, “SMS alerts”, “intelligent medication”) ([I2, I3, I4](#))

Patients are automatically reminded if they don’t take their medication at the appropriate time. There are a number of different ways that this could happen:

**SMS alerts** – a simple SMS message sent to the patient at a particular time of the day to remind them to take their medication.

**Intelligent pill dispensers** – these are pill boxes or bottles which can sense whether they have been opened each day at the appropriate time. If they are not opened they can sound an alarm. Alternatively they could send a message to the patient’s home hub which notifies a relative, friend or the patient.

**Intelligent medication** – the medication itself includes sensors which can recognise whether they have been administered or not. If they haven’t the medication can wirelessly send a message to the home hub which can notify the relevant person.

### Evidence:
- A case study featuring patient and carer experiences of medication reminders, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Aging populations</td>
<td>• Initial set up costs</td>
</tr>
<tr>
<td>• Increase in chronic conditions</td>
<td>• Lack of funding from the NHS – ongoing costs of using the medication container</td>
</tr>
<tr>
<td></td>
<td>• Privacy concerns</td>
</tr>
</tbody>
</table>

### Maximum addressable market
- Universal

### Rationale
- Assumes every individual will require a healthcare appointment or prescription service at some point in their lifetime
• Significant
• Number of prescription items dispensed in the UK represents a significant addressable market

---

**SMS pharmacy and drug location (I5, I6)**

SMS pharmacy and drug finder – a service where users can SMS a short code number with a specific question like “where is my nearest pharmacy with migraine medication in stock?”

**Evidence:**

• In the US, Google SMS offers a local business directory service; users text “pharmacy” plus their zip code and receive listings in a return SMS, [link]
• NHS Choices are shortly launching an SMS shortcode service which uses location based services and links the user to a WAP page displaying their nearest hospital, pharmacy, GP etc.

<table>
<thead>
<tr>
<th><strong>Drivers</strong></th>
<th><strong>Barriers</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing use of technology, in particular mobile, to buy and locate products and services</td>
<td>Digital inclusion – not everyone (particularly the elderly) has a mobile phone</td>
</tr>
<tr>
<td>Increase in chronic diseases and reliance on medication to control symptoms</td>
<td>Pharmacies are not nationalised – small independent pharmacies would have to be persuaded to install a system which would require set up costs which they are unlikely to re-coup</td>
</tr>
</tbody>
</table>

**Maximum addressable market**

**Rationale**

• Universal
• Estimation assumes that every person in the UK will, at some point in their lifetime, require pharmacy services

---

**SMS payment for prescription charges (I7)**

Premium rate SMS (or another mobile phone based payment system) could be used to allow cashless payment for prescription charges.

**Evidence:**

• Some local authorities now require payment by mobile phone for services such as parking, [link]

<table>
<thead>
<tr>
<th><strong>Drivers</strong></th>
<th><strong>Barriers</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>People like fast, convenient ways to pay – like Oyster cards for example.</td>
<td>Digital inclusion – not everyone (particularly the elderly) has a mobile phone</td>
</tr>
<tr>
<td>Increasing levels of patient expectation and a</td>
<td>Trust, security and privacy – will my phone be secure</td>
</tr>
</tbody>
</table>
Health Technology Scenarios

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing number of prescriptions being written (with increased potential for errors etc; the system is streamlined) as we get older and fatter.</td>
<td>Cost of initial set up</td>
</tr>
<tr>
<td>Increasing levels of patient expectation and a &quot;consumerist&quot; attitude to healthcare</td>
<td>GP surgeries fail to adopt the system and rely on traditional methods of prescription writing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Market size based on the number of GP practices and community pharmacy contractors in the UK</td>
</tr>
</tbody>
</table>

Electronic prescription services (I8)

The Electronic Prescription Service will enable prescribers - such as GPs and practice nurses - to send prescriptions electronically to a dispenser (such as a pharmacy) of the patient’s choice. This will make the prescribing and dispensing process safer and more convenient for patients and staff.

Evidence:

- NHS CfH Electronic Prescription Service website, [link](#)

Drivers

- Increasing number of prescriptions being written (with increased potential for errors etc; the system is streamlined) as we get older and fatter.
- Increasing levels of patient expectation and a "consumerist" attitude to healthcare

Barriers

- Cost of initial set up
- GP surgeries fail to adopt the system and rely on traditional methods of prescription writing

Maximum addressable market

- Niche

Rationale

- Market size based on the number of GP practices and community pharmacy contractors in the UK

Mobile interpretation services (I9)

There are two potentially different mobile interpretation services. One in which devices can automatically translate using voice recognition technology. Or another where translators are located in a call centre and the clinician can make a voice call using a wireless device such as a mobile phone. Furthermore for deaf people the technology may include a screen displaying a person using sign language.

Evidence:

- Many GP surgeries offer interpretation via a telephone call to a company called Language Line, [link](#)

Drivers

- Increasing levels of migration, particularly within the

Barriers

- Government policy that overseas nationals should
EU

- Many older immigrant communities are “ghettoised” and some people never learn English
- Would interpreters need subject knowledge

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Based on number of hard of hearing people in the UK</td>
</tr>
<tr>
<td></td>
<td>Figures for non-English speakers in the UK were not available but it is anticipated this would not alter the classification of this addressable market size as niche</td>
</tr>
</tbody>
</table>

13.1.2 Discretionary healthcare applications

**Nutritional content scanning (I10)**

In the future it may be possible to scan all food items within a supermarket using a reader on a mobile phone. Nutritional information could be displayed on the mobile device alongside advice from your health practitioner where necessary.

**Evidence:**

- A proprietary technology is currently available but not widely deployed, [link](#)
- A Finnish company has developed a mobile solution, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>People are becoming more interested in where their food comes from, its nutritional value etc</td>
<td></td>
</tr>
<tr>
<td>Increasing levels of consumer engagement with their health</td>
<td></td>
</tr>
<tr>
<td>This could help supermarkets learn more about consumption habits</td>
<td></td>
</tr>
<tr>
<td>Cost of implementation – this would probably require a number of private companies to invest in the system e.g. the shop, food and drink manufacturers etc.</td>
<td></td>
</tr>
<tr>
<td>No immediate benefits will be seen to the health service or the food and drink retail industry – there may be no benefits for some retailers e.g. off licenses</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universal</td>
<td>Potential benefit and roll out to whole population</td>
</tr>
</tbody>
</table>

**Remote personal trainer (I11)**

Mobile devices could collate your vital signs as well as number of paces taken in a day etc. The personal trainer
accesses this data remotely and sends you messages of encouragement or advice for your fitness regime. It may also include warnings such as the need for fluids, or glucose if the patient was diabetic.

**Evidence:**
- Apple and Nike already sell a similar device which allows you to manage your fitness regime and monitor progress on a computer, [link](#).

### Drivers vs. Barriers

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many people are taking more responsibility for their personal health and fitness</td>
<td>Cost of the technology and accessories</td>
</tr>
<tr>
<td>Mobile operators are keen to provide extra services which “add value” and capture a larger share of the market</td>
<td>Digital inclusion</td>
</tr>
</tbody>
</table>

### Maximum addressable market vs. Rationale

| Universal | Potential benefit and roll out to whole population |

#### 13.1.3 Diagnostic applications

**MMS photos to NHS direct (or other) (112)**

As the quality of cameras on mobile phones get better there is potential to use them to send MMS messages to health services of rashes etc to help with diagnosis.

**Evidence:**
- Junior doctors have used MMS in hospitals to send images of x-rays to specialists for diagnosis, [link](#).

### Drivers vs. Barriers

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing levels of camera phone ownership</td>
<td>Digital inclusion</td>
</tr>
<tr>
<td>Increasing levels of patient expectation</td>
<td>Lack of funding</td>
</tr>
<tr>
<td>Fewer GP appointments available putting extra burden on services such as NHS Direct to provide primary care</td>
<td>Lack of clarity on who would bear the cost of the message, the user, NHS or mobile operator?</td>
</tr>
<tr>
<td>NHS Choices employees may lack the relevant training to assess images</td>
<td>Ability of the system to be able to receive and display images within a suitable timeframe</td>
</tr>
</tbody>
</table>

### Maximum addressable market vs. Rationale

| Universal | |
| Potential benefit and roll out to whole population |
Health Technology Scenarios

- Universal
- Potential to be used by whole population

### Public health sensors (Infectious disease sensors) (I13)

Sensors measuring levels of indicators which suggest public ill-health, such as body temperature. These sensors are placed in public areas such as airports and will alert the system or a clinician if someone’s body temperature is outside the normal range. Devices such as this may be used in a flu pandemic.

**Evidence:**
- Infrared temperature sensors designed specifically for the threat of a flu pandemic, [link]
- Research into biosensors which can be printed onto paper (?) and detect a range of body chemicals for diagnosis, [link]

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public and health service concern over pandemic flu</td>
<td>Concerns about privacy and surveillance</td>
</tr>
</tbody>
</table>

**Maximum addressable market**

<table>
<thead>
<tr>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensors to be installed in airports – addressable market size is based on the number of airports in the UK</td>
</tr>
</tbody>
</table>

### 13.1.4 Communication applications

### Alarms / falls monitors (from patient to hub) (I14)

These alarms can either be triggered by the patient themselves after they have fallen, or they will be triggered using an accelerometer or some other technology which can detect a fall. The alarm itself will include a microphone and speaker which will allow the wearer to talk to someone in a call centre (if they are able to). This would usually be in the home but could be deployed in care homes, hospitals at night etc.

**Evidence:**
- The Department of Health’s Building Telecare in England report explains telecare and sets out implementation guidelines and instructions, [link]
- A company providing care homes and sheltered accommodation in Ireland explains the system clearly, [link]

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aging population</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>Government drive to allow people to remain</td>
<td>Privacy – will people want to feel &quot;watched&quot;?</td>
</tr>
</tbody>
</table>
Health Technology Scenarios

**Alarms / falls monitors (hub to call centre) (I15)**

Once a message is received from the patient’s alarm this automatically activates a call to the call centre, or, in an emergency will call the emergency services directly.

- **Evidence:**
  - The Department of Health’s Building Telecare in England report explains telecare and sets out implementation guidelines and instructions, [link](#).
  - A company providing care homes and sheltered accommodation in Ireland explains the system clearly, [link](#).

- **Drivers:**
  - Aging population
  - Government drive to allow people to remain independent for as long as possible.

- **Barriers:**
  - Cost of implementation (including call centre)
  - Privacy – will people want to feel “watched”?

- **Maximum addressable market**
  - Moderate

- **Rationale**
  - Addressable market based on the number of people who received social care in 2006-2007.

**Digital health information including peer to peer networks (I16)**

Online health information and support being provided and shared between patients, such as forums and social networking sites.

- **Evidence:**
  - Forums like the eHealth Forum allow users to ask questions, contribute and search previous discussions by health query, [link](#).
  - iMedix beta health site is a website where people can contact other people with similar health conditions or queries, using a message service or IM. There are also lists of sites about conditions which users can rate depending on how useful they are, [link](#).
13.1.5 Body Area Network (BAN) applications

In-body monitoring (17)

Sensors can either be implanted within the body to measure vital signs or they may be swallowed or put inside the body for a particular diagnostic test. It would wirelessly transmit the results to a transceiver outside the body. There are a number of different applications of in-body monitoring, here are some examples:

A sensor inside the body would continuously measure vital signs such as heart rate, blood pressure etc. (the advantage of in-body would be that the patient could be monitored all the time without having to attach anything to his / her body, and information from within the body could be the most accurate way of gauging vital signs.)

Evidence:

- Imperial College conducts a lot of research in the field of implantable Body Sensor Networks; an overview of the field can be found here, [link]
In-body drug delivery (I18)

A sensor is implanted inside the body to measure levels of particular chemicals within the bloodstream. It would wirelessly transmit the results to a transceiver outside the body. There are a number of different applications of in-body drug delivery, here are some examples:

- e.g. A sensor continuously measures the blood glucose levels of a diabetic and sends information to a terminal outside the body which in turn sends a message to an insulin pump telling it exactly how much insulin should be released into the system. The terminal could also raise an alarm if the glucose levels become dangerously high or low.

Evidence:

- Explanation of the technology and its potential applications, (link)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>More accurate and efficient delivery of medications</td>
<td>People may not want to undergo &quot;unnecessary&quot; surgical procedures if there is an on-body alternative</td>
</tr>
<tr>
<td>Advances in technology</td>
<td>People may want to remain in control of administering their own medication</td>
</tr>
<tr>
<td>Increasing levels of chronic conditions and the resulting increased pressure on the health service</td>
<td>Ownership of responsibility – who is responsible if the technology administers the wrong dosage</td>
</tr>
<tr>
<td></td>
<td>Dedicated spectrum isn’t allocated – interference could be problematic</td>
</tr>
<tr>
<td></td>
<td>International spectrum isn’t allocated – could be problematic if the in-body sensors only work in the originating country</td>
</tr>
</tbody>
</table>

Maximum addressable market

- Moderate

Rationale

- Roll out of such applications likely to be related to conditions that require monitoring, such as diabetes

On body monitoring (I19)

A pack which monitors either vital signs or other things such as vapour emitted from the skin. It will then transfer the information either to a wearable device (such as a watch or mobile phone) or, if in the home to a local hub within the home.

Evidence:
• Wearable smart textiles which monitor vital signs for a range of applications including fitness and chronic conditions,
(link)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Increasing levels of patient expectation</td>
<td>• Funding – disparities between health and social care</td>
</tr>
<tr>
<td>• Advances in technology</td>
<td>• Responsibility of ownership – who is responsible for ensuring the device is working correctly</td>
</tr>
<tr>
<td>• The &quot;worried well&quot; could turn this into a health, fitness and wellness application</td>
<td>• Patient confidentiality concerns</td>
</tr>
<tr>
<td>• Less invasive (and perhaps therefore more acceptable to public perception) than in body monitoring</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Universal</td>
<td>• Potential benefit to whole population</td>
</tr>
</tbody>
</table>

Interface between BAN and hub (I20)

The transceiver which the patient wears that collects data from the sensor within the body will only be able to store a limited amount of data. The best solution to this problem is for the transceiver to download the data to a central hub. For ease of use the transceiver will communicate with this hub whenever possible either using WIFI or possibly mobile networks (if their data is collected on a mobile phone).

Evidence:
• N/A

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• As above</td>
<td>• As above</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Moderate</td>
<td>• Roll out of such applications likely to be related to conditions that require monitoring, such as diabetes</td>
</tr>
</tbody>
</table>

13.2 Applications in the ambulance

These are applications that would be used by paramedics or other emergency service workers. Their usage would occur predominantly from an ambulance.

Video conferencing (A1)

Video conferencing technology allows the paramedic crew to communicate and show moving images to A&E staff or specialists to assist with in-ambulance treatment and prepare A&E for arriving casualties. Alternatively video
conferencing may become more commonplace as ambulance crews are trained to help patients within the home.

<table>
<thead>
<tr>
<th>Evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>An ambulance to hospital video conferencing system was launched in June 2007 in Arizona, [link]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer ambulance journeys to specialist hospitals (requiring better in-ambulance treatment and A&amp;E preparedness)</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>Where possible paramedics will increasingly treat people on site – to reduce unnecessary burden on A&amp;E departments</td>
<td>Paramedics uncomfortable with the increased responsibility</td>
</tr>
<tr>
<td>Spectrum availability – video requires high bandwidth</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Addressable market based on the number of ambulance vehicles in England</td>
</tr>
</tbody>
</table>

**On-body / in-body mass triage sensors (A2)**

Sensors which can be placed on the patient in the ambulance to monitor heart rate, blood pressure, blood oxygen etc so that when the patient arrives in A&E their vital signs are already known and A&E staff can prioritise treatment.

<table>
<thead>
<tr>
<th>Evidence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A white paper on a system for mass triage including sensors that transmit data to A&amp;E, [link]</td>
</tr>
<tr>
<td>A system for performing mass triage at the scene of a disaster or other mass-casualty event, for which the hub is in the ambulance, [link]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer ambulance journeys to specialist hospitals (requiring better in-ambulance treatment and A&amp;E preparedness)</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>Extra equipment for the ambulance to carry</td>
<td></td>
</tr>
<tr>
<td>Paramedics may not see the extra time spent setting the system up as valuable use of time</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Addressable market based on the number of ambulance vehicles in England</td>
</tr>
</tbody>
</table>
**PDAs for paramedics (A3)**

PDAs for paramedics would typically include the ability to access patient records, real time information of local clinician availability (including social workers). The PDAs would also be able to send details of the patient to the hospital as well as bed availability in local hospitals.

**Evidence:**

- Paramedics in Cambridge use BlackBerries for non-emergencies to access patient information eg allergies, medication, next of kin, to avoid costly short-term hospital admissions, [link]
- Ireland and Dubai have commissioned tablet PCs for paramedics to send information to clinicians, [link]

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer ambulance journeys to specialist hospitals (requiring better in-ambulance treatment and A&amp;E preparedness)</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>A drive to reduce short-term hospital admissions for non-emergency patients</td>
<td>Public fears over security and privacy</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Addressable market based on the number of ambulance vehicles in England</td>
</tr>
</tbody>
</table>

**Ambulance hub (A4)**

Collate information and communicate with hospital (using Airwave). This could be the hub through which all of the data collected by the in-ambulance applications discussed above would be sent.

**Evidence:**

- What Airwave is and does, [link], benefits for ambulance crews, [link]
- A system run by France Telecom in Avignon which collates patient data and sends it to the ambulance service headquarters, which then notifies the relevant departments and services in the hospital, [link]

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer ambulance journeys to specialist hospitals (requiring better in-ambulance treatment and A&amp;E preparedness)</td>
<td>Cost of implementation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Addressable market based on the number of ambulance vehicles in England</td>
</tr>
</tbody>
</table>
13.3 Applications in the home

These are applications which necessarily take place in the patient’s home. All the applications listed under “individual-level anywhere applications” in the section above could also take place in the home.

### Home Hub and Sensors (H1)

Telecare and Telehealth sensors (eg vital signs monitoring) connect to a central hub (either wirelessly using a PAN or LAN, or by wired communications), which the hub sends back to the clinician. Many also interact with the patient, asking them questions or notifying them when their vital signs are out of range.

There are a number of slightly different lifestyle monitors / sensors but they are all aimed to monitor an ill or elderly person in their home. They can be set up depending on the requirements of the individual but they typically will monitor a person’s daily routine and alert a call centre / relative if there is a major deviation from the norm.

**Example applications:**

1. Environment monitors – these will monitor things such as temperature and can alert the person within the home or a relative that the temperature is outside the normal range.
2. Sensors on fridges / taps – these are set up to alert a call centre or relative if the person hasn’t turned on a tap or opened the fridge (suggests that they are not eating or drinking)
3. Intruder sensors – apart from traditional burglar alarms there are also sensors which can aid an elderly person to identify a caller to the door to ensure that they are a genuine. E.g. remind the elderly person to ask for ID etc.
4. Inactivity alarms – bed and chair exit monitors are used to ensure that the person is moving as much as they should.

**Evidence:**

- There are multiple examples of lifestyle monitors / sensors being deployed within the UK, for example within Portsmouth City Council ([link](#))
- NHS PASA lists a number of approved telecare and telehealth suppliers; this manufacturer’s option has a hand held patient hub which asks questions and allows patients to monitor their own progress as well as providing data to clinicians, ([link](#))

<table>
<thead>
<tr>
<th><strong>Drivers</strong></th>
<th><strong>Barriers</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageing population</td>
<td>Cost of implementation – and confusion over who should pay, health, social care, relatives, insurance companies, technology companies (if it is a subscription service)</td>
</tr>
<tr>
<td>Socially fragmented society</td>
<td>Privacy – will people want to feel &quot;watched&quot;?</td>
</tr>
<tr>
<td>Higher bandwidths as norm</td>
<td></td>
</tr>
<tr>
<td>Localise / centralise vision (the Darzi plan)</td>
<td></td>
</tr>
<tr>
<td>Government drive to allow people to live</td>
<td></td>
</tr>
</tbody>
</table>
There are two uses of video conferencing within the home; the first is between a patient and clinician for appointments / checkups. Video may be particularly relevant where the clinician needs to see something, for example how a wound is healing.

The second use of video conferencing is between a patient and their family / friends to allow relatives to chat to their elderly / disabled relative without having to be physically present. Video is advantageous compared to traditional telephony as it gives the relative more peace of mind – they can actually see that their Mum is fit and well rather than just taking their word for it.

**Evidence:**

- Some telecare and telehealth companies provide video conferencing options so that patients can talk to clinicians as well as family. [link]

- A service in Ireland provides a video conferencing “NHS Direct”-type service via mobile. [link]

- A&E video booth trial in remote areas of Scotland. [link]

**Drivers**

- Ageing population
- Socially fragmented society
- Higher bandwidths are widespread
- Localise / centralise vision (the Darzi plan)
- Government drive to allow people to live independently in their homes for as long as possible

**Barriers**

- Cost of implementation
- Privacy – are people aware or everyone who is present

**Maximum addressable market**

- Moderate

**Rationale**

- This application would be rolled out as part of social care – addressable market estimate is based on number of people receiving social care
Interactive Computerised Therapy (H3)

This is interactive computerised therapy, and could be used by patients in a home setting using any internet-enabled PC. There is the potential for the service to be extended to mobile wireless devices used out of the home.

Evidence:

- NICE have approved pilots of ICT-delivered Cognitive Behavioural Therapy (CBT).

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-cost, easy-to-monitor access to CBT</td>
<td>Clinical concerns</td>
</tr>
<tr>
<td>Increasing levels of patient expectation of quality of care – less tolerance of errors such as incorrect dosage of medication or mistaken identities</td>
<td>Possibly slow rate of Individual adoption and adherence</td>
</tr>
</tbody>
</table>

Maximum addressable market

- Moderate

Rationale

- An estimated one tenth of adults are affected by a mental disorder at some stage in their lifetime

Visiting Doctor’s Bag / Clinician PDA (H4)

Portable computers specifically designed for healthcare professionals, which would include basic diagnostic testing equipment as well as decision support systems and access to online medical records etc. They would also include technology for video and imagery.

Evidence:

- Intel’s Mobile Clinical Assistant is a tablet PC which is designed specifically for clinicians, to be portable, give access to online records, decision support, RFID, photo capabilities and other diagnostic testing equipment, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The need for improved access to information and support for clinicians</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>Increasing levels of patient expectation of quality of care – less tolerance of errors such as incorrect dosage of medication or mistaken identities</td>
<td>Resistance against alteration of existing work practices</td>
</tr>
</tbody>
</table>

Maximum addressable market

- Niche

Rationale

- This application would be rolled out to GPs and potentially practice nurses
13.4 Applications within the hospital or GP surgery setting

All the applications listed under “individual-level anywhere applications” in the section above could also take place in the clinical setting.

13.4.1 Radio-frequency identification (RFID) applications

### RFID to track assets (M1)

RFID tags are small enough to be placed on mobile equipment to aid location. This would not only mean that equipment can be located more easily, increasing efficiency, but could help secure equipment (an alarm could sound if it is taken out of the building).

If all equipment was tagged within the hospital with RFID identifiers surgical nurses would be able to check that all equipment had been removed from the body before the patient is closed.

**Evidence:**

- A white paper on asset tracking in healthcare, and issues and concerns in the area, ([link](#))

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID asset tracking is widespread in other sectors (such as retail)</td>
<td>Cost of implementation – tagging every single piece of valuable equipment in the NHS would be an enormous task</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>This application could potentially be used to track all inventory in the NHS</td>
</tr>
<tr>
<td></td>
<td>For the purpose of illustration, we have used an example figure in this estimation which is the number of surgical trays in the NHS in England</td>
</tr>
</tbody>
</table>

### RFID to track patients (M2)

The traditional handwritten tags that are currently used to identify a patient within a hospital are replaced with RFID tags. RFID can hold a larger amount of information about the patient, for example allergies, medication and long term conditions. Additionally, RFID tags not only present a more robust way of identifying a patient but they can also be used to identify the location of a patient within the hospital setting.

**Evidence:**

- The new mobile clinical assistant developed by Intel is being deployed in US hospitals. This applications includes a barcode reader as well as an RFID reader ([link](#))
- St Mary’s hospital are trialling RFID tags ([link](#)).

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing patient expectations (regarding errors in patient care, such as incorrect dosage of medication or mistaken identities).</td>
<td>Patients feel watched or imprisoned</td>
</tr>
</tbody>
</table>

### Maximum addressable market

- Niche

### Rationale

- This application could be rolled out to patients in hospital
- For the purpose of the calculation we have used the number of hospital beds in the NHS in England

---

#### RFID to track staff (M3)

RFID tags could be used to track staff within a hospital so that other clinicians can see where the nearest surgeon / porter etc is. Software could include the “presence” of staff so not only could you see their location but also whether they are busy etc. This would make staff allocation — in particular highly mobile staff such as porters more efficient. Additionally RFID could be used to unlock doors to members of staff that allowed in a particular part of the building. This could improve patient safety, particularly on paediatric wards.

**Evidence:**

- An article on RFID tagging with some discussion of tracking staff ([link](#))

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larger hospitals (cf. the Darzi plan) may make it harder to locate staff quickly and efficiently</td>
<td>Concerns about staff privacy — would they be monitored on their breaks, in bathrooms etc?</td>
</tr>
</tbody>
</table>

### Maximum addressable market

- Moderate

### Rationale

- This application could be used by all NHS staff
- The estimate is based on the number of NHS employees

---

#### RFID and pharmaceutical use within the hospital (M4)

All drugs could be tagged using RFID which could be used in a number of ways. Firstly the clinician administering the drugs could easily identify that the correct drugs are given to the correct person at the correct time. Secondly the authenticity of the drugs could be confirmed. Thirdly, the location of drugs could be tracked so that the pharmacy (and pharmaceutical company) can manage their supply chain more accurately.

**Evidence:**
Health Technology Scenarios

- A German hospital uses RFID to help ensure patients receive the correct dosage. (link)
- IBM designed a system to help ensure that drugs are not counterfeit. (link)
- A US pharmaceutical company using RFID to track its stock through the supply chain. (link)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFID asset tracking is widespread in other sectors (such as retail)</td>
<td>Cost of implementation to the pharmaceutical industry</td>
</tr>
<tr>
<td>This could be driven by the pharmaceutical industry rather than the NHS, reducing NHS costs</td>
<td></td>
</tr>
<tr>
<td>Increasing patient expectations (regarding errors in patient care, such as incorrect dosage of medication or mistaken identities).</td>
<td></td>
</tr>
</tbody>
</table>

Maximum addressable market: Significant

Rationale: Estimate based on number of prescription items dispensed in 2006

### 13.4.2 Communication applications

**Mobile Communication Device for Clinicians (M5)**

This is a small hands-free communication device which uses push to talk and voice recognition technologies. For example: when user A speaks user B’s name into the microphone the voice recognition technology is used to connect the two users automatically if person b is available. It runs over a private WiFi network within the hospital.

We refer to this as “The Communicator” in our scenario vignettes

**Evidence:**

- A US company has developed a system which is currently being trialled in Kings College Hospital in London. (link)
- BT’s Vocera product

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing size and complexity of hospitals</td>
<td>Quality of service could be a problem if there is a large quantity of people accessing the network at the same time</td>
</tr>
<tr>
<td>Higher call cost of alternatives, such as mobile phones</td>
<td></td>
</tr>
</tbody>
</table>

Maximum addressable market: Niche

Rationale: This application could be rolled out to medical staff in the NHS
### 13.4.3 Clinical applications

**Remote presence robots (M6)**

In particular here we are referring to robots used for surgery from a remote location.

**Evidence:**
- The first remote surgery was performed in September 2001 between New York and Strasbourg, using robots to perform a minimally-invasive gall bladder removal, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advances in technology</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>The technique can connect larger teaching hospitals to polyclinics to allow the surgeons in these clinics to perform technically advanced procedures with expert support</td>
<td>Patient safety fears</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>This application could be utilised by the armed forces or in other extreme circumstances; there is one military hospital in the UK</td>
</tr>
</tbody>
</table>

**Diagnostic tests at the bedside (M7)**

Blood tests / urine tests etc. that can be analysed straight away at the bedside. The results of these tests can then be uploaded wirelessly to the central system via the hospital WLAN.

**Evidence:**
- Manufacturer site for a wireless diagnostic system which outlines some of the key benefits, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advances in technology</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>Reduction of “spaghetti syndrome”</td>
<td></td>
</tr>
<tr>
<td>Potentially useful for infection control as cross-contamination becomes less likely?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Health Technology Scenarios

<table>
<thead>
<tr>
<th>Niche</th>
<th>This application could be rolled out in hospitals</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The estimate is based on the number of hospital beds in England</td>
</tr>
</tbody>
</table>

#### PACs (M8)

PACS enables images such as x-rays and scans to be stored electronically and viewed on screens, creating a near filmless process and improved diagnosis methods. Doctors and other health professionals can access and compare images at the touch of a button.

**Evidence:**

- NHS connecting for health have already begun implementation ([link](#))

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabling faster and easier access to images</td>
<td>PACS being transferred wirelessly requires a network to be in place</td>
</tr>
<tr>
<td></td>
<td>Ownership and security issues</td>
</tr>
</tbody>
</table>

**Maximum addressable market**

<table>
<thead>
<tr>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>This application would be rolled out to hospitals and GP practices</td>
</tr>
</tbody>
</table>

#### Clinician PDAs (M9)

Portable computers specifically designed for healthcare professionals. They would include basic diagnostic testing equipment as well as decision support systems and access to online medical records etc. They would also include technology for video and imagery. These would act as a portable clinician specific PC so that they clinician can access patient details at any time, regardless of their location within the hospital.

**Evidence:**

- Intel's Mobile Clinical Assistant is a tablet PC which is designed specifically for clinicians, to be portable, give access to online records, decision support, RFID, photo capabilities and other diagnostic testing equipment, ([link](#))

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>The need for improved access to information and support for clinicians</td>
<td>Cost of implementation</td>
</tr>
<tr>
<td>Increasing demand for up to date accurate information</td>
<td>Lack of uniformity between systems – PDAs would ideally be standardized between hospitals</td>
</tr>
<tr>
<td>Increasing levels of patient expectation of quality of care – less tolerance of errors such as incorrect</td>
<td>Changes in work practices – additional training</td>
</tr>
</tbody>
</table>
Health Technology Scenarios

<table>
<thead>
<tr>
<th>dosage of medication or mistaken identities</th>
<th>required</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Private electronic companies such as Intel are keen to expand their health products</td>
<td></td>
</tr>
<tr>
<td>• Decreasing size and cost of technology leading to greater portability</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Niche</td>
<td>• This application would be rolled out to medical staff in the NHS</td>
</tr>
</tbody>
</table>

**Access to Research Database of Individual Health (M10)**

Database of health incidence and treatments of many individuals, which allows clinicians and researchers to seek patterns or causes of disease, or to obtain “early warning” of pandemics. This database would ideally hold information about as much information as possible about as many people as possible. The information would be anonymised and aggregated.

This database would be most likely to be used by researchers and academics. It may also be used by clinicians in the context of decision support for complex treatment.

**Evidence:**

- Widespread belief in the potential benefit of this database. It could uncover as-yet-unseen causes of disease. It could be used to direct resources for public-health information, diagnosis, and treatment. It could work as a “radar” for detecting pandemics.
- It could substitute for clinical trials in some cases.
- A good analogy for this database is retail databases, such as Tesco Clubcard or Experian’s Mosaic.

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A new source of information about disease and treatment</td>
<td>• Access to the data in common format</td>
</tr>
<tr>
<td>• Likely to be popular with the medical research community</td>
<td>• Individuals’ concerns about privacy. Although the database is seen as anonymised and aggregated, it is still likely to prompt concerns about how personal medical data is stored and shared and used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Universal</td>
<td>• Potential benefit to whole population</td>
</tr>
</tbody>
</table>
Ultra-stethoscope (M22)

A handheld ultrasound which would ultimately replace the stethoscope. This device would be used to listen and take ultrasound images of a patient’s heart replacing the traditional stethoscope. It is a portable device and therefore it would ideally be linked to the hospital WLAN network so that images can automatically be uploaded to a patient’s record and also enabling radiographers to access pictures immediately.

Evidence:
- SonoSite have developed the “SonoHeart Elite” (link)

Drivers
- Advances in technology
- Increases in chronic diseases such as heart disease

Barriers
- Cost of implementation
- Clinicians would have to undergo extra training

Maximum addressable market
- Moderate

Rationale
- Application could be used by all individuals admitted to hospital
- Estimate based on the number of hospital admissions in 2006/7

13.4.4 Body Area Networks

Vital sign monitoring at the bedside (M11)

This application would consist of sensors that would transmit vital signs wirelessly to a computer or PDA. Clinicians would receive real time information and would therefore be able to monitor the patient from another location if necessary. Any important changes in the vital signs would sound an alarm, and clinicians could also be alerted if they are not in the direct vicinity.

Evidence:
- Overview of the technology behind a wireless bedside vital signs monitor, plus its applications, what needs it satisfies and its geographical application. (link)

Drivers
- Advances in technology
- It would reduce the “spaghetti syndrome”
- Increased fears of safety (wires often get tangled and disconnected accidentally)

Barriers
- Lack of standards
**Diagnostic body area networks (M12)**

As nanotechnology is developed, sensors can be made small enough to be swallowed by the patient. These can then perform diagnostic functions from temperature and biochemical measurements to endoscopy. Data is wirelessly sent to sensors on the body or close to the body.

**Evidence:**
- Investment is being made in research into a swallowable diagnostic camera pill developed at Glasgow University, [link](#).

**Drivers**
- Advances in technology
- Increase in obesity-related cancers and other morbidities
- Desire for immediate and continuous non-invasive internal monitoring

**Barriers**
- Cost of each device is currently very high
- Processing and analysing up to 8 hours of film is extremely resource-hungry

**Maximum addressable market**
- Moderate

**Rationale**
- Roll out of such applications likely to be related to conditions that require monitoring, such as diabetes, but potentially application could also be taken up by the whole population as the "worried well"

---

**Re-programming of in-body sensors (M13)**

In-body sensors could be wirelessly recalibrated to adjust to changes in the patients’ physiology / morbidity, removing the need for surgical removal and reinstallation.

**Evidence:**
- Remote reprogramming of in-body devices is not currently available, though the possibility is discussed in this article on pacemakers, [link](#).

**Drivers**
- Increasing levels of patient expectation - people

**Barriers**
- Risk of interference and “hacking”
### Health Technology Scenarios

**Maximum addressable market**

- **Niche**

**Rationale**

- Calculation based on the number of NHS hospital beds in England

#### 13.4.5 Administrative applications

**Room clean sensors (M14)**

Sensors that can tell whether a room has been thoroughly cleaned by detecting anti-bacterial agents within the cleaning agent. This application is likely to be linked into the central map so that staff can easily see which rooms are free, have been cleaned and when. This would also be a good way of ensuring that all rooms are cleaned at regular intervals.

**Evidence:**

- Keyboards being used at UCLH have sensors which detect whether they have been cleaned properly or not. ([link](#))

**Drivers**

- Increasing levels of public fear over the prevalence of superbugs like MRSA.

**Barriers**

- Cost of implementation

**Smart cards (M15)**

Smart cards are already in use within the National Health Service. These are a similar size and shape to a credit card containing a chip which records personal, contractual and health clearance information about clinicians.

Additionally, smart cards could be extended to store information which can be used to regulate entry into certain areas within hospitals. Smart cards prevent the need for pin numbers to be used on doors and can be “swiped” against a reader without the user touching anything but the smart card.

**Evidence:**

- NHS trust HR departments already using smart cards in some areas ([link](#))

**Drivers**

- Increasing patient safety fears e.g. baby wards

**Barriers**

- Privacy concerns by clinicians
• Increasing fear of super bugs
• Increasing mobility of labour force

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>Roll out to NHS employees</td>
</tr>
</tbody>
</table>

**Electronic Prescription Services (M16)**

The Electronic Prescription Service will enable prescribers - such as GPs and practice nurses - to send prescriptions electronically to a dispenser (such as a pharmacy) of the patient’s choice. This will make the prescribing and dispensing process safer and more convenient for patients and staff.

**Evidence:**
- Connecting for Health [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing numbers of prescriptions</td>
<td>Quality of service</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Significant</td>
<td>Calculation based on the number of prescription items dispensed in 2006</td>
</tr>
</tbody>
</table>

**NHS Care Records Service (M17)**

One central repository of health care records, including a summary care record

**Evidence:**
- Connecting for Health [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing patient expectations</td>
<td>Security and privacy fears</td>
</tr>
<tr>
<td>Increasing mobility of patients and staff</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Calculation based on the number of hospitals and GP practices that would use the NHS care records</td>
</tr>
</tbody>
</table>
### Equipment status monitoring (M21)

Equipment is monitored remotely. So if a piece of equipment stops working or has a problem it can notify the correct member of staff. Because equipment in hospitals is often mobile it would need to move with the piece of equipment.

**Evidence:**

- Some supermarkets use remote monitoring for equipment such as fridges

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing levels of patient expectations of safety</td>
<td>Cost of implementation</td>
</tr>
</tbody>
</table>

**Maximum addressable market**

<table>
<thead>
<tr>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>This application could potentially be used to track all inventory in the NHS. For the purpose of illustration, we have used an example figure for the number our surgical trays in this calculation</td>
</tr>
</tbody>
</table>

### Patient video displays (M18)

Patients have a screen which they can access a webcam from their home, if available, or from a choice of webcams showing attractive views (for example) to make them feel less isolated in hospitals.

**Evidence:**

- Patientline already provides a range of (wired) communication and entertainment tools in hospitals such as the internet and television, showing that there is a market for patient applications, [link](#)

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageing population</td>
<td>Cost</td>
</tr>
<tr>
<td>Increasing patient expectations</td>
<td>Privacy issues – two way webcams could impinge on other patients’ right to privacy</td>
</tr>
</tbody>
</table>

**Maximum addressable market**

<table>
<thead>
<tr>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculation based on the number of hospital beds in England</td>
</tr>
</tbody>
</table>
### Internet Connectivity for patients (M19)

Patients and visitors are able to access a public wireless network within the hospital to give them access to information and communications tools, and to make them feel less isolated.

**Evidence:**
- Patientline already provides a range of (wired) communication and entertainment tools in hospitals such as the internet and television, showing that there is a market for patient applications, [link](#).

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing patient expectations</td>
<td>Security – what kind of websites can and can’t patients access?</td>
</tr>
<tr>
<td></td>
<td>Bandwidth – what if all the patients start downloading large files?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Calculation based on the number of hospital beds in England</td>
</tr>
</tbody>
</table>

### Mobile interpretation services (M20)

There are two potentially different mobile interpretation services. One in which devices can automatically translate using voice recognition technology. Or another where translators are located in a call centre and the clinician can make a voice call using a wireless device such as a mobile phone. Furthermore for deaf people the technology may include a screen displaying a person using sign language.

**Evidence:**
- Many GP surgeries offer interpretation via a telephone call to a company called Language Line, [link](#).

<table>
<thead>
<tr>
<th>Drivers</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing levels of migration, particularly within the EU</td>
<td>Government policy that overseas nationals should learn English</td>
</tr>
<tr>
<td>Many older immigrant communities are “ghettoised” and some people never learn English</td>
<td>Would interpreters need subject knowledge</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Maximum addressable market</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niche</td>
<td>Based on number of hard of hearing people in the UK</td>
</tr>
<tr>
<td></td>
<td>Figures for non-English speakers in the UK were not available but it is anticipated this would not alter the classification of this addressable market size as niche</td>
</tr>
</tbody>
</table>
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