



# 101 Things To Do With A Mobile Phone In Healthcare

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## 1. Introduction – The Tipping Point

When sites offering medical advice first appeared on the World Wide Web few GPs believed that, within a decade, they would encounter patients who used the Internet to become specialists in a particular ailment. Before the arrival of the 'informed patient' the GP was expected to provide a diagnosis, then recommend a course of treatment. Today many patients believe they already have a diagnosis and merely wish to have it confirmed by a series of tests. The question is no longer 'Doctor what is wrong with me?' but 'Doctor when can my treatment begin?'

While patient-facing ehealth systems have changed the relationship between the GP and patient, their impact on the hospital consultant has been small. The patient still relies on the consultant to carry out tests and, to a large degree, has to accept the treatment regime offered. However, a new wave of automation is subtly altering working practices within hospitals and changing the role of the consultant within the healthcare process.

A new generation of ehealth products and services, based on wireless and mobile technology, is putting diagnosis and treatment management into the hands of the patient. Companies such as CardGuard and Vitaphone are offering suites of wireless ehealth applications – which include blood pressure, heart rate and blood glucose monitoring – to patients with or without the support of a conventional healthcare provider.

Within the hospital itself wireless technology is being deployed to manage workflow and deliver new and innovative services to the patient. Wireless is a compelling platform for ehealth as it supports the rapid deployment of applications – sometimes using existing GSM networks. Applications such as SMS patient reminders provide immediate results, with the number of missed appointments falling as soon as the service is deployed. Others, such as wireless enabled dispensing carts, hold out the promise of costs savings when supporting infrastructure, such as electronic patient records, is in place. Whereas at present a skilled nurse might spend up to an hour on a typical ward round, an automated dispensing system would enable the same process to be carried out in half the time by a semi-skilled orderly.

The key barrier to adoption of many ehealth systems is no longer the limitations of the technology or the cost of equipment and software, but the health worker's resistance to change. Nurses, clinicians and consultants are concerned that automation will impact on their careers and lead to job losses. Some of these fears are well founded, as governments, realising that healthcare costs are becoming an unsupportable burden on the rest of the economy, are desperately seeking ways to reduce expenditure.

While health workers are being told automation will free them to provide more care and personal attention to patients, in truth the de-manning of the healthcare sector will differ little from the downsizing in the engineering and financial services sectors. The amount of personal attention a patient receives is unlikely to increase from today's level – especially if increased workflow efficiency and automated diagnostics means the patient spends less time in hospital.

Clinicians claim that the processes that underpin their relationship with the patient were unique to the healthcare sector and are difficult to automate. However, equivalent processes in the engineering and financial services sectors have already been automated. The desire to reduce healthcare costs is forcing governments to invest heavily in IT infrastructure to automate both back office and frontline healthcare processes. Thirty years ago an airline pilot would have been dismissive of the idea that a passenger jet could be flown under computer control – today the role of the pilot of an A340 Airbus has little in common with that of the pilot of a 1960s Boeing 707. In the coming years clinicians will see an increasing number of clinical processes controlled by a range of devices operating as part of a local or wide area network.

The ehealth sector has reached a tipping point. A number of clinicians have come to realise that the best way to protect their jobs is to embrace new technology rather than continue to resist changes that are inevitable. Similar 'tipping points' revolutionised the financial services and engineering sectors. Initially accountants were sceptical of the benefit of computerised accounting, and engineers felt CAD technology offered few advantages over traditional design techniques. When it became obvious the technology worked and was having a significant impact on professionals in both sectors, accountants began designing accounting software packages, and engineers set up computer-aided engineering bureaus.

A number of surgeons have formed their own IT companies – Intelligent Medical Systems and Xenetec are typical of ehealth vendors run by clinicians who have first hand experience of clinical processes. These companies will accelerate the adoption of ehealth by giving credibility to ehealth as a technology and providing reference sites within the healthcare sector itself. If they receive backing from venture capitalists and an eventual IPO this will encourage other clinicians to set up their own companies. In the not too distant future the ehealth market will enter a new phase where clinicians themselves drive the automation of clinical processes.

No one product or service will define ehealth; instead there will be a highly integrated mesh of offerings either delivered to the patient directly or made available to the clinician as a toolset they can call upon as required. A large proportion of these services will be delivered, via wireless networks, to smart phones or customised PDAs. In this report we list 101 applications that will play a role within such a wireless ehealth network.

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## 2. Engaging The Mobile Telecoms Industry

As a platform for ehealth services, a mobile network has a number of key advantages over a fixed line network.

A mobile network is quick and relatively cheap to deploy. Consequently a number of developing countries are leap-frogging the fixed line phase of their telecommunications infrastructure development, and are deploying mobile networks from the outset. In developing countries disease and poor health often characterise areas where there is little or no access to fixed line telecommunications. For this reason, there has been a strong emphasis placed on services that utilise wireless communications technologies such as satellite and cellular networks, when setting up ehealth systems in developing countries.

An effective ehealth service - one that can detect and monitor the spread of disease - will require a global reach. It is important therefore that ehealth services are capable of running efficiently over a range of different infrastructures, including mobile networks.

A mobile network operator communicates with a specific individual, rather than a household. That level of granularity is important to an ehealth service provider. The subscriber usually keeps their phone close to hand, so they could use it in a range of ehealth scenarios – for instance to communicate with a wireless enabled monitoring device.

Mobile telephone services have been heavily marketed to teenagers and people in their early twenties. Members of this demographic group tend to neglect their health, and are largely beyond the reach of conventional healthcare providers. Only in later life, when their health fails, do these people contact their GP or attempt to modify their lifestyle. Mobile operators are in an ideal position to deliver advice and healthcare services, at a time when these services would have the greatest impact on the subscriber's long-term health.

Most mobile healthcare services generate only small amounts of data, and can be run over a GSM network. This means that mobile operators and applications developers can deploy services ahead of the rollout of GPRS or 3G infrastructure.

### 3. Large IT Vendors and Wireless eHealth

A number of established IT companies, such as Cisco and Oracle, sought refuge in the public sector when the Dot Com market collapsed. More recently as governments have increased spending on healthcare IT these companies have repackaged their products as healthcare specific offerings and have either built up or acquired the expertise to market and deliver these products to healthcare providers.

Initially IT vendors were encouraged by reports that a growing number of elderly people would force healthcare providers to automate their clinical processes. Companies now realise that health providers need IT solutions that meet the needs of all their patients and that the treatment of obesity amongst young and middle aged patients is as much a pressing issue as bed blocking.

Vendors have taken different approaches to the healthcare market. Some work with system integrators while others work directly with the health provider. There are drawbacks and benefits associated with both approaches. While working directly with the health provider enables the vendor to gain experience of the healthcare market it could also reflect badly on the company if a medical error is traced back to a fault in their product.

To date most healthcare IT applications have automated administrative procedures. However as only 32% of the people employed by the NHS have jobs that involve no direct contact with patients more advanced, or healthcare specific solutions, will be required to support the 68% who do. Only recently have companies started to use their products to support new clinical processes – here wireless technology is particularly relevant.

Companies, such as Olympus, that were already established in the healthcare sector still have an edge over more recent arrivals and have proved particularly adept at delivering solutions that support new clinical processes.

## 4. New Outlets For eHealth

Supermarkets have joined the list of organisations offering healthcare services. Tesco, in conjunction with U-First Healthcare, held GP consultations in selected stores across the UK. The GPs carried out tests on over 1500 Tesco customers. In the US Wal-Mart provided in-store blood sugar testing during Diabetes Awareness month. Abbot's Ross Products Division and Novartis supported the diabetes screening services. Customers visiting Wal-Mart were offered a number of free diabetes related products.

Perhaps the most interesting in-store healthcare service is the one now on offer at US based Basha's Food Stores. Customers, concerned over unusual blemishes on their skin, can pay £20 for a skin cancer screening service. Rather than waiting for the results a digital image of the customer's skin is sent to a laboratory via a telecoms link. Once a skin specialist has examined the image the results of the test are transmitted back to the store. Today the clinicians, supporting what is essentially an outsourced medical procedure, are supplied by the dermatology department of Arizona University. In the long term a separate company, Telemedco ([www.telemedco.com](http://www.telemedco.com)) will manage the service.

The ability to provide a medical service from a remote location has opened up the ehealth market and made relatively advanced clinical processes accessible to next generation health providers. Specially adapted mobile phones can now be used to take heart rate readings. These phones are supported by companies such as SHL Telemedicine whose call centres are be located around the world.

Today all parties - the retailer, the health provider and sponsors - gain something from in-store health services so no one is too concerned with the bottom line. In Wal-Mart's case the store itself gains publicity and adds value to its in-store pharmacy while Novartis and Abbott gain exposure for their Diabetes related products.

However, to be sustainable in the long term, in-store medical services must pay their way – especially if they are to support a diversification away from low margin food retailing. Here Basha's skin cancer screening shows some promise. The service is relatively simple to set up and, as the clinicians are remote from the store, skilled medical staff can be shared amongst a number of participating outlets.

## 5. Outsourcing Mobilised eHealth

As far as the patient is concerned, if a clinical process can be carried out remotely it matters little whether the clinician is in the next room, a nearby building or, for that matter, another country. It is therefore no surprise that outsourcing is becoming an issue just as a significant number of wireless ehealth applications move beyond trial phase.

Telemedicine was originally seen as a way of delivering sophisticated clinical processes available in developed countries to patients in underdeveloped countries. Today changes in the demographic profiles of both developing and developed countries mean that the flow of services has been reversed.

Clinicians, and some healthcare trust managers, fear outsourcing will lead to a loss of skills within the UK. However cost savings could free up resources and allow the NHS to concentrate on core competencies such as surgery. At present surgery is being outsourced from overseas as patients arrange their own operations in other European countries.

So as not to alarm clinicians outsourcing companies tend to play down the impact of the low cost of the services they provide. However, claims by outsourcing providers that they are merely exploiting their geographic location to provide services out of UK working hours are unlikely to placate the fears of health workers who are well aware of the impact outsourcing is having on the IT sector. At the same time understating potential savings will discourage potential early adopters of outsourced services within the private healthcare sector.

It could be argued that outsourcing provides some relief from the pillaging of hospitals and medical centres in developing countries by agencies recruiting staff to work in the NHS. However health workers who leave developing countries usually do so on fixed term contracts and return when those contracts end. While working overseas many health workers send money home to their families. On the other hand health workers employed in outsourcing centres are beyond the reach of patients in developing countries – just as they would be if they worked overseas. Overall, in the short to medium term, outsourcing will have a neutral impact on a developing country.

To make outsourcing and offshoring of healthcare services a viable proposition issues regarding access to electronic patient records by clinicians outside of the UK and EU will have to be resolved.

## 6. PACS - Getting The Picture At Last

Heavily marketed by manufacturers and network operators smart phones are proving attractive to clinicians who require access to medical images while they are on the move either within, or outside of, a hospital. These devices are available in high street stores and some network operators, eager for publicity, will supply handsets free of charge to clinicians who are setting up mobile medical imaging trials.

In 2002 the Neurosurgery Department of The Murakami Memorial Hospital in Japan began using J-Phone's 'Sha-Mail' service to send images of MRI scans to specialists outside of the hospital. Images were sent as email attachments and, despite being little more than 100 x 100 pixel resolution, the clinicians who set up the system claimed these images were for sufficient for early diagnosis and initiation of treatment in an emergency. However a number of similar trials in the UK have been unsuccessful. Radiologists at the Royal Glamorgan Hospital in Wales attempted to exchange images of x-rays using picture phones but abandoned the trial at an early stage.

The Royal Glamorgan Hospital system relied on the person taking the picture selecting the relevant section of an x-ray and ensuring the camera was correctly focussed. The picture phones used were ideal for taking relatively low resolution colour photographs but were not designed to capture high-resolution greyscale images. As well, the picture messaging network service used during the trial was designed with the consumer in mind and there were restrictions placed on the size and number of images that could be transmitted.

Less ambitious systems are proving more successful. Fife Fire and Rescue in Scotland use picture phones to capture images of injuries suffered by accident victims. Images are transmitted to the accident and emergency department of a local hospital – clinicians at the hospital use the images to help them prepare for the admission of the patient. Also, based on the images received, clinicians decide whether to attend the scene of the accident or delay treatment until the victim is brought into the hospital. Here the resolution of the camera is not a major issue as images are supported by a voice call from a rescue worker.

More complex applications will require more sophisticated handsets and the next generation of handsets and PDAs should overcome some of the problems encountered during recent trials.

## 7. Wearable Wireless eHealth

Less than 1% of the £1.6 Million spent each year on chronic heart disease goes towards prevention. This is a small amount compared to the advertising budgets of companies which market lifestyle choices - such as high fat food, cigarettes and physical inactivity - which some suggest contribute to heart disease. Arguable people take more notice of their own health if they are merely provided with a means of monitoring the condition of their body - even if vital signs data is not collected by a healthcare provider.

However in cases where the healthcare provider is collecting data, such as in supervised exercise diet and stress (SEDS) management programmes the economic benefit of monitoring is impressive. It has been found that patients on SEDS programs cost the healthcare provider \$18,119 per year as opposed to \$47,647 for conventional care. These savings would be even greater if the monitoring technology was simplified at the patient's end and automated at the healthcare provider's end.

For the healthcare provider treatment and care are only one component of the total cost of heart disease. By its very nature congestive heart failure necessitates an unplanned hospital admission. While statistically it is possible to determine how many people will be admitted to hospital over a year predicting who will need treating and when is almost impossible. Monitoring patients at risk provides some warning and enables individual hospitals to refine planning and deploy resources more effectively.

To maximise the cost effectiveness of patient monitoring the system should operate with as little manual intervention as possible. Monitoring a patient in their home, rather than on a hospital ward, allows the healthcare provider to collect data over an extended period. However present systems are cumbersome and little more than remote versions of the ones used in the hospital itself. This means the patient often requires help setting up and operating the equipment – particularly the attachment and arrangement of sensors.

Increasing ease of use of equipment at the patient's end of the system - by incorporating sensors in clothing for example - would greatly reduce the cost of implementing a monitoring system. Seamless integration of sensor and communication technology would also reduce the complexity of monitoring a patient. Here wireless has a key role as the transport medium for collecting data from sensors and as the networking technology that transport data from the patient's home to a control centre.

## 8. Wireless Tagging

'Healthcare is not like the motor industry – treating people is far more complex than building cars and cannot be automated.' This is the key plank in the defence of clinicians who see further automation of their working practices as a threat rather than an opportunity. While it would be impossible to turn a hospital into something resembling a modern automobile assembly plant, there are key patient-facing processes within a health provider's organisation that could be fully or partially automated. Furthermore these processes have equivalents in industry and commerce that either have been, or are in the process of being, automated.

IT vendors have already made significant inroads into the automated drug dispensing market with networked medicine trolleys and dispensing systems. By tagging the patient, the nurse and the drugs it would be possible to eliminate most dispensing errors. It would also be possible to detect departures from established procedures and treatment regimes before a patient comes to harm. These systems could also alert a clinician to a mismatch between the patient's blood group and the blood that is being administered during a transfusion.

Beyond dispensing, there are other applications involving patient contact that would benefit from the support of wireless tagging technology. One example is location wireless monitoring and tagging systems that measure post-surgery contact between the nurse and the patient and ensure the patient is given the exercises they need to help them recover.

Wireless tagging and location monitoring have a potential role in community care and are already being used in a number of trial systems to support elderly people in their own homes. These systems help elderly people control devices within their home and provide feedback to domiciliary carers or monitoring centres. The microprocessor manufacturer Intel has carried out research in this field and has one of a number of systems being trialed in the US and Europe.

This market, while technically more challenging, may prove easier to break into than the HIS market. Channels into the care market are not dependent on large healthcare programmes but are dominated by smaller players who sell to community healthcare organisations, charities and to the patient or their relatives. A large number of devices are marketed direct to the consumer through retail outlets or magazines. This market will expand as a growing number of elderly people attempt to postpone their relocation into long-term care and use technology to maintain their independence.

## 9. SMS - Keeping The Appointment

IT vendors are developing large solutions that, in the long term, will increase the workflow efficiency of healthcare providers. These solutions will also improve the patient's experience within hospitals and outpatient clinics. However, in the short term it has been smaller IT initiatives that have impacted on the performance, and the patient's perception, of the healthcare provider. One application in particular, the SMS-based Patient Reminder (SMS PR) system, has already been shown to reduce 'Did Not attend' (DNA) rates in outpatient clinics where it is used. Another application, Patient Paging (PP), has been adopted by a number of outpatient clinics and has improved the patient's experience of outpatient care.

There are a number of factors driving the market for these systems:-

- They are based on technology that is relatively simple to deploy and requires the minimum of integration with existing IT.
- They are low cost and can, in some cases, be funded locally from revenue with donations from patient associations.
- The impact of SMS PR on workflow efficiency shows up relatively quickly in published data on DNAs.
- Increasingly, time to treatment is becoming as important as the treatment itself.
- Patients expect health providers to use similar technology to that employed by companies in the service sector.
- Large IT vendors have discovered that SMS PR generates additional revenue and adds value to their portfolio of services.
- Small IT vendors and communications providers have discovered that SMS PR and PP provide ideal routes into a healthcare sector that is dominated by larger players.

SMS PR and PP systems are simple to deploy, as they require minimal integration with the health provider's existing IT infrastructure – for example Patient Administration Systems. Funding SMS PR systems is not an issue, as they are purchased as a licensed service and represent a revenue expense rather than a capital cost. As PP systems improve the patient's experience of a particular clinic and cost relatively little to deploy, individual hospitals have purchased systems using charitable donations rather than applying for central funding.

## 10. 101 Applications

We have used a traffic light notation to indicate the feasibility and market readiness of each application: -



Speculative or in the early stages of research.



Feasible and in trials.



Market ready or already commercially deployed.

<b>1</b>	<b>Appointment Reminders (SMS)</b>		
<p><b>Description</b></p> <p>A few days before they are due to attend an outpatient’s clinic the patient is sent a text message reminding them of the time and date of their appointment. The system reduces the number of people failing to keep their appointments and increases workflow efficiency within busy outpatient departments.</p>			
<p><b>Key vendors</b></p> <p><a href="http://www.txttools.co.uk">www.txttools.co.uk</a> <a href="http://www.iplato.net">www.iplato.net</a></p>		<p><b>Key users</b></p> <p>Various NHS Trusts within the UK</p>	
			

<b>2</b>	<b>Patient Support (SMS)</b>		
<p><b>Description</b></p> <p>SMS messaging is used to support mentally ill patients who are being cared for in the community. The system reminds patients to take medication and attend appointments. The mobile phone also provides the patient with immediate contact with a caseworker in emergencies.</p>			
<p><b>Key vendors</b></p> <p><a href="http://www.strandtech.co.uk">www.strandtech.co.uk</a></p>		<p><b>Key user</b></p> <p>Wolverhampton Social Services</p>	
			

<b>3</b>	<b>Medication Reminders (SMS)</b>		
<p><b>Description</b></p> <p>A large number of patients fail to complete courses of medication. Some cause themselves harm by taking incorrect doses. SMS messages can provide time critical reminders sent direct the patient's mobile phone – offering both medication guidance and advice.</p>			
<p><b>Key vendors</b></p> <p><a href="http://www.exco.uk.com">www.exco.uk.com</a></p>		<p><b>Key users</b></p>	
			

<b>4</b>	<b>Appointment Booking</b>		
<p><b>Description</b></p> <p>eBooking will enable a GP to arrange appointments at a time and in a hospital of the patient's choosing. When the system is rolled out access will be via a desktop PC located in the GPs surgery. Eventually GPs and domiciliary healthcare workers will have access to ebooking via mobile devices enabling hospital appointments to be arranged either from a surgery or during a home visit to the patient.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.vodafone.com">www.vodafone.com</a></p>		<p>Key users</p> <p style="text-align: center;">The NHS – Connecting For Health</p>	
			

<b>5</b>	<b>Medical Data On A SIM Card</b>		
<p><b>Description</b></p> <p>Issues such as privacy and cost are delaying the introduction of electronic ID cards. However mobile phone users already carry a form of ID card called a SIM (Subscriber Identification Module) that is embedded in their handset. Modern SIM cards have enough spare capacity to hold basic medical data about the owner and could also provide a gateway to the subscriber's electronic patient record. Research projects and trials are underway in The Netherlands and Italy to assess the feasibility of using SIM cards to store medical data.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.vodafone.com">www.vodafone.com</a></p>		<p>Key users</p>	
			

<b>6</b>	<b>Patient Information For Relatives</b>		
<p><b>Description</b></p> <p>A service to reduce the number of calls relatives make to staff in intensive care units. The patient, or their relatives, post information on the patient's condition on a web page where it can be accessed by relatives. The system is particularly useful for patients with dispersed family and friends, eliminating the need for numerous phone calls each time new information is available.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.carepages.com">www.carepages.com</a></p>		<p>Key users</p> <p style="text-align: center;">Sutter Roseville Medical Centre, U.S</p>	
			

<b>7</b>	<b>Peer Support For Patients</b>	
<p><b>Description</b></p> <p>The 'Circles of Care' concept consists of a number of mobile-based services that enable family members to share advice on health and fitness. A knowledge base of medical data is shared amongst family members or support groups. The service, which has been designed help young people who live apart from relatives, would ease the pressure on GPs.</p>		
<p><b>Key vendors</b>  <a href="http://www.hhrc.rca.ac.uk">www.hhrc.rca.ac.uk</a>, <a href="http://www.orange.com">www.orange.com</a>  <a href="http://www.pearsonmatthews.com">www.pearsonmatthews.com</a></p>	<p><b>Key users</b></p>	

<b>8</b>	<b>Post Cardiac Surgery Support</b>	
<p><b>Description</b></p> <p>Patients who have recently undergone heart operations but are keen to maintain an active life use a GPS enabled mobile phone that enables them to contact a medical expert if they believe they are in danger of having a cardiac arrest. The phone has a sensor that measures heart rate and transmits data to a call centre. If the data indicates that the patient is in danger the call centre operator arranges for the emergency services to attend the patient.</p>		
<p><b>Key vendors</b>  <a href="http://www.vitaphone.de">www.vitaphone.de</a></p>	<p><b>User</b>                  Available to public in Germany and Switzerland</p>	

<b>9</b>	<b>Accessing Electronic Patient Records</b>	
<p><b>Description</b></p> <p>An application that provides remote, real time, access to patient notes and clinical systems via a Pocket PC. There is no downloading or time delay and the patient notes can be accessed in the field, updated and recorded via a Pocket PC with all amendments being recorded on a the server located in a doctors surgery.</p>		
<p><b>Key vendors</b>  <a href="http://www.medifysolutions.com">www.medifysolutions.com</a></p>	<p><b>Key users</b>                  The UK NHS - NPfIT</p>	

<b>10</b>	<b>Access To Dietary Information</b>		
<p><b>Description</b></p> <p>Technology deployed by supermarkets to enable shoppers to scan their own purchases could also be used to provide dietary information on a particular product – for example sugar and salt content. These systems could also be used to alert sufferers of allergies to the presence of nuts or gluten in a particular product.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.symbol.com">www.symbol.com</a></p>		<p><b>User</b></p> <p style="text-align: center;">Facility available but not deployed</p>	

<b>11</b>	<b>ePrescribing</b>		
<p><b>Description</b></p> <p>Physicians and long term care providers can use a range of mobile devices to submit a prescription directly to the pharmacy either from their surgeries or from the patient's bedside. These systems also give the physician access to patient clinical information and data on medications a patient is already taking. ePrescribing systems also automatically highlight possible adverse drug interactions.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.ramp.com">www.ramp.com</a> <a href="http://www.allscripts.com">www.allscripts.com</a></p>		<p><b>Key users</b></p> <p style="text-align: center;">Physicians in the US</p>	

<b>12</b>	<b>Patient Paging In Outpatient Clinics</b>		
<p><b>Description</b></p> <p>Wireless pagers allow patients to wait for appointments in the area of their choosing. This system is particularly useful for parents whose children become restless. Paging, which is also to be made available for mobile phones, also reduces stress in outpatients clinics and provides a better working environment for staff.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.jtech.com">www.jtech.com</a></p>		<p><b>Key users</b></p> <p style="text-align: center;">Northumbria Healthcare NHS Trust and hospitals in the US</p>	

<b>13</b>	<b>Support For Alzheimer Patients</b>		
<p><b>Description</b></p> <p>Mobile devices can be used to monitor the movement of people in their homes and to interact with a range of household appliances. The system would enable Alzheimer sufferers to remain in their own home or sheltered accommodation rather than going into long-term care.</p>			
<p>Key vendors</p> <p><a href="http://www.homefreesys.com">www.homefreesys.com</a> <a href="http://www.intel.com">www.intel.com</a></p>		<p>Key users</p>	
			

<b>14</b>	<b>Support For Diabetes Sufferers</b>		
<p><b>Description</b></p> <p>Diabetes sufferers can manage daily appointments and resources needed for a meeting or event using a wireless web phone, PDA, or personal computer. Patients that receive appointment notices have the option to accept or decline appointments or add notes for future reference.</p>			
<p>Key vendors</p> <p><a href="http://www.mdiabetic.com">www.mdiabetic.com</a></p>		<p>Key users</p>	
			

<b>15</b>	<b>Clinical Trials</b>		
<p><b>Description</b></p> <p>Wireless enabled handheld devices are used to collect data during clinical trials. Wireless communication provides a rapid response and can detect non-compliance at an early stage.</p>			
<p>Key vendors</p> <p><a href="http://www.invivodata.com">www.invivodata.com</a></p>		<p>Key users</p> <p>Pharmaceutical Companies</p>	
			

<b>16</b>	<b>Support For Dementia Sufferers</b>	
<p><b>Description</b></p> <p>A mobile telephone tracking system is being used to locate people suffering from mild dementia.</p> <p>The tracking system works via a mobile telephone that the user has secured to them in a holster. If the person goes missing, their carer telephones the council's control centre who can then pinpoint the person using Global Positioning System (GPS) data.</p> <p>The system could also be used to track patients within the healthcare system if they have been omitted without their relatives knowledge</p>		
<p><b>Key vendors</b></p> <p>Various Mobile Operators</p>	<p><b>Key user</b></p> <p>Ealing Council and Charing Cross Hospital</p>	

<b>17</b>	<b>Support During Rehabilitation</b>	
<p><b>Description</b></p> <p>While an athlete is often assigned a personal fitness instructor while recovering from an injury the typical patient must make do with an occasional visit to a physiotherapist. There are, however, a number of devices on the market that help a person maintain an exercise regime. An example of such a device is the 'Forerunner' which uses GPS and a virtual personal fitness instructor to encourage the patient to maintain a predefined pace during exercising. It is likely that manufacturers of such devices will attempt to broaden the market for their products by incorporating features that are applicable in a number of rehabilitation scenarios</p>		
<p><b>Key vendors</b></p> <p>www.garmin.com</p>	<p><b>Key users</b></p>	

<b>18</b>	<b>Support For The Deaf</b>	
<p><b>Description</b></p> <p>SMS text messaging has a key role to play in providing information for the deaf. Wireless technology is also used to help patients suffering from single side deafness by transferring sound from the patient's deaf ear to their good ear via a microphone, speaker and a wireless link. By adding a small delay to the signal the patient can regain some of their spatial awareness.</p>		
<p><b>Key vendors</b></p> <p>www.siemens.de</p>	<p><b>Key users</b></p> <p>Medical equipment retailers</p>	

<b>19</b>	<b>Support For The Chronically III</b>			
<p>Description</p> <p>Mobile phones could be used to monitor chronically ill patients as they go about their normal daily routines. Daily monitoring would help patients with chronic diseases maintain appropriate drug, diet and exercise regimes. As treating the chronically ill accounts for a substantial proportion of a healthcare provider's expenditure any technology that automates the care process will enhance the providers financial performance.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.motorola.com">www.motorola.com</a></p>		<p>Key users</p> <p style="text-align: center;">Harvard Teaching Hospitals</p>		

<b>20</b>	<b>Support For Addicts</b>			
<p>Description</p> <p>Alcoholics and drug addicts need constant support either, in the case of alcoholics, from peer group members or from counsellors and caseworkers. In many instances this support is needed when the addict is away from their home and cannot be contact via a landline.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.nhsdirect.nhs.uk">www.nhsdirect.nhs.uk</a></p>		<p>Key users</p>		

<b>21</b>	<b>Support For STD Sufferers</b>			
<p>Description</p> <p>Mobile phones are ideal for contacting people who may be too embarrassed to discuss ailments face to face with either their doctor or caseworker. The fact that a mobile phone is a personal communications device and that a young person usually carries one with them at all times means it can also be used to ensure that patients persevere with treatment. The mobile phone can also be used as a channel for advice on disease prevention.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.primetext.com">www.primetext.com</a></p>		<p>Key users</p>		

<b>22</b>	<b>Baby Monitoring</b>	
<p><b>Description</b></p> <p>A child monitoring system that works over a telephone line but does not need a permanently open phone line. The user plugs a device into a phone socket then programs in the number of the mobile phone they would like to ring if their child cries.</p>		
<p>Key vendors www.bebetel.co.uk</p>	<p>Key users</p>	

<b>23</b>	<b>Suicide Watch</b>	
<p><b>Description</b></p> <p>Mobile phones can be used to counsel people thought to be at risk of suicide. Support is offered in the form of text messages and voice calls. In some cases intelligent agents are used to monitor responses and the data is used as part of research into depression.</p> <p>Some prison inmates are issued with mobile phones that can only be used to call a counselling service such as the Samaritans.</p>		
<p>Vendor www.objectconsulting.com.au</p>	<p>User Murdoch Children's Research Institute</p>	

<b>24</b>	<b>Support For Children</b>	
<p><b>Description</b></p> <p>Mobile phone ownership is high amongst teenagers and children and a mobile phone is often the easiest way of maintaining contact with a child. It is also, in many cases the easiest way for a child to report that an adult is mistreating them as the child can contact a helpdesk without being overheard.</p>		
<p>Key vendors www.childline.org</p>	<p>Key users</p>	

<b>25</b>	<b>Food Product Dietary Information</b>		
<p><b>Description</b></p> <p>A shopper uses a mobile camera phone to capture the barcode on packaged foods. The image is transmitted to a central server where it is decoded and used to access a database of food products. A list of ingredients that might cause allergic reactions together with advice on the nutritional value of the food product itself is transmitted to the shopper's phone as a text message.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;">tivik.vtt.fi/tivik</p>		<p><b>Key users</b></p>	
			

<b>26</b>	<b>Allergy Alert Service For Asthmatics (SMS and GPS)</b>		
<p><b>Description</b></p> <p>Mobile operators provide help for allergy sufferers by providing up-to-date pollen alert forecasts that help users to avoid high-risk areas or take the appropriate medication. A SMS text message provides individualised pollen alerts that take into consideration the user's personal allergy profile and, using GPS technology, their current location.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;">www.vodafone.de</p>		<p><b>Key users</b></p> <p style="text-align: center;">Vodafone Live Users</p>	
			

<b>27</b>	<b>Doctor At Home</b>		
<p><b>Description</b></p> <p>A GSM based device that enables a patient to log symptoms and vital signs data. This information is then sent to a central server where it can be analysed by the patient's GP.</p> <p>250 units are being used in trials throughout Europe – 75 of these in the UK.</p>			
<p><b>Vendor</b></p> <p style="text-align: center;">www.docobo.uk</p>		<p><b>Users</b></p> <p style="text-align: center;">Various European Healthcare Providers</p>	
			

<b>28</b>	<b>Self Diagnosis</b>	
<p><b>Description</b></p> <p>An increasing number of people are opting for self-diagnosis. In 2002 alone almost £55 million was spent on self-diagnostic products, such as blood pressure monitors, blood glucose monitors and pregnancy tests. A mobile phone or wireless PDA connected to a conventional GSM network would provide an ideal platform for these products and services.</p>		
<p>Key vendors www.medicalmicrosystems.co.uk</p>	<p>Key users</p>	

<b>29</b>	<b>Access To Electronic Patient Data For Overseas Travellers</b>	
<p><b>Description</b></p> <p>Physicians treating visitors from overseas often require access to patient data. A mobile device provides an ideal means of accessing a person's medical record and the information the physician needs when treating the patient during an emergency. The device could also be used to add notes to the visitors medical record.</p>		
<p>Key vendors www.roamingmessenger.com</p>	<p>Key users</p>	

<b>30</b>	<b>Data Capture From Medical Instrumentation</b>	
<p><b>Description</b></p> <p>A smart phone or wireless PDA could be used to aggregate patient data from a wide range of hospital monitoring equipment. The data could be used to support conference calls between groups of specialists during emergency situations or when a care worker needs advice from a specialist who is remote from the patient's bedside.</p>		
<p>Key vendors</p>	<p>Key users</p>	

<b>31</b>	<b>Smart Card Applications</b>	
<p><b>Description</b></p> <p>Smart cards can be used for a range of healthcare related applications including patient identification and the storage of basic medical data such as drug allergies and blood group. In the coming years there will be a degree of cross over between the functionality of smart cards and mobile phone SIM cards. However the smart card provides a low cost means of storing and transporting basic medical data and could, as low cost card readers come onto the market, provide an important step towards the patient taking ownership of their own electronic medical records.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.otiglobal.com">www.otiglobal.com</a></p>	<p>Key users</p> <p style="text-align: center;">CareCross Health South Africa</p>	

<b>32</b>	<b>Monitoring For Asthma Sufferers</b>	
<p><b>Description</b></p> <p>As an alternative to Asthma patients recording daily peak flow meter readings in a diary this solution, built around GPRS mobile phone technology, gives health professionals real-time access to patient data.</p> <p>Peak flow meter readings are taken in the normal way then transmitted, in real time, using a GPRS mobile phone to a central server.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.e-san.co.uk">www.e-san.co.uk</a></p>	<p>Key users</p> <p style="text-align: center;">Bristol Royal Infirmary</p>	

<b>33</b>	<b>Blood Glucose Monitoring</b>	
<p><b>Description</b></p> <p>Blood glucose monitors are available from most high street pharmaceutical stores and are used by diabetes sufferers to monitor their condition. A number of communications vendors have designed GSM modules that enable the data collected by these monitors to be sent across a conventional mobile network to a central server where results can be accessed by a GP or a care worker. In some cases automated blood glucose monitoring is offered as part of a suite of ehealth services.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.alivetec.com">www.alivetec.com</a> <a href="http://www.rtx.dk">www.rtx.dk</a></p>	<p>Key users</p>	

<b>34</b>	<b>Temperature Measurement</b>	
<p><b>Description</b></p> <p>Thermometer technology has advance radically over the last decade. Some digital devices merely require contact with the patient's ear to obtain a reading. A number of vendors are producing wireless enabled thermometers that relay temperature data to a PDA where it can be stored, processed or transferred to a database running on an ehealth service provider's server.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.rtx.dk">www.rtx.dk</a></p>	<p>Key users</p>	

<b>35</b>	<b>Weight Measurement</b>	
<p><b>Description</b></p> <p>Wireless modules, fitted into bathroom scales, can transmit data to a GSM hub within the user's home from where it is forwarded to a server maintained by the ehealth service provider. The data collected can be used during patient consultations or as a foundation for a weight management program.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.americanhealthways.com">www.americanhealthways.com</a></p>	<p>Key users</p>	

<b>36</b>	<b>Medication Compliance Monitoring</b>	
<p><b>Description</b></p> <p>Mobile wireless technology is used to remind patients with chronic conditions to take their medication as prescribed. When a pill bottle is opened it delivers an SMS text message to a central server. The SMS contains a unique pill box ID number.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.simpill.com">www.simpill.com</a></p>	<p>Key users</p> <p style="text-align: center;">Service available for doctors in South Africa</p>	

<b>37</b>	<b>Voice Pattern Analysis</b>	
<p><b>Description</b></p> <p>As more technology is incorporated into mobile handsets and microphone technology improves it may become possible to build a utility into mobile phones that analyses speech patterns to detect signs of stress. This technology could be used to either inform the user that they are under too much stress or to collect data as part of a broader health monitoring service run by a third party.</p>		
Key vendors	Key users	

<b>38</b>	<b>Analysis Of Breath</b>	
<p><b>Description</b></p> <p>Conventional telephones have been used for respirometry, or lung function tests. Even though microphones in the current generation of mobile phones are of insufficient quality to support detail analysis some basis work in this area has been carried out. It has also been suggested that some elementary chemical analysis – similar to alcohol breath testing could be incorporated into mobile phones.</p>		
Key vendors <a href="http://www.lungsounds.org.uk">www.lungsounds.org.uk</a>	Key users	

<b>39</b>	<b>Heart Rate Monitoring</b>	
<p><b>Description</b></p> <p>Body-worn sensors wirelessly communicates the health status of the patient to the appropriate centre in the hospital, clinic or home, leaving the patient free to walk about and lead a normal life. The product provides continuous surveillance of the patient and enables the early detection of life threatening cardiac events.</p>		
Key vendors <a href="http://www.ulster.ac.uk">www.ulster.ac.uk</a>	Key users	

<b>40</b>	<b>Smart Homes For The Elderly</b>		
<p><b>Description</b></p> <p>Wireless and mobile technology make ideal platforms for the smart home applications that allow older people to remain in their own homes or sheltered accommodation rather than moving into long term care. The technology is used to monitor the elderly person's movement within their home and alert a central operator and/or a mobile care worker if a problem, such as a fall, is detected.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.tunstallgroup.com">www.tunstallgroup.com</a></p>		<p><b>Key users</b></p> <p style="text-align: center;">West Lothian Council</p>	
			

<b>41</b>	<b>Patient Diaries For Clinical Trials</b>		
<p><b>Description</b></p> <p>A large number of mobile devices are used in medical trials to monitor the patient's compliance with medication. Mobile devices have an advantage over written diaries as non-compliance shows up immediately and technicians can monitor trials remotely.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.phtcorp.com">www.phtcorp.com</a></p>		<p><b>Key users</b></p> <p style="text-align: center;">Most major pharmaceutical manufacturers</p>	
			

<b>42</b>	<b>Collecting Data From Pacemakers</b>		
<p><b>Description</b></p> <p>Modern pacemaker systems are capable of storing patient data. This data is communicated, via a wireless link to a mobile device then forwarded to a server where it can be accessed by a GP or consultant. The system saves both the patient and the health provider time and money by reducing the number of tests the provider has to conduct and cutting consultation times. The system plays a key role in reducing the cost of providing care to patients with heart conditions.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.medtronic.com">www.medtronic.com</a></p>		<p><b>Key users</b></p> <p style="text-align: center;">Metropolitan Cardiology Consultants. US</p>	
			

<b>43</b>	<b>Fitness Monitoring</b>		
<p><b>Description</b></p> <p>Wireless and mobile devices are already used to monitor athletes while they are training. Keep fit enthusiasts also use a number of devices to monitor vital signs while they are exercising. Some of these devices can make exercise more compelling and encourage younger people to become more active. It is claimed that the use of these devices as part of an exercise regime could reduce depression and lethargy.</p>			
<p><b>Key vendors</b></p> <p><a href="http://www.polar.fi">www.polar.fi</a> <a href="http://www.scifit.com">www.scifit.com</a></p>		<p><b>Key users</b></p> <p>Fitness centres worldwide</p>	
			

<b>44</b>	<b>Real Time Patient Assessment</b>		
<p><b>Description</b></p> <p>Wireless devices can be used to record vital signs data during the patient's stay in hospital. The clinician enters the data on a PDA or tablet PC from the patient's bedside. The system reduces paper work and supports real time entry into an electronic patient record system.</p>			
<p><b>Key vendors</b></p> <p><a href="http://www.ethitec.co.uk">www.ethitec.co.uk</a></p>		<p><b>Key users</b></p> <p>Rutland Memorial Hospital</p>	
			

<b>45</b>	<b>Sleep Monitoring</b>		
<p><b>Description</b></p> <p>Analysing a patient's sleep patterns can be an expensive and time consuming exercise taking up a significant amount of a health provider's resources if the patient is in a hospital. An alternative is to use wireless enabled sensors that can be worn by the patient. Data from these sensors can be forwarded to a server maintained by the health provider. The patient can either be monitored remotely by a clinician or, in cases where the patient's condition is not critical, the data can be stored for processing at a later date.</p>			
<p><b>Key vendors</b></p> <p><a href="http://www.nonin.com">www.nonin.com</a> <a href="http://www.camntech.co.uk">www.camntech.co.uk</a></p>		<p><b>Key users</b></p>	
			

<b>46</b>	<b>Collection Of Data From Wearable Sensors</b>			
<p><b>Description</b></p> <p>A number of vendors have produced garments that incorporate sensors to monitor the wearer's vital signs. The data from these sensors can be collected by a wireless device and then, if the device is GSM or GPRS enabled, transferred to a remote server. This technology is used in clinical trials and to monitor children while they sleep.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.vivometrics.com">www.vivometrics.com</a></p>		<p>Key users</p> <p style="text-align: center;">Roche Diagnostics</p>		

<b>47</b>	<b>Collection Of Data From Implanted Devices</b>			
<p><b>Description</b></p> <p>RFID tags can be used to measure temperature and when implanted under the skin of a patient can be used both identify the patient and provide vital signs data. Data collected from sensors implanted in the brain can be used to help disabled patients control a variety of devices.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.verichipcorp.com">www.verichipcorp.com</a></p>		<p>Key users</p>		

<b>48</b>	<b>Diabetes Monitoring In Chiropody</b>			
<p><b>Description</b></p> <p>A mobile phone based system could be used to monitor patients with diabetes Mellitus. The system would measure pressures, temperatures and humidity in the feet and sending the data to the hospital for further analysis. Data would then be sent over a GSM or GPRS network to a remote server where it would be analysed.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.diafoot.com">www.diafoot.com</a></p>		<p>Key users</p> <p style="text-align: center;">EU Funded Project</p>		

<b>49</b>	<b>Detection Of Septic Episodes</b>	
<p><b>Description</b></p> <p>A wireless device attached to the patient monitors skin temperatures and pulse rate. A PDA, linked to the device, communicates via Bluetooth with a GPRS terminal that in turn relays the patient's data to an application server. The patient can place the GPRS unit in their pocket should they wish to leave their house. The PDA can initiate an alarm signal if the data collected indicates an incipient infection.</p>		
Vendor	<a href="http://www.roke.co.uk">www.roke.co.uk</a>	User
		

<b>50</b>	<b>Remote Antenatal Care</b>	
<p><b>Description</b></p> <p>Wireless devices used to measure the vital signs of athletes during training are now being used to monitor women during pregnancy. The data is collected and processed using a wireless PDA and an alert sent to a clinician if any abnormalities are detected. The system has been designed to reduce the number of home visits by health workers and also free up hospital beds occupied by mothers being monitored during pregnancy.</p>		
Key vendors	<a href="http://www.xenetec.com">www.xenetec.com</a>	Key users
		

<b>51</b>	<b>Telehealth Gateways</b>	
<p><b>Description</b></p> <p>A single 'hub' connected to a GSM network can be used to collect an array of data from ehealth devices and monitors (such as Bluetooth enabled scales and thermometers). This information can be forwarded to a server managed by an ehealth service provider.</p>		
Key vendors	<a href="http://www.rtx.dk">www.rtx.dk</a>	Key users
		

<b>52</b>	<b>Patient Location</b>	
<p><b>Description</b></p> <p>With care providers under pressure to keep staffing levels to a minimum it is not uncommon for a patient to wander off a ward or sometimes out of a the building altogether. A simple tag, possibly incorporated into the patient identification wristband, could be used to log the patient's position within the building.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.ubisense.net">www.ubisense.net</a></p>	<p>Key users</p>	

<b>53</b>	<b>Pulse Oximetry</b>	
<p><b>Description</b></p> <p>Wireless enabled patches can be used to monitor for pulse oximetry, core temperature, brain activity, and peripheral circulation. The sensor technology allows placement on virtually any area of the body as easily as placement of a band-aid. Data can be analysed either locally or remotely.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.physioadvantage.com">www.physioadvantage.com</a></p>	<p>Key users</p>	

<b>54</b>	<b>Personalised Diagnosis</b>	
<p><b>Description</b></p> <p>eHealth vendors now provide suites of wireless peripherals such as ECG heart monitor, lung function Spirometer, Pulse Oximeter, blood pressure devices, and SD I/O blood glucose monitors that can be used in conjunction with smart mobile phones. The phone acts as a mobile health monitor and transmits data to a central server where the patient's condition is diagnosed.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.cardguard.com">www.cardguard.com</a></p>	<p>Key users</p>	

<b>55</b>	<b>Early Detection Of Cardiological Syndromes</b>		
<p><b>Description</b></p> <p>Implantable medical therapy offers the prospect of automatic fluid status monitoring in the thoracic cavity, the chest area encompassing the lungs and heart. The technology is expected to provide a critical advantage in managing heart failure, since thoracic fluid accumulation is a primary indicator of worsening heart failure and often results in patient hospitalisation.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.medtronic.com">www.medtronic.com</a></p>		<p>Key users</p>	
			

<b>56</b>	<b>Appointment Scheduling</b>		
<p><b>Description</b></p> <p>A mobile system which enables nurses to access full patient details and complete treatment forms via a PDA whilst on the road. Using wireless technology, nurses will be able to instantly send back details of each patient visit directly to a central database. The system includes a scheduling system that will allow managers to plan appointments all over the country at the touch of a button.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.leyscomit.com">www.leyscomit.com</a></p>		<p>Key users</p>	
			

<b>57</b>	<b>Access to Patient Data For Domiciliary Workers</b>		
<p><b>Description</b></p> <p>Wireless handheld devices will enable doctors and nurses to obtain pathology and patient history reports. Wireless enabled tablet PCs will be capable of accessing and displaying larger reports and X-ray images. These devices will bring about a significant change in working practises within the healthcare industry where, currently, patient information consists of handwritten notes and hard copy reports stored in different locations.</p>			
<p>Key vendors</p> <p><a href="http://www.symbol.com">www.symbol.com</a> <a href="http://www.medifysolutions.com">www.medifysolutions.com</a></p>		<p>Key users</p> <p style="text-align: center;">Monash Medical Centre, Australia</p>	
			

<b>58</b>	<b>Diagnosis Support For Domiciliary Workers</b>		
<p><b>Description</b></p> <p>There is a move towards treating patients in their own homes with healthcare providers providing patient support with domiciliary staff or 'Community Matrons'. These domiciliary workers will require supporting technology and there is a market for a mobile device with access to intelligent agents that can analyse an array data from sensors, or textual answers to questions, then prompt the health worker for further information or suggest tests. Research is already underway into how such agents would operate.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.royalsurrey.nhs.uk">www.royalsurrey.nhs.uk</a></p>		<p><b>Key users</b></p>	
			

<b>59</b>	<b>Personal Attack Alarm Service</b>		
<p><b>Description</b></p> <p>Automated lone worker communication system based on mobile phones and IVR (Interactive Voice Response) technology that provides additional protection for healthcare professionals. Workers who feel 'at risk' or are involved in an incident notify their 'LookOut' call system by pressing a button on their mobile phone. The system automates the incident detection and response processes to ensure that the health provider identifies all potential incidents and responds appropriately.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.c3ltd.co.uk">www.c3ltd.co.uk</a></p>		<p><b>Key users</b></p> <p style="text-align: center;">Hounslow PCT, UK</p>	
			

<b>60</b>	<b>Clinician Identification</b>		
<p><b>Description</b></p> <p>Medical procedures are becoming more complex with a large number of healthcare workers coming into contact with the patient. Sometimes the patient is treated in his or her own home. It is, therefore, important that treatment regimes are coordinated and there is an audit trail of actions and events that can be examined should a problem occur. Wireless and mobile devices have a key role to play in monitoring patient-healthcare worker contact and identifying clinicians involved in the care process.</p>			
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.bioscrypt.com">www.bioscrypt.com</a></p>		<p><b>Key users</b></p>	
			

<b>61</b>	<b>Asset Tracking (RFID)</b>	
<p><b>Description</b></p> <p>Wireless RFID readers can be used to track assets, ensure diagnostic equipment is in the right location at the right time and items - such as wheelchairs - do not leave the hospital premises. The technology can also be used to monitor the location of doctors, nurses, patient escort services staff, hazardous waste managers, and other human resources on site.</p>		
Key vendors	<a href="http://www.ibss.net">www.ibss.net</a>	Key users 

<b>62</b>	<b>Stock Control (RFID)</b>	
<p><b>Description</b></p> <p>Wireless devices can be used to monitor stocks of bedding, towels and bandages ensuring that shortages do not disrupt workflow and that overstocking does not tie up funds or over commit storage space.</p>		
Key vendors	<a href="http://www.socketcom.com">www.socketcom.com</a>	Key users 

<b>63</b>	<b>Patient Identification (RFID)</b>	
<p><b>Description</b></p> <p>A wireless PDA with integrated RFID reader for use by nurses at the point-of-care could positively identify patients, medications, and other medical supplies at the time care is provided. The system would also integrate with electronic health record and electronic medication administration systems to ensure real time checks are accurate. It would also provide real time updates of the patient record on completion of a particular task.</p>		
Key vendors	<a href="http://www.seastate1.com">www.seastate1.com</a>	Key users 

<b>64</b>	<b>Dispensing Support</b>		
<p><b>Description</b></p> <p>Wireless enabled dispensing carts increase workflow and monitor medication at all stages from the dispensary to the patient. As well as reducing the risk of injury and harm caused by dispensing errors the technology both speeds up and deskills the dispensing process.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.artromick.com">www.artromick.com</a></p>		<p>Key users</p> <p style="text-align: center;">Healthcare providers worldwide</p>	
			

<b>65</b>	<b>Locating Staff</b>		
<p><b>Description</b></p> <p>While most key medical staff carry pagers while in hospital WIFI, SMS and GPS technology improves workflow by identifying where a particular member of staff is and forwarding key relevant information to them. The technology can automatically provide hospital administration systems with confirmation that the member of staff paged has taken the action requested. It can also pin point members of staff who are closest to the department where they are required. The technology can also be used for operational research purposes and to improve workflow.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.ekahau.com">www.ekahau.com</a> <a href="http://www.ubisense.net">www.ubisense.net</a></p>		<p>Key users</p>	
			

<b>66</b>	<b>Conferencing During Emergencies</b>		
<p><b>Description</b></p> <p>Wi-Fi handsets can be used to provide immediate communication for nurses, doctors and hospital staff and set up conference calls between groups of healthcare workers during emergency situations. In cases where time is critical but specialists are widely dispersed across a hospital campus the time saved by instantly setting up a conference call could both save lives and improve workflow.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.spectralink.com">www.spectralink.com</a></p>		<p>Key users</p>	
			

<b>67</b>	<b>Accessing Training Material</b>	
<p><b>Description</b></p> <p>Wireless technology can be used to support educational tools designed to deliver continual professional development and provide educational material during training. Students can access material while standing beside the patient’s bedside.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.medifysolutions.com">www.medifysolutions.com</a></p>	<p>Key users</p>	

<b>68</b>	<b>Accessing Laboratory Results</b>	
<p><b>Description</b></p> <p>In time basic laboratory test results will be produced in an electronic format. These records will become part of the patient’s electronic records. The ability to access test results with a wireless device will speed up the diagnosis procedure and enable a number of health workers, working remotely, to access test results at the same time.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.olympusosyris.com">www.olympusosyris.com</a></p>	<p>Key users</p>	

<b>69</b>	<b>Blood Bank Support Services</b>	
<p><b>Description</b></p> <p>A number of patients come to harm due to transfusions of the wrong type of blood. Many healthcare providers are installing barcode systems to ensure blood type compatibility. Eventually RFID technology will replace barcodes and the dispensing of blood will be tightly integrated into the healthcare providers computerised administration system.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.olympusosyris.com">www.olympusosyris.com</a></p>	<p>Key users</p>	

<b>70</b>	<b>Locating Blood Donors</b>		
<p><b>Description</b></p> <p>Emergency blood requests via SMS prompt an application to match against donors and generate blood donation alerts. The SMS service is used to recruit and recall blood donors in collaboration with a National Blood Transfusion Service.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.dialog.lk">www.dialog.lk</a></p>		<p>Key users</p> <p style="text-align: center;">Blood Transfusion Service of Sri Lanka</p>	
			

<b>71</b>	<b>Locating Organ Donors</b>		
<p><b>Description</b></p> <p>Organ transplant alerts let users virtually communicate and share information through a private and secure network. Donors, recipients, hospitals, physicians, pharmacies, and transporters can communicate with all those involved in the organ transplant process using a variety of devices including pagers, PDAs and mobile phones.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.egoware.com">www.egoware.com</a></p>		<p>Key users</p>	
			

<b>72</b>	<b>Support For A&amp;E</b>		
<p><b>Description</b></p> <p>Mobile and wireless devices are used by medical staff who provide urgent care directly at the patient's bedside. Emergency staff can make better care decisions, track patient care and accurately document the medicines and attention that each staff member provides.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.netmotionwireless.com">www.netmotionwireless.com</a></p>		<p>Key users</p> <p style="text-align: center;">Fletcher Allen Healthcare, Vermont</p>	
			

<b>73</b>	<b>Tracking Surgical Instruments</b>		
<p><b>Description</b></p> <p>The development of RFID tags that can withstand the heat of an autoclave based sterilisation process means that surgical instruments can be tracked at all stages of their use. This not only improves workflow efficiency but also makes it easier to identify instruments that have been used on a patient who is later found to be suffering from a Prion related disease.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.bradycorp.com">www.bradycorp.com</a></p>		<p>Key users</p>	
			

<b>74</b>	<b>Controlling Insulin Patches</b>		
<p><b>Description</b></p> <p>Wireless can be used to control external pumps used for subcutaneous injection of insulin for diabetes care. The insulin pump is based on a micro-pump chip that is small and can be taped directly onto the patient's skin. The device is operated and programmed remotely using a wireless device.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.debiotech.com">www.debiotech.com</a></p>		<p>Key users</p> <p style="text-align: center;">Delphi Medical Systems Corporation</p>	
			

<b>75</b>	<b>Billing</b>		
<p><b>Description</b></p> <p>Mobile based charge capture software enables the physician to streamline the billing process and cut down on administration. The technology enables physicians and staff to improve billing accuracy, decrease administrative costs and avoid denials.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.medtronsoftware.com">www.medtronsoftware.com</a></p>		<p>Key users</p>	
			

<b>76</b>	<b>Patient Consent</b>		
<p><b>Description</b></p> <p>A small computer chip is programmed with the following critical information: date of surgery, patient's full name, surgical site, a description of the operation to be performed, and surgeon's name. The chip may be programmed at the preoperative outpatient visit, in the emergency room, or on the hospital floor if the patient is an inpatient. A nurse or physician then scans the chip with an RFID reader and the patient reviews the information to be sure it is correct.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.surgichip.com">www.surgichip.com</a></p>		<p>Key users</p>	
			

<b>77</b>	<b>Drug Authenticity Verification (RFID)</b>		
<p><b>Description</b></p> <p>Drugs can be tagged using an RFID tag containing a unique number. When checked by the pharmacist using a scanner the product is authenticated if it matches details on a secure database, and rejected if not recognised. The technology removes counterfeit drugs from the supply chain before they can do harm to patients.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.aegate.com">www.aegate.com</a></p>		<p>Key users</p>	
			

<b>78</b>	<b>Patient Entertainment And Communication</b>		
<p><b>Description</b></p> <p>Healthcare providers earn revenue from arrangements with vendors who provide bedside entertainment and communication systems. This market is protected, as there are restrictions on the use of mobile phones within hospitals. As these restrictions are lifted vendors will need to find alternative sources of revenue based on mobile and wireless technology.</p>			
<p>Key vendors</p>		<p>Key users</p>	
			

<b>79</b>	<b>Patient Notes Dictation Systems</b>	
<p><b>Description</b></p> <p>Specialised turnkey speech input systems are available for the healthcare sector. These mobile/wireless based systems identify key words commonly used by consultants and other healthcare workers and enable hands free capture of data at the patients bedside.</p>		
Key vendors	<a href="http://www.infologixsys.com">www.infologixsys.com</a>	Key users 

<b>80</b>	<b>Administration At The Point Of Care</b>	
<p><b>Description</b></p> <p>Tablet computing vendors are producing turnkey packages that enable a range of administrative tasks to be carried out by healthcare workers at the point of care – in the patient’s home or on the hospital ward. This technology cuts down on delays in updating records and improves workflow within hospitals and general practices.</p>		
Key vendors	<a href="http://www.wifi-med.com">www.wifi-med.com</a>	Key users Healthcare Providers Worldwide 

<b>81</b>	<b>Linking Emergency Services To A&amp;E</b>	
<p><b>Description</b></p> <p>Rescue workers, attending an incident, use picture phones to transmit an image of the victim’s injuries to a clinician. Based on the images received, and additional information provided by a voice call from rescue personnel, the clinician decides whether they need to attend the scene of the accident or delay treatment until the victim has arrived at the A&amp;E department of the hospital.</p>		
Key vendors	<a href="http://www.orange.com">www.orange.com</a>	Key users Fife Fire And Rescue Queen Margaret Hospital 

<b>82</b>	<b>Access To X-ray Images</b>		
<p><b>Description</b></p> <p>A mobile picture phone can be used to capture a segment of an x-ray image - or alternatively a smart phone or PDA supporting a DICOM viewer can display a section of an image downloaded from a PACS database. The technology enables specialists, located remotely from the hospital, to access x-ray images.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.pedagog.com">www.pedagog.com</a></p>		<p>Key users</p> <p style="text-align: center;">Cardiff and Vale NHS Trust</p>	
			

<b>83</b>	<b>Skin Cancer Monitoring</b>		
<p><b>Description</b></p> <p>High-resolution picture phones could be used to reassure people who are concerned about blemishes on their skin. Although the present generation of handsets do not have sufficient resolution to support anything other than basic applications, experiments have been conducted using conventional digital cameras set up in public areas and linked to remote test laboratories. The technology makes test facilities more accessible to the general public.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.telemedco.com">www.telemedco.com</a></p>		<p>Key users</p> <p style="text-align: center;">Basha Food Stores</p>	
			

<b>84</b>	<b>Remote Consultation (Telemedicine)</b>		
<p><b>Description</b></p> <p>Public anytime, anywhere, independent, impartial advice of a qualified GMC registered medical doctor can be supported by 3G mobile phone devices. The application could provide a flexible and cost effective alternative to a visit to a GP's surgery</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.3gdoctor.com">www.3gdoctor.com</a></p>		<p>Key users</p>	
			

<b>85</b>	<b>Data Collection From Capsule Endoscopes</b>	
<p><b>Description</b></p> <p>The capsule endoscope is based around a camera embedded in a capsule that is swallowed by the patient. As the device passes through the patient's gut system images are transmitted to an array of sensors attached to the patient's body.</p> <p>The technology is particularly useful in applications where examination with a conventional endoscope is difficult or disruptive – for example the examination of the small intestine.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.givenimaging.com">www.givenimaging.com</a></p>	<p>Key users</p> <p style="text-align: center;">Over 65,000 patient examinations to date</p>	

<b>86</b>	<b>Conventional Endoscopes</b>	
<p><b>Description</b></p> <p>Conventional endoscopes can be fitted to a number of PDAs and picture phones, for example the Nokia 6600. Advances in CCD technology have radically reduced the cost of endoscopes to the point where they can almost be regarded as disposable. This means domiciliary workers and dental surgeons could use a mobile device as a relatively low cost means of carrying out examinations and capturing images for inclusion in a electronic patient record database.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.schoelly.de">www.schoelly.de</a></p>	<p>Key users</p>	

<b>87</b>	<b>Nutrition Coaching</b>	
<p><b>Description</b></p> <p>A nutrition-coaching application uses a camera-phone as part of a personalised dietary advice service. The user takes a take picture of the food they are eating, the images are sent automatically to the user's registered dietician who sends back advice about the nutritional content of the food and its suitability as part of the user's diet.</p>		
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.myfoodphone.com">www.myfoodphone.com</a></p>	<p>Key users</p>	

<b>88</b>	<b>Monitoring Wound Healing</b>	
<p><b>Description</b></p> <p>Doctors have used phone photos to assess and treat some patients, saving those patients the trouble and cost of transport to the clinic.</p> <p>Two normal-light images of leg ulcers were captured with a standard camera cell phone and transmitted by e-mail to two consulting physicians who assessed the patient's condition.</p>		
Key vendors	Key users University Hospital of Geneva	

<b>89</b>	<b>Support For Neurosurgeons</b>	
<p><b>Description</b></p> <p>Photograph of X-rays could be taken using a picture phone and to sent to a consultant via MMS. The system would provide prompter decisions to be made in medical emergencies and would support the involvement of external specialists in the diagnosis.</p>		
Key vendors <a href="http://www.vodafone.com">www.vodafone.com</a>	Key users Rotenburg Hospital's Neurosurgery Clinic	

<b>90</b>	<b>Breast Cancer Screening</b>	
<p><b>Description</b></p> <p>A team of researchers is developing a new test to detect breast cancer at an early stage. If successful, this test will be effective for women of all ages.</p> <p>The test, which utilises an innovative radar system, will enable women to be tested regularly without the fear of over-exposure to radiation.</p>		
Key vendors	Key users Bristol University, UK	

<b>91</b>	<b>Context Sensitive Medicine</b>			
<p><b>Description</b></p> <p>Wireless technology is being used to create "smart" clinical spaces and systems that support context-sensitive medicine. This means the time and position of interactions between the patient and the clinicians are continually logged with the view to detecting errors and anomalies before the patient comes to harm – for example due to the wrong medicine being administered or an incorrect procedure being carried out. The system can also be use to create billing data and to monitor costs.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.radianse.com">www.radianse.com</a></p>		<p>Key users</p> <p style="text-align: center;">Massachusetts General Hospital</p>		

<b>92</b>	<b>Disease Monitoring</b>			
<p><b>Description</b></p> <p>The information collected by mobile phone based telemedicine systems could be used to monitor the outbreak of SARS, Avian A Influenza (Bird Flu) or other public health threats. Not only would it be possible to use intelligent agents to search for signs of a public health threat but the international nature of mobile services mean that it would be possible to monitor global threats to public health.</p>				
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.medday.com">www.medday.com</a></p>		<p>Key users</p> <p style="text-align: center;">Beijing Xuanwu Hospital</p>		

<b>93</b>	<b>Food Contamination Alerts</b>			
<p><b>Description</b></p> <p>At present the broadcast and print media are the main channels for alerting the public and retailers to the presence of contaminated products in the food supply chain. Sometimes the alert generates panic or hysteria. A service that sent out alerts to mobile phones could provide clear and timely information that would enable retailers and consumers to return the relevant products to the manufacturer.</p>				
<p>Key vendors</p>		<p>Key users</p>		

<b>94</b>	<b>Environmental Contamination Alerts</b>	
<p><b>Description</b></p> <p>Using GPS and satellite technology it is possible to send location specific information on air quality to vulnerable individuals (such as people suffering from asthma, chronic respiratory diseases and heart disease) via mobile phone text messages.</p>		
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.cerc.co.uk">www.cerc.co.uk</a></p>	<p><b>Key users</b></p> <p style="text-align: center;">London Borough of Croydon</p>	

<b>95</b>	<b>Mobile MRSA Detector</b>	
<p><b>Description</b></p> <p>Current detection of MRSA depends on sending bacteriological specimens for testing. This is a time consuming, labour intensive and expensive. A wireless enabled device that could analyse specimens at the patient's bedside and confirm the presence or absence of the infection would provide more rapid results and allow healthcare providers to take immediate action to stop the infection spreading.</p>		
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.medicalmicrosystems.co.uk">www.medicalmicrosystems.co.uk</a></p>	<p><b>Key users</b></p>	

<b>96</b>	<b>Telecare In Rural Areas</b>	
<p><b>Description</b></p> <p>Due to a lack of public transport in rural areas it is not always possible for patients in remote communities to visit their GP for follow up appointments or to receive advice regarding minor ailments. Mobile networks have been identified as one means of delivering basic healthcare services in such areas.</p>		
<p><b>Key vendors</b></p> <p style="text-align: center;"><a href="http://www.cocam.com">www.cocam.com</a> <a href="http://www.tunstallgroup.com">www.tunstallgroup.com</a></p>	<p><b>Key users</b></p>	

<b>97</b>	<b>Telecare In Developing Countries</b>		
<p><b>Description</b></p> <p>Developing countries are often poorly served by fixed line telecommunications infrastructure and the best way of delivering ehealth services is via a combination of satellite and mobile communication.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.wideray.com">www.wideray.com</a></p>		<p>Key users</p> <p style="text-align: center;">Healthnet Uganda</p>	
			

<b>98</b>	<b>A&amp;E Field Support</b>		
<p><b>Description</b></p> <p>Mobile phones could become life-saving devices. Bluetooth-enabled mobile phones could be used as relay hubs for transmission of data acquired from physiological sensors. Wireless would be used both to acquire medical data from a person in the field and to forward that data via GSM or GPRS to a central control unit.</p>			
<p>Key vendors</p> <p style="text-align: center;"><a href="http://www.cyberfab.net">www.cyberfab.net</a> <a href="http://www.xbernavt.com">www.xbernavt.com</a></p>		<p>Key users</p>	
			

<b>99</b>	<b>Wireless Stethoscope</b>		
<p><b>Description</b></p> <p>A wireless stethoscope would support analysis of auscultation data on a PDA or smart phone and this data to be made available to diagnostic tools or added to the patient's electronic medical records. The device could also be sold directly to the patient who could use it as part of a self-diagnosis service.</p>			
<p>Key vendors</p>		<p>Key users</p>	
			

<b>100</b>	<b>Support For Aids Sufferers</b>		
<p><b>Description</b></p> <p>A freestanding kiosk measures blood pressure, heart rate, weight and Body Mass Index, as well as conducts overall health screenings. HIV/AIDS outreach programs can place these kiosks in non-threatening, non-clinical settings such as restaurants, subways and drugstores and encourage patients to monitor their health.</p>			
<p>Key vendors</p> <p><a href="http://www.computerized-screening.com">www.computerized-screening.com</a></p>		<p>Key users</p>	
			

<b>101</b>	<b>Call Centre Supported Health Services</b>		
<p><b>Description</b></p> <p>A number of companies are now offering call centre based medical information and monitoring services. In the future, assuming regulatory obstacles can be overcome, these services will be delivered to mobile subscribers from countries where labour costs are low. As these call centres are located in different time zones than the subscriber, services will be available 24 hours per day.</p>			
<p>Key vendors</p> <p><a href="http://www.shl-telemedicine.com">www.shl-telemedicine.com</a></p>		<p>Key users</p>	
			

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