

Table 1

Potential eHealth areas and issues considered at the outset of the project

What issues currently dominate eHealth? What is going on in eHealth?			What emerging technologies are likely to impact on health care?	How does research inform eHealth?	How do developments in eHealth inform research?
Professional Clinical Informatics - Decision aids for practitioners (eg, prompts, reminders, care pathways, guidelines) - Clinical management tools (eg, electronic health records [EHRs/EPRs], audit tools) - Educational aids (guidelines, medical teaching) - Electronic clinical communications tools (eg, e-referral, e-booking, e-discharge correspondence, clinical email/second	Electronic Patient/Health Records (EPR, EHR) - Electronic medical records. Record linkage. The Universal Patient Indicator. Databases and population registers. - Achieving multiprofessional access. Technical and ethical issues. - Data protection/security issues - Patient access and control - Integration with other services (eg, social work, police) - Clinical coding issues	Consumer Health Informatics - Decision aids for patients facing difficult choices (eg, genetic screening) - Information on the web and/or digital TV (public information and educational tools for specific clinical groups) - Clinician-patient communication tools: 1. Remote: Clinical email and web-based messaging systems for consultation, disease monitoring, service-oriented tasks (eg, appointment booking, prescription reordering). 2. Proximal: Shared decision making tools, informed consent aids 3. Mixed: On-line	New Technologies - Satellite communications (eg, for remote medicine) - Wireless networks (eg, within hospitals, across geographical areas) - Palmtop technologies (for information, for records) - New mobile telephones - Digital TV (for disseminating health information & communicating with patients) - The WWW and it's applications for health (issues: quality control, confidentiality, access) NHS-Direct etc. - Virtual reality (eg, remote/transcontinental	Research Input - Development - Need for user involvement in product conception, design and testing. Iterative development. Needs assessment, accessibility and usability research. Multi-faceted expertise required. - Implementation – Understanding people and organizational factors eg, system acceptability, resistance to change etc. Use of tailored implementation strategies. - Innovative methods for mapping functional and technology needs eg, place of systems in the organization - Knowledge management, systems approaches, communication networks	Research Outcomes - Potential of electronic databases such as population registers for epidemiological research. - Research into the impact or use of informatics tools suggests appropriate and cost-effective priorities for policymakers. - Areas of cross-over (eg, bioin

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opinion, laboratory test requesting/results reporting, e-shared care) - Electronic networks (NHS-Net and disease-specific clinical networking systems) - Discipline/disease-specific tools (eg, diabetes informatics) - Telemedicine applications (for interprofessional communication, patient communication and remote consultation) - Subfields eg, nursing & primary care informatics)	(terminologies, etc) Healthcare Business Management - Billing and tracking systems - Audit & quality assessment systems	screening tools (eg, for depression) and therapeutic interventions (eg, cognitive behaviour therapy) - Access and equity issues (data protection issues, the Digital Divide) - Quality issues for health information on the net - “virtual” health communities	surgery) - Nanotechnology - Intersection of bioinformatics and health informatics.	models, organizational development to map pathways. - Evaluation Formative, as above, also: Outcome assessment to establish impact of new systems on clinical outcomes, processes and costs.)	

Definitions of eHealth identified from searching databases of scientific abstracts and wider Web-based information sources J Med Internet Res. 2005 Jan–Mar; 7(1): e9.

Definition	Source	Date	Technologies Specified	Applications Specified	Stakeholder Focus(and Other Concepts)
1) “e-Health is a consumer-centred model of health care where stakeholders collaborate, utilizing ICTs, including Internet technologies to manage health, arrange, deliver and account for care, and manage the health care system”	Alvarez [13], based on Ontario Hospital e-health Council [14]	2002 (2002)	ICTs including Internet	General: manage health, arrange, deliver and account for care, and manage the health care system	Consumer centered but also emphasizes collaboration with providers
2) “Healthcare delivery is being transformed by advances in e-health and by the empowered, computer-literate public. Ready to become partners in their own health and to take advantage of online processes, health portals, and physician web pages and e-mail, this new breed of consumer is slowly redefining the physician/patient relationship. Such changes can effect positive results like improved clinical decision-making, increased efficiency, and strengthened communication between physicians and patients.”	Ball and Lillis [15]	2001	Internet online processes, health portals, physician en-pages, email.	General: healthcare delivery	Consumers (Change. Citizen empowerment. Physician/patient relationship/ communication. Improved clinical decision making, efficiency)
3) “The "e-health" era is nothing less than the digital transformation of the	Coile [16]	2000	Internet	The practice of medicine as well as	Consumers and providers (Change. New frontiers.

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practice of medicine, as well as the business side of the health industry.... The Internet is the next frontier of health care. Health care consumers are flooding into cyberspace, and an Internet-based industry of health information providers is springing up to serve them. Internet technology may rank with antibiotics, genetics, and computers as among the most important changes for medical care delivery.”				the business side of the health industry	Transformation of medical practice.)
4) “E-health—any electronic exchange of healthcare data or information across organizations—reflects an industry in transition.... The Internet clearly drives the development and adoption of e-health applications; standing alone, it has the reach, the infrastructure, and the acceptance to achieve widespread change.”	DeLuca and Enmark [17]	2000	Internet	Electronic exchange of healthcare data or information across organizations	Not specified. Implies focus on professional & organizational levels (Change)
5) "a new term needed to describe the combined use of electronic communication and information technology in the health sector... the use in the health sector of digital data - transmitted, stored and retrieved electronically - for clinical, educational and administrative purposes, both at the local site and at distance"	Della Mea [18], based on Mitchell [19]	2001 [1999]	Combined use of electronic communication in and IT in the health sector. Digital data transfer	Transmission of digital data locally and across distances, for clinical, educational and administrative purposes	Professionals and organizations

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6) “e-health is the use of emerging information and communication technology, especially the Internet, to improve or enable health and healthcare.”	Eng [20], based on Eng [21]	2004 [2001]	Emerging ICTs, especially the Internet	General: To improve or enable health and health care	Not specified but implies consumers and providers
7) “e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.”	Eysenbach [22]	2001	Broad definition encompassing many aspects of health informatics but focusing on the Internet and related technologies	Delivery of health services and information	Not specified. Implies consumers and providers. (“a state of mind, a way of thinking, an attitude and commitment for networked, global thinking to improve healthcare...”)
8) “Many of the major forces of change impacting health care today have technological underpinnings, and many of the less desirable impacts may have technological solutions. Two related technological forces are transacting business, online (e-business) and delivering health care online (e-health).”	Ellis and Schonfeld [23]	2001	Internet	General: Delivering healthcare	“Delivering” implies focus on professionals (Change. Relationship between eHealth and eBusiness)
9) “ehealth includes use of the internet or	Gustafson and	2004	Internet or other	Dissemination of	Implies consumers

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other electronic media to disseminate health related information or services.”	Wyatt [24]		electronic media	health related information or services	
10) “As a special expression of e-business in the health service the sphere of e-health has developed in recent years which increasingly manifests itself in the internet via health portals. Next to the transmitting of medical contents, the offer of community functions and the trading with goods from the medical sector, these health portals now increasingly provide advisory services for citizens by medical experts.”	Khorrami [25]	2002	Increasingly manifests itself in the Internet via health portals.	e-business Heath advice. Information exchange. Community functions. Advisory services for citizens	Consumers Healthcare organizations
11) “e-Health (use of interactive communication and information technologies to engage in health-related activities) includes not only telehealth-related media and telecommunications but also a wide array of consumer and healthcare provider activities that use the Internet.”	Maddox [26]	2002	Interactive ICT, telehealth, internet etc	General: health-related activities	Consumer and healthcare provider
12) “ ...technologies with practical applications that have the potential to improve both quality of and access to healthcare....Telemedicine, Health Information Systems, Databases, Genomics, Biotechnology, eLearning,	McConnell [27]	2002	Wide range of digital technologies	Wide range of informatics applications that may contribute to improved quality of and access to	Providers and patients (Quality. Access. “Disruptive technologies”)

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Continuing Professional Development, Nanotechnology, Drug Treatment Technologies, Decision Making Tools, Diagnostic Aids, eLibraries, Laboratory tools, and Robotics are all innovative or 'disruptive' technologies that promise a better health for our children.”				healthcare	
13) “e-Health offers the rich potential of supplementing traditional delivery of services and channels of communication in ways that extend the healthcare organization's ability to meet the needs of its patients. Benefits include enhanced access to information and resources, empowerment of patients to make informed healthcare decisions, streamlined organizational processes and transactions, and improved quality, value, and patient satisfaction.”	Nazi [28]	2003	Not specified	Delivery of services Communication. Access to information and resources.	Patients (empowerment, satisfaction) Organization (efficiency and quality)
14) “the use of the Internet for health purposes”	Provost et al [29]	2003	Internet	General: “Health purposes”	Any
15) "a means of applying new low cost electronic technologies, such as 'web enabled' transactions, advanced networks and new design approaches, to healthcare delivery. In practice, it implies not only the application of new technologies, but also a fundamental re-	Richardson [30] , based on Silicon Bridge [31]	2003 [2001]	Internet New low-cost electronic technologies such as “web enabled” transactions and advanced networks”	General: “Healthcare delivery” Electronic communication and computer-based support at all levels	‘Healthcare delivery [and] processes' implies organizational/ professional level (“...a way of working”)

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thinking of healthcare processes based on using electronic communication and computer-based support at all levels and for all functions both within the healthcare service itself and in its dealings with outside suppliers. eHealth is a term which implies a way of working rather than a specific technology or application".				and for all functions	
16) "The healthcare industry's component of business over the internet."	Blutt [32]	2001	Internet	Business	Implies organizations
17) "The application of the Internet and other related technologies in the healthcare industry to improve the access, efficiency, effectiveness, and quality of clinical and business processes utilized by healthcare organizations, practitioners, patients, and consumers to improve the health status of patients."	Broderick and Smaltz [33]	2003	Internet and related technologies	Improvement of access, efficiency, effectiveness and quality of clinical and business processes	Organizations, practitioners, patients, consumers
18) "eHealth includes the development, application and implementation of technology to improve effectiveness in healthcare. But it also includes getting it out there wherever it's needed in the service and making it happen across the service. It includes the use of telemedicine and clinical systems used	Chisholm [34]	2003	Technology	Telemedicine Clinical systems for diagnosis and care pathways Policies and protocols	Not specified, but implies organizational/professional focus (Importance of organizational and professional behaviour change recognized. Also confidentiality and security

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for diagnosis and care pathways. We also apply the term to the policies and protocols that assure the confidentiality and security of sensitive data. Most of all it includes those aspects that support major change of working practice - training, support and Organisational Development.”					issues.)
19) “...using Information and Communications Technologies to ensure the right treatment to each patient, specialised to each individual's context and situation, and to deliver healthcare where patients and providers need not be in the same place at the same time.	CSIRO [35]	Un-dated	ICTs	Delivery of personalized patient care. Telemedicine implied	Not specified. Implies provider focus but also interaction with patients
20) "Put simply, e-health is a wide-ranging area of social policy that uses new media technologies to deliver both new and existing health outcomes. In the UK, it incorporates everything from NHS Direct online to Internet pharmacies to webcast operations involving consultants in another country...At the moment, the main focus of e-health is on patient empowerment and self-care. As the area develops, e-health could expand to include online long-term disease management, personalised health checks, and more	GJW Government Relations Ltd [36]	2000	New media technologies	On-line health information Long-term disease management and patient self-care Telemedicine	Patients and professionals (Patients emphasized)

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efficient primary care services due to informed patients accessing the healthcare system at the most appropriate point."					
21) "something to do with computers, people, and health"(Centre for Global e-Health Innovation, 2003)	Gustafson [37]	2003	Computers in general	Very broad – computers, people and health	Implies all stakeholders
22) "the application of information and communication technologies (ICT) across the whole range of functions which, one way or another, affect the health of citizens and patients."	European Commission [38]	2003	ICTs	Broad – the whole range of functions which, in one way or another, affect the health of citizens and patients	All stakeholders. Providers, patients, citizens.
23) "the emerging world of e-health can be defined as the application of information, communication and video technologies to the delivery of timely, professional and safe healthcare."	European Health Telematics Association [39]	2004	ICT and video technologies	Broad – delivery of timely, professional and safe care	Not specified. Implies professional perspective.
24) "the use of emerging interactive technologies (i.e., Internet, interactive TV, interactive voice response systems, kiosks, personal digital assistants, CD-ROMs, DVD-ROMs) to enable health improvement and health care services. For this Initiative, these technologies should focus primarily on health behavior change and chronic disease	Health e-Technol-ogies Initiative [40]	2002	Emerging interactive technologies (Internet, interactive TV, interactive voice response systems, kiosks, personal digital assistants, CD-ROMs, DVD)	Enabling health improvement and health care services, chronic disease management, health behaviour change	Consumers, patients

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management for consumers/patients.”					
25) “the use of ICT to support and improve healthcare”	Hoving et al [41]	2002	ICT	General: support and improve health care	Not specified.
26) "eHealth means taking the most recent developments in computer and networking technology, and applying it to the problems facing the healthcare community in all its forms - eHealth is the endeavour to produce reliable, easy-to-use, highly-automated, accurate systems, so that health care professionals can spend less time and resources on finalising the paperwork, and more time doing what they do best - taking care of people's health!"	IBA eHealth [42]	Un-dated	Recent developments in computer and networking technology	General: Applying it to the problems facing the healthcare community in all its forms Specific: administrative and clinical information to improve efficiency	Professionals (improved efficiency)
27) “The "e" is for electronic. Placed before the word health, it implies all things transmitted and technological in health care, which help improve the flow of information and the process of health care delivery. "E" networks integrate isolated towers of information and create new knowledge through the creation of relational databases. The spectrum of "E" is broad and goes beyond the use of a computer as a box on the desktop. It includes wireless communication using hand-held devices and the storage and	Marcus and Fabius [43]	Un-dated	Electronic networks, relational databases. Wireless communication.	All things transmitted and technological in health care, which help improve the flow of information and the process of health care delivery Electronic care delivery (telemedicine) Sound and image	Not specified Connectivity; communication, interactivity, intervention

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function by the microchip which is revolutionizing health care, as it is inserted into everything we use to diagnose, treat, record, sort, analyze, and conclude. It also incorporates electronic forms of care delivery, such as telemedicine, providing health care over a distance, communicating by sound and image transmission. E-health is connectivity; it is transactional; it is clinical. It is informational, interactive and interventional.”				transmission	
28) "the health services organisation and societal approach to health and health services which result from the introduction of, and increasing access to, new digital technologies: including the Internet, other computerised networks and tele- or distant health care facilitated by new digital technologies".	NHS SDO Programme [44]	2002	New digital technologies Internet Other computerized networks Telemedicine	Health service organization “Societal functions”	Organizations Society (citizens)
29) “More commonly known as “eHealth”, the headings of Telemedicine and Telecare are themselves subsumed under the framework category of "health informatics", which basically means the delivery of healthcare and medical knowledge through the application of advanced information and computer technologies.”	NHS Wales [45]	2003	Advanced information and computer technologies	Telemedicine and Telecare.	Not specified. (Identified eHealth with telemedicine)

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30) “The big difference between yesterday's knowledge-based patient care and that of tomorrow is a fundamental premise that patients will explore the web world with a desire to learn more about their condition, including its treatment and prognosis. This has evolved into the concept of e-health”	Podichetty and Biscup [46]	2003	Internet	Patient information and decision support	Patients (Cultural shift to patient participation/ empowerment in health care)
31) “eHealth signifies a concerted effort undertaken by some leaders in healthcare and hi-tech industries to harness the benefits available through convergence of the internet and healthcare...”	Rx2000 Institute [47]	Un-dated	Internet	None specified	Not specified. Implies organizations (Harnessing benefits of converging internet and healthcare)
32) “eHealth describes the application of information and communications technologies (ICT) across the whole range of functions that help health. It is the means to deliver responsive healthcare tailored to the needs of the citizen.”	Silber [48]	2003	ICTs	Broad – the whole range of functions that help health	Citizens (consumers, patients, public)
33) “E-health is a new term used to describe the combined use of electronic communication and information technology in the health sector OR is the use, in the health sector, of digital data-transmitted, stored and retrieved electronically-for clinical, educational	WHO [49]	Un-dated	ICTs Digital data	Clinical, educational and administrative purposes, at the local site and at a distance	Organizations/professionals

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and administrative purposes, both at the local site and at a distance.”					
34) “Using the internet and other electronic media to disseminate or provide access to health & lifestyle information or services”	Wyatt [50]	2003	Internet and other electronic media	Access to health and lifestyle information or services	Patients, public
35) “e-Health refers to all forms of electronic healthcare delivered over the Internet, ranging from informational, educational and commercial "products" to direct services offered by professionals, non-professionals, businesses or consumers themselves. e-Health includes a wide variety of the clinical activities that have traditionally characterized telehealth, but delivered through the Internet. Simply stated, e-Health is making health care more efficient, while allowing patients and professionals to do the previously impossible.”	Wysocki [51]	2001	Internet	Delivery of informational, educational and commercial "products" Direct delivery of services Clinical activities traditionally characterized telehealth	Professionals, consumers, businesses (Making health care more efficient, while allowing patients and professionals to do the previously impossible)
36) “E-health is a very broad term that encompasses many different activities related to the use of the Internet for healthcare. Many of these activities have focused on administrative functions such as claims processing or records storage. However, there is an increasing use of e-	American Telemedicine Association [52]	2001	Internet	Administrative functions, patient and clinical care	Not specified. Implies organizational and professional focus (increasing use of eHealth for patient and

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health related to patient and clinical care.”					