Informatics for Healthcare Systems

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Introduction

This chapter explores the role of Informatics in managing healthcare systems, with particular emphasis on innovation and future trends. It begins with definitions of Health Informatics as an academic discipline and emerging profession. The approach to Informatics is led by health problems rather than technologies or organisations, and this is set as the direction of translational thinking that healthcare managers should take when dealing with information and communications technologies. Subsequent sections take a journey from the maintenance of wellbeing to specialist healthcare, and consider the information systems requirements at each stage. The chapter then brings together different systems in creating a population-wide picture of health and healthcare to enable well-informed management of the whole system.
The concluding part demonstrates the need for perpetual innovation of both Informatics and healthcare systems, in a tightly coupled and sometimes disruptive way.

**Definitions of Health Informatics**

The term “Informatics” is variably used to describe academic disciplines and professions, usually specified to a domain of application, such as Health Informatics or Business Informatics (Wikipedia, 2011a). The academic diaspora of Informatics has one thing in common across different domains – namely that it brings technically focused science and engineering together with research that is focused on human factors. This union of approaches has common purpose to inform discovery and decision making in any given field. Information systems are common to all fields of Informatics, but the balance between technical and human focus varies. To emphasise the importance of human factors the term “eHealth” is sometimes used interchangeably with Health Informatics (Wikipedia, 2011b).

Definitions and terms for Health Informatics vary. Broadly, Health Informatics comprises the knowledge, skills and tools which enable information to be collected, managed, used and shared safely to support the delivery of healthcare and promote health (UK Council for Health Informatics Professions, 2011). The International Medical Informatics Association pulls the various threads together and organises a four yearly conference “Medinfo”.

The professionalization of some Informatics specialities has arisen from the spread of information systems into most business processes. In order to manage the risks and opportunities posed by modern information systems, which are too complex to be addressed properly without specialist knowledge, it is necessary to set professional standards. The
Health Informatics profession is emerging. In the UK for example, the Council for Health Informatics Professions was formed in 2002, but registration is still voluntary (UK Council for Health Informatics Professions, 2011). Healthcare systems around the world are exploring various levels of Informatics competence for 1) all health professionals; 2) specialist Health Informaticians. In the US and parts of continental Europe there are career paths, with recognised specialist qualifications, for people intending to manage information systems in clinical settings – some of these paths are open to clinicians and form clinical sub-specialities. It is interesting to note that in the UK, where there is no clinical career path in Informatics and there has been the world’s largest healthcare IT programme, that the technical infrastructure produced by the programme was found to be largely successful (Payne, Detmer, Wyatt, & Buchan, 2011) while the clinical application was poor (Hendy et al., 2005; Robertson et. al. 2010). It could be argued that any large healthcare organisation should have a Board member capable of translating healthcare needs into Informatics requirements.

Translational Informatics Thinking for Healthcare Management

Informatics concerns information systems, which in turn comprise people, organisations and technologies. The most challenging part of developing health information systems is overcoming cultural, political and organisational barriers – the engineering is more predictable (Coiera, 2009). It is therefore wise for healthcare managers to take a problem-oriented approach to Informatics, prioritised by the potential public health gain from informing specific aspects of healthcare systems. In addition, information technologies can uniquely help make collective decision-making greater than its sum of parts. So those managing healthcare should always keep Informatics in mind as a way of coordinating care
and understanding the whole system. Proactive healthcare managers will ensure that their Informatics and clinical teams are thinking ahead about requirements for information systems. More often there is a reactive approach, with boards being asked to approve business cases for expensive technology written by IT managers.

This chapter takes a translational approach, from health-problems to information systems, and encourages general managers to do the same in any healthcare organisation. This approach can be taken for all aspects of the health of a defined population, from maintenance of wellbeing to end-of-life care. The need for a problem-oriented approach is illustrated by considering the problem of tackling the obesity epidemic (Roux, & Donaldson, 2004) and avoiding of acute escalations of long-term conditions (Purdy, 2010). Both of these are priority areas in many healthcare systems in terms of reducing costs and suffering. Maintenance of a healthy body weight is common to both problems, and information systems might be used to help control body weight (Gibbons et al. 2009). An organisation-centred approach might consider the information systems requirements for the health promotion, diabetes, hypertension, rheumatology etc. services separately. But there is an economy of scale in considering the Informatics for supporting a healthy weight for patients across these organisational units.

Translational Informatics thinking like this is common among those tackling information infrastructure problems such as appointment booking systems, but it is uncommon among those in a position to drive healthcare innovation through informatics. Such innovation is where informatics has the greatest potential to improve healthcare systems. General managers have oversight of this translation and need to make sure it happens proactively.
A common need for innovation is to improve the coordination of care between healthcare organisations, with relevant information following the patient/citizen. In order to translate information needs across organisational boundaries we will consider the citizen’s journey from maintaining wellbeing to receiving care for multiple conditions. Figure 1 illustrates this journey and shows the personal health record as the single common information system.

Figure 1: Convergence of different healthcare organisations on the personal health record, linking healthcare and wellbeing sectors as ‘Pre-primary’ Care.

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**Citizen-led wellbeing and ‘pre-primary’ care**

Reviews of the affordability of healthcare in society consistently emphasise the lack of sustainability (Medearis, & Hishow, 2010), and the need for more prevention (Wanless, Appleby, Harrison, & Patel, 2007). In the Unites States, some Health Maintenance
Organisations actively engage with their clients over managing health risks such as obesity, as part of a contractual obligation of the insured person to make best efforts to maintain their health (Steinbrook, 2006). In some cultures, such as Singapore, social programmes almost mandate citizens to tackle their own health risks (Toh, Cutter, & Chew, 2002). In more liberal nations with state-funded healthcare, such as the UK, there is a tension over avoiding ‘nanny state’ approaches to the public health vs. meeting the escalating costs of healthcare (Department of Health, 2010). Irrespective of the political or organisational issues, the daily choices an individual makes, which may affect their health, are becoming easier to collate through networked data sources about transactions, and through mobile technologies.

The recent emergence of mobile or ‘m’ health as a sub-speciality of Health Informatics or eHealth emphasises the importance of mobile technologies in linking the consumer healthcare and wellbeing market with clinical healthcare (Wikipedia, 2011c). Consider the position and motion sensing capability of the latest mobile phones – this can be harnessed to track an individual’s unstructured physical activity. In addition, a local network connection between the mobile phone and gym equipment might record structured physical activity. It is likely to be attractive to the individual citizen to be at the centre of information systems that ‘persuade’ them into greater wellbeing – thus there is a case for developing this kind of health promotion in the wellbeing market. But the same technologies might also be used to monitor physical activity as part of a healthcare contract with an insurer or state healthcare organisation. There is room for experimentation to develop the most safe, effective, efficient and acceptable means of health promotion through mobile technologies. The balance between consumer freedom and responsibility will vary from culture to culture but the information opens up a new interface with primary healthcare in general.
Given a growing wellbeing market and the emergence of on-line personal health records, healthcare information will start to accumulate at much earlier stages of disease than is the case with present medical records. This creates an opportunity for primary care to reach ‘upstream’ in its preventive activities, engaging with individuals who have mounting health risks apparent in their personal health records, but who might not otherwise seek primary care. The extended reach might be called ‘pre-primary’ care. Furthermore an individual who elects to share their health information with a trusted primary care professional might find that the act of sharing adds to the motivation they need, for example to take more exercise. So, pre-primary care might become an important vehicle for targeting primary care resources.

The following potential future scenario illustrates pre-primary care: Mr Smith is a 43 year old overweight man with a sedentary job, and he is an ex-smoker with is family history of myocardial infarction under age 65. His blood pressure and lipid profiles were in a slightly raised risk zone when he saw his GP three years ago, and he would like to be able to find the motivation to reduce his risk of a heart attack. His wife bought him a motion and position tracking wrist watch for his birthday to encourage him to exercise. The device required him to register with the company’s website and create a profile. From his profile he had the option to connect with social networks such as Facebook to get support from his friends. There was also a link to a general personal health record (PHR) system, where he decided to create a profile. His primary care organisation had an agreement with the PHR provider to advertise a linkage scheme between medical records and PHRs. So he made an appointment with his GP and arranged for the records to be linked. Mr Smith and his GP discussed cardiovascular risk reduction strategies. Scenarios of lifestyle change vs. risk were available for Mr Smith to reflect via his PHR on the Web following the consultation. The act of sharing his physical activity achievements with his friends and GP motivated Mr Smith to keep taking regular
exercise. The treatment for high blood pressure that had been considered at the first consultation was no longer necessary after three months of regular exercise. The primary care organisation had engaged actively in health promotion with a person who, in times before the PHR and connected devices, might not otherwise have presented until they had symptomatic disease. First contact in this case had been made by the consumer of a wellbeing product. First contact might otherwise be made by the healthcare provider running population based cardiovascular screening for the over forties. Both of these approaches are pre-primary care.

**Patient co-produced primary care information**

As patients engage with primary care there is a need for information to: 1) support the decision whether or not to seek primary care; 2) provide the primary care professional with all relevant information; and 3) maximise the concordance with treatment. The Informatics focus in this area since the mid-90s has been on the quality of medical information available to the public via Internet (Eysenbach, & Diepgen, 1998), and on triage services such as algorithm-driven telephone and Web-based help-lines like NHS Direct (Bunn, Byrne, & Kendall, 2005). Such initiatives assume that individuals will 1) seek the information issued by the main healthcare provider; and 2) act on high quality information predictably. Neither of these assumptions may hold true.

With the advent of personal health records (Tang *et. al.* 2006) there is an opportunity to engage with patients over the information they are bought into rather than the information that is being offered to them. Consider the individual who has a health record that is linked to sources of advice over managing illness – it is easier for the healthcare provider’s information system to give personalised advice with this kind of system than via Web search engines,
which lack contextual information about the individual, and which have a multitude of competing websites that may drown out the most relevant one. In addition to reducing unnecessary clinical appointments, personal health records could considerably improve the exchange of information during and around the clinical encounter.

Early initiatives to open up primary care records to patients are proving popular with patients – where patients can add information to records, the majority choose to do so (Hannan, & Fitton, 2011). Thus there is an opportunity to engage with patients as co-producers of primary care (information). This might be another vehicle for encouraging individuals to take a more active part in their own healthcare. A by-product of the co-produced healthcare record might be an increase in knowledge about medical interventions ‘in the wild’, outside the rarefied environments of clinical trials – the results of trials predicting as little as a quarter of what will happen to a patient given the treatment in question (Fortin et. al. 2006). An example of a potentially important missing signal might be a daily quality of life score filled in by the patient as part of their ‘contract’ in being prescribed a course of antibiotics. The current signal from medical records that a patient has or has not tolerated therapy is much less detailed, often missing and subject to multiple biases – i.e. unusable. Mobile technologies connected to personal health records could further enhance the capture of new signals about responses to treatment. Indeed the aspiration of “personalised medicine”, usually discussed in the context of genomics, depends on more accurate and detailed capture of personal health information. The same information is likely to be important for targeting primary care resources.

Co-production of care through a shared record is illustrated in the following potential future scenario: Mr Jones is a 53 year old woman with a ten year history of rheumatoid arthritis,
requiring occasional hospital admissions during flare-ups. She has also been treated for clinical depression. Since the introduction of access to her care-records through a Personal Health Record (PHR) Mrs Jones has been able to share daily pain and quality of life scores with her care team. Both the specialist rheumatology services and primary care are able to see when Mrs Jones is running into problems and intervene early to help avoid hospital admission – which is particularly important for avoiding healthcare associated infection as Mrs Jones is immune-compromised by the treatment for her arthritis. In addition, she joined a social network of people with arthritis finding rewarding ways to increase physical activity, in spite of their disease, to offset the increased risk of cardiovascular diseases in rheumatoid arthritis and its treatment – she brought up this risk with her primary care team for the first time and discussed the management options. An Informatics researcher studying Mrs Jones’ experience of care before and after she took up the PHR found that she felt a greater sense of control over her own care, specifically the coordination between generalist and specialist care, which she felt was lacking previously.

**Informing self-care**

Given the patient, or the patient’s immediate carer, as an active co-producer of the healthcare record, the information systems that link patient/carer, professional and personal health records can provide a new vehicle for informing self-care. The Informatics of self-healthcare, however, is usually considered in respect of “information prescriptions”, telemedical consultations with patients, or monitoring physical parameters such as blood glucose in the community (Nijland et. al. 2008). In healthcare management terms there is a more subtle, and potentially more influential, Informatics phenomenon around the communication loop between patient, professional and information system:-
Consider the patient with schizophrenia in relation to community psychiatric nursing, primary care and inpatient psychiatric services. The cost to the patient and the healthcare service of relapse requiring inpatient admission is large. So the monitoring and adjustment of therapy in the community to prevent relapse is important. Patients respond best to such monitoring when they are actively involved (May et al. 2009). Information systems that send text messages to a patient’s mobile phone and analyse responses could help to detect when a patient is going off their medication and at risk of relapse, thus triggering self-adjustment of medication and enhanced contact with clinical services. Early results from studies of the use of text message loops between service user, care team and information system are showing reduced relapse in schizophrenia and bipolar disorder (Lewis. 2011; Merz, 2010).

A new form of healthcare organisation comprising patient, clinical service and algorithm/information system is emerging. This is effectively a triangle of information between patient, clinician and technology – more usually considered in the context of medical devices. Regulatory agencies are gradually catching up with this. For example EU Directive 2007/47/EC now classifies algorithms/software as medical devices if the information produced is used to support diagnostic or prognostic decisions (European Union. 2007). Consider the many software applications that are used to calculate risks such as the risk of a cardiovascular event within X years given a set of information about an individual’s characteristics. The risk-calculators in common use at present have not been validated as medical devices and are technically illegal in the EU now. There is a need to bring Informatics into the mainstream of healthcare management to maximise the benefits of such systems while managing the risks.
Coordinating care for patients with multiple conditions

With an aging population, improved care outcomes and the persistence of multiple disease risk factors such as obesity the number of people with multiple long-term conditions is set to rise (Nolte, & McKee, 2008). At the same time advances in medical knowledge have produced more interventions, and services have become more specialised. The increasing specialisation adds to the complexity of healthcare organisations with a greater number of organisational units and the need for coordination between them.

One mechanism for managing the quality of care of patients as they flow between generalist and specialist services, and between different health professions, has been the introduction of clinical guidelines and integrated care pathways (Kitchiner, Davidson, & Bundred, 1996). This has been informed by a branch of Health Informatics concerned with representing medical knowledge and supporting clinical decisions (Peleg, et. al. 2003). But there is a fundamental problem with condition-specific care pathways – namely a person with multiple conditions is not the sum of multiple specialist care pathways (Valderas, et. al, 2009). For example a patient with type 2 diabetes, chronic kidney disease, high blood pressure and coronary heart disease might have an over emphasis on control of blood sugar by diabetic services at the expense of increasing body weight pushing up blood pressure and making the kidney disease more difficult to control. At a simpler level, scheduling of blood tests in one visit rather than three would increase efficiency and convenience, and decrease the risk of healthcare associated infection. Informatics in sectors such as transport has developed workflow optimisation techniques that tackle challenges similar to coordinating healthcare for a person with multiple conditions. As care pathways are central to the body of knowledge
that defines clinical professions there is a need for more clinical engagement in Health Informatics if workflow is to be optimised within healthcare systems.

At a socio-technical level, the central Informatics problem for improving care for people with multiple conditions is the lack of interoperability of the knowledge of patients, generalist clinicians and specialist clinicians. Simply connecting all parties to a conventional medical record on-line will not solve this problem. Indeed, it has been argued that the natural evolution of the medical record will produce an avatar representation of a person’s health, with different personalities depending on who is interacting with it – in other words, neither like clinical case-notes nor the early attempts at personal health records (Buchan, Winn, & Bishop, 2009). Figure 2 illustrated this concept.
Figure 2: Envisioning a potential evolution of health records into health avatars underpinned by dynamic models, frequently updated data, and more useful complexity of healthcare knowledge.

It would be easy to get lost in the technical details here, and for managers to delegate the responsibility for this to a technical department. Instead, managers might usefully keep oversight and return frequently to ask how the evolving clinical information systems in their organisations are leading to a common understanding of care between patients, generalist clinicians and specialist clinicians. In part, the impetus may come from patients directly, as they become co-producers of health records shared with healthcare organisations. The danger is that a two-tier record may develop, one tier for health professionals, the other for patients, translating a paper-based barrier to communication into a digital barrier. The early signs of primary care record sharing are encouraging that this obstacle may be overcome sooner rather than later (Fisher, Fitton, Poirer, & Stables, 2007).

**Using Informatics to help manage health systems**

Improving the coordination of care for individuals across multiple parts of a healthcare system is effectively a generalisation of patient level Health Informatics to the population level. In other words, titrating healthcare resources to deliver maximum population health gain can be seen as a Public Health Informatics problem (Ainsworth, & Buchan, 2009). This area is usually the preserve of Management and Economics. In some countries, such as the UK however, the Public Health Service helps to inform healthcare resource allocation, adding an epidemiological perspective to the corporate and comparative approaches to healthcare needs assessment (Wright, Williams, & Wilkinson, 1998).
Management information for health systems usually focuses on strategy rather than tactics. For example the resource allocation decisions that are made infrequently may be supported by expensive reports while the subsequent implementation of services is barely monitored. Commissioners may return to examining this service in a cycle of say three years, therefore the oversight relies on summary evaluation covering long periods. Tactical management is under-informed in most health systems – this is particularly apparent when healthcare is compared with dynamically adapting sectors such as e-commerce.

Business intelligence solutions and “dashboards” are marketed to healthcare organisations as ways to produce more timely management information (Mettler, & Rohner, 2009). These information systems range from clinically oriented summaries of process or outcome across multiple care records to financially centred intelligence. All such systems are limited by: 1) the quality of the underpinning data; 2) the engagement of staff with the information. Typical databases of healthcare contacts are fraught with errors. For example, a clinician using the code for a heart attack may edit the code’s rubric with “MI r/o” meaning heart attack has been ruled out – so the dashboard may count this as an event that did not occur. Non-coded and miscoded clinical information is common. This problem will not be resolved until clinical and personal healthcare records have evolved to capture and check the relevant information at source. However, there are subsets of care data captured for clinical audit and performance management purposes that are important for benchmarking. Such information is most advanced where clinicians drive the comparisons at national scale – for example the publications on survival rates after heart surgery by the Society of Cardiothoracic Surgery of Great Britain and Ireland (Care Quality Commission, 2011). A different approach is commissioner/insurer-driven benchmarking, for example the “Spend and Outcomes” tools
from the English NHS where mortality and spend data are analysed leading to an
“information pack” for each locality with slides declaring for example “Bolton PCT has a
higher spend and worse outcome for CVD when compared to PCTs nationally” (NHS
Information Centre for Health and Social Care, 2011). Such benchmarking may fail to adjust
for factors such as case-mix differences or time-limited investments. In future there may be
more value in creating social networks of benchmarking clubs over live information than in
managing responses to intermittent publication of comparisons. The same principle applied to
intra-organisation benchmarking, say over rates of healthcare associated infections between
different wards of a hospital.

Given what is envisioned above about the evolution of medical records into dynamic,
interactive information systems co-produced with patients, there is a need to plan for adapting
services according to more detailed and contemporary assessments of the health needs of
populations. Even before such systems are developed there is a vast amount of unused
information about population health needs that could be produced now by linking and
analysing databases across health systems. The informatics challenge in providing this
information is not about linking databases, that is the easy part. The central challenge is one
of social computing – to generate collective insight across information silos such as finance,
public health, clinical quality improvement, service performance management etc. The
tipping point is more likely to be a cultural shift through increased visibility of actors than a
technical achievement of a certain quality of information.

Imagine Amazon-like (Amazon) prompts for clinical audit, whereby the information system
prompts the user with “…colleagues who selected the variables you have selected from the
audit system also selected these… …might they be relevant to your analysis?” Further,
imagine a needs-assessment for bariatric surgery services for population X, where instead of starting from scratch the analyst can search an information system for a template needs assessment conducted in population Y, populate it with data from population X, refine the methods, publish the template back and get professional development credits for sharing this knowledge. The bottle neck for generating population health intelligence is not the supply of data, nor is it the supply of methods for analysing the data. The enduring bottle neck is, and will continue to be, the supply of people with the skills to contextualise and interpret the analyses. The ideal Informatics approach here is to connect such people with social computing methods such that their insights collectively are greater than the sum of parts.

With the right information systems, Health Services Management and Public Health approaches to understanding the healthcare needs of populations can reinforce one another. A substantial amount of research and sharing of data and expertise will be needed to build such systems, creating dynamic, localised models of population health needs vs. services.

**Harnessing disruption: Synchronous innovation & implementation**

Commissioning a data warehouse is an example of an investment in part of an information system, which, if the data simply gathers (digital) dust, is inadequate. There is a need to link such investments to clear requirements for generating information from the data, particularly in areas of unmet need for informing healthcare decisions? But healthcare IT policies tend to stop at data management and information *infrastructure*. This is not sufficiently disruptive (Christensen, Grossmab, & Hwang, 2009) to engage the relevant staff and service users to become part of the information *system* – taking ownership and bringing essential tacit knowledge to bear.
Informatics management needs to tread a careful line between not getting enough clinical engagement and getting too much. An example of “too much” would be where a clinician diverts more Informatics resource into their own specialist area of interest at the expense of other areas with equal or greater needs. A core competence of an Informatician is to be able to abstract requirements in say from diabetes to another service such as rheumatology, so that one system can serve both needs and an economy of scale is realised. Furthermore, the smart Informatician will try to seed innovation in the rheumatology service from what is observed in diabetes, and vice versa. With the dawn of personal health records, a new ally in this cross-fertilisation of innovation is the patient.

The trained Health Informatician workforce is in short supply and the degree of professionalization varies around the world (Hersh, 2008). So it is difficult for many healthcare organisation boards to keep oversight of both what is needed and what is technically possible of healthcare information systems. The scarcest capacity is in clinically-trained Informaticians. Healthcare IT policies and activities have therefore focused on technical infrastructure, and are often under the management of a Director of Finance.

Conventional healthcare IT policies focus on large infrastructure and long procurement cycles. As already noted this can fail to engage clinicians and patients sufficiently to make best use of the infrastructure. A knee-jerk response to this problem might be to get clinical and patient groups to suggest priorities for care-information and then fund various pilot initiatives. Such responses usually fail to recognise generic Informatics problems – for example that the different priority areas selected share a common Informatics requirement to close the loop between the production and use of information. A clear oversight of what is
needed and what is technically possible might be generated by managing the innovation much more closely with the implementation of health information systems.

Looking ahead, a greater supply of data and analytical tools, combined with social networks of sense-making, will generate complex models of healthcare. The use of such models will need to be managed – their limitations understood and accountabilities for monitoring them made clear. Under-use will also need to be managed, which is more often the case at present. For example, a patient requiring coronary revascularisation (unblocking coronary arteries to prevent a heart attack) needs to consider the risk of dying during the procedure, the risk of having a coronary event within X years without the procedure, and the risk of requiring another revascularisation within Y years. The treatment options are: 1) stay on current drug treatment and observe; 2) revascularise using a catheter and stents; 3) revascularise using open surgery and bypass grafts. Then there are optional variations on the procedure such as the number of blocked vessels to target. Currently, patients are given risk information based on models developed using data from when the indications for treatment were different (Grayson et al. 2006). So the models need updating. Furthermore, the modelling is done separately by cardiologists and cardiac surgeons, working on speciality-specific audit databases, precluding the kind of modelling that might help a patient chose between surgery and stenting. It could be argued that healthcare managers have a duty to ensure that the relevant data is shared and models are kept up to date, in order that patients are properly informed about the treatment options relevant to local services.

The introduction of new information systems into healthcare usually disrupts a clinical or administrative workflow. If the disruption is led by those driving the relevant clinical or administrative work then the system is likely to succeed. If not, it may be wasteful or directly
harmful. The long procurement cycles that have come to characterise healthcare IT initiatives have disconnected technical infrastructure from healthcare innovation. Many large healthcare IT initiatives may have failed because they treated innovation to implementation as a one way process over a long time period. Other sectors have benefited from a more participative, user-centred approach, harnessing the beneficial effects of disruptive technologies. Managers of healthcare in an ever more data-intensive and socially-networked world, might bring together the innovation in care with innovation in Informatics to achieve the participation needed to deliver the best healthcare information.

**Conclusion**

Most businesses and public sector organisations are becoming more data-intensive. In this chapter we have shown that healthcare has particular needs to: 1) engage with service-users to provide additional data and co-produce their care information; 2) generate more complex understanding of healthcare across conventional organisational boundaries; 3) harness the insights of networks of health professionals using complex information about services and social computing techniques; 4) increase workforce capacity in Health Informatics; 5) integrate Informatics operations with all parts of healthcare organisations, particularly clinical leadership and innovation.
Summary box

- Health Informatics comprises the knowledge, skills and tools which enable information to be collected, managed, used and shared safely to support the delivery of healthcare and promote health.
- Health Informatics is an academic discipline and emerging profession.
- Human factors are core to health information systems.
- Healthcare managers should oversee a translational approach to Health Informatics, with coordinated clinical engagement and needs-led planning.
- Consumers of wellbeing products and services, linked to primary care through Personal Health Records, may form a new sector ‘pre-primary care’, through which preventive healthcare measures can be enhanced.
- Patients can usefully co-produce their care record via access to clinical systems, and might add further information through Personal Health Record systems and devices.
- The communication loop between patient, healthcare professional and information system can provide mobile information that supports self-care.
- Analysis of data from aggregated care records is essential for filling gaps in medical knowledge, particularly for people with multiple conditions.
- Healthcare record extracts are easily misused in benchmarking performance – clinical coding and case mix adjustment are commonly problematic.
- Social networks of ‘sense-making’ are as important as databases for informing the management of health systems.
- The disruptive effects of IT might be harnessed within healthcare innovation initiatives: This requires the early participation of patients and professionals.
References


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Websites and resources

The **International Medical Informatics Association** is an association of Health Informatics associations. The website acts as a portal to the lead Health Informatics association in each member country and coordinates the four yearly international conference.


The main Health Informatics Journals provide objective evidence:

**Journal of the American Medical Informatics Association** has a North American focus but carries many international articles: jamia.bmj.com.

**Journal of Internet Medical Research** focuses on Web-based medical intervention:

www.jimronline.net.

**Methods of Information in Medicine** carries more technical articles:

www.schattauer.de/en/magazine/subject-areas/journals-a-z/methods.html.

**Health Affairs** focuses on policy: www.healthaffairs.org.

The Web can present a blizzard of information about healthcare information systems sponsored by vendors or other organisations who might take a biased viewpoint. The reader exploring the healthcare management implications of an Informatics problem is advised to search for scholarly articles via **Google Scholar**: scholar.google.com.