Types of Health Information Systems (IS)

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Contents

1. Introduction 2
2. What is an Information System (IS) 2
3. Subject and Task based systems 3
4. Operational/tactical and strategic Health information Systems 4
5. Clinical and Administrative Health information Systems 5
6. The Electronic Health/Patient Record (EHR / EPR) 6
7. Financial and Clinical Health Information Systems 7
8. Decision Support Systems (DSS) 7
9. Robotics and Simulators 8
10. Telemedicine, Telematics and eHealth Systems 9
11. Computer Simulations 9
12. Summary 13
13. References 13
14. links - largely provided by students 14

1. Introduction

This document introduces the types of Health information systems that are around and how various people have tried to classify such systems from a number of perspectives.

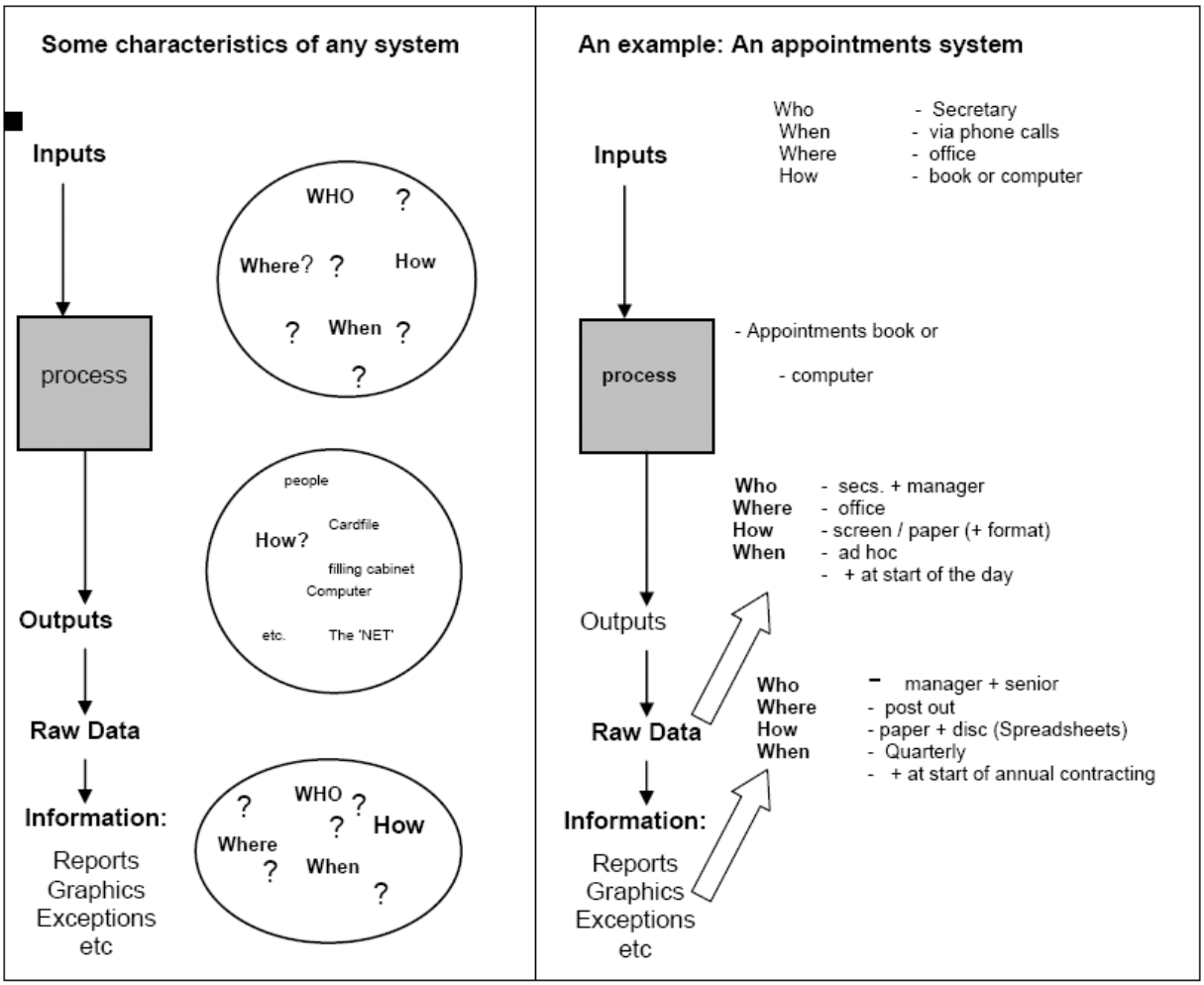
2. What is an Information System (IS)

Although an information system may not involve a computer (the traditional filing cabinet is a good example of one such IS) in this document we will assume that IS means a computerised information system. While the systems view of the world will be introduced elsewhere (Introduction to Modelling chapter) I have repeated the introductory information below.

Those who accept the systems view believe that everything can be described by considering:

- Input(s)
- Process(es)
- Output(s)
- Boundary

A system receives data - **inputs** which is then possibly **process**ed in some way before producing some type of **output**. The human body is possibly the most beautiful and complex system there is. The processing aspect also contains, memory and monitoring functions. In Informatics the idea of a system is often applied to a wide range of things. For example the hospital, the nurse bank and the mortuary are all systems. Each of these systems has a clearly defined **boundary**. For example, we know that the local shoe shop is not part of the hospital system. The two diagrams below provide both a template and an example of a typical system. [Please note that they are incomplete].



From the above diagrams it appears that there is a great deal to consider for any system. Depending upon your viewpoint you may focus on either the input, processes or output. It is often felt that certain models of systems consider in too greater depth the input aspects to the detriment of other aspects such as the processes and more importantly the output. Because of this, '**output based**' specifications have become popular where the model

concentrates on describing the present or required outputs. Taking the above example of an appointment system, an output based specification would focus on the reports required rather than the processes and input required to produce them, at least initially.

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3. Subject and Task based systems

James Martin, as long ago as 1981, suggested that you could divide information systems into those that are either '**subject**' or '**task**' based, although he did not use these exact terms. He defined a 'subject' based system to be one which related to a particular thing in the organisation such as a patient or doctor. In contrast a task based system was one that supported a particular task. Examples of task based systems would be standalone operating theatre or admissions/ discharge systems.

He suggested that '**subject**' rather than '**task**' based systems were best (p.28 -31). The reason for his preference is that it reduces data duplication. In a task based system if a subject often undergoes many tasks, basic details (e.g. name and address) would be collected each time, in contrast in a subject oriented system basic information would be collected once and would flow from task to task.

Considering the above dichotomy one can see how the Electronic Health/Patient Record (EHR/EPR) is an example of a 'subject' based system.

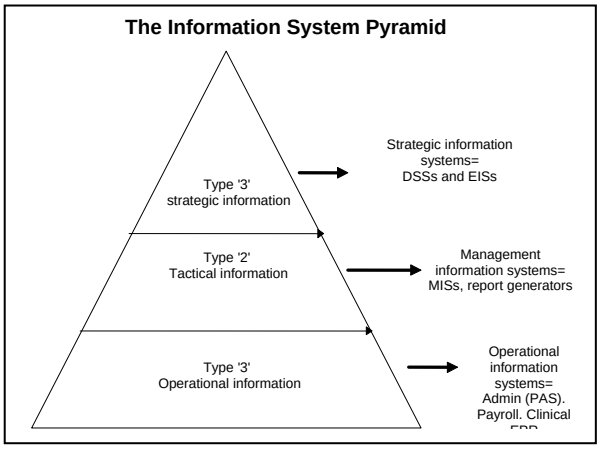
Exercise 1.

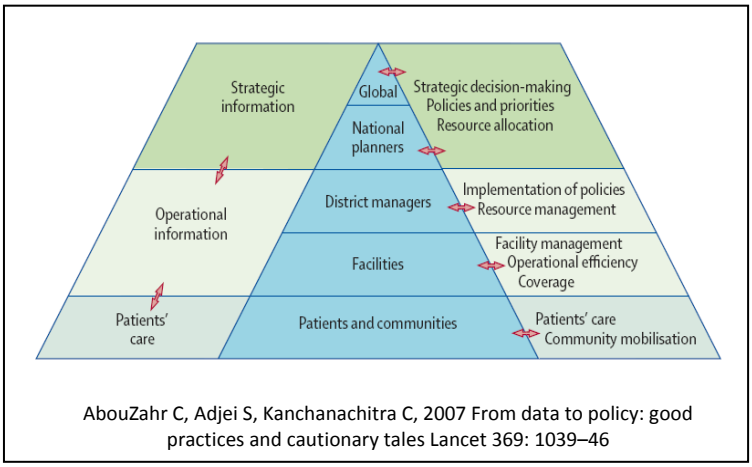
In you area of work what type of information systems exist, subject or task based. Do you agree with the assertion that subject systems are best? Also consider your answer from both security and risk management perspectives.

Produce a list below, possibly in some form of table

4. Operational/tactical and strategic Health information Systems

One of the most common ways to classify information is to use the operational, tactical, strategic divisions discussed in the section on information and knowledge (Chapter 5 section 3 at http://www.robin-beaumont.co.uk/virtualclassroom/contents.htm). At each level of the information pyramid there are also information systems which deal specifically with that type of information.





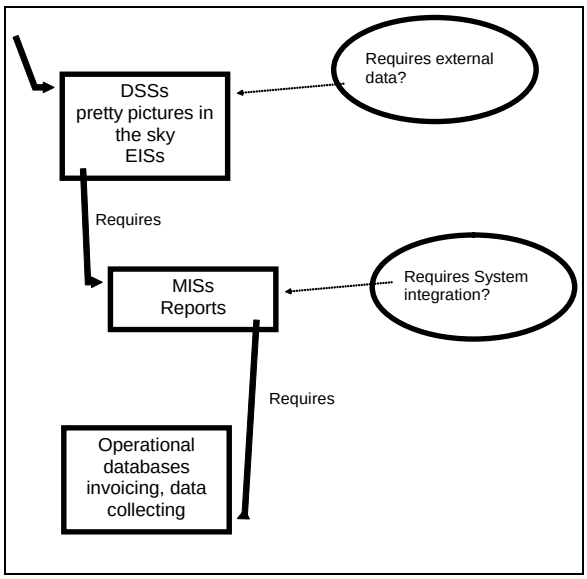
AbouZahr C, Adjei S, Kanchanachitra C, 2007 From data to policy: good practices and cautionary tales Lancet 369: 1039–46

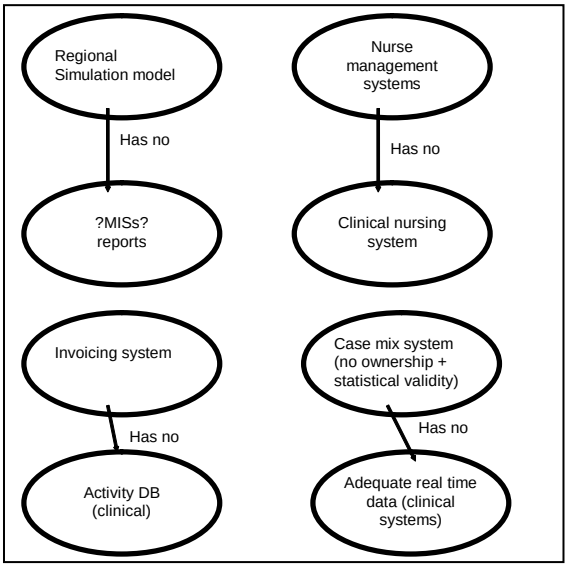
Recently AbouZahr, Adjei & Kanchanachitra 2007 in a fascinating article, have updated the pyramid (right above) to take into account global information, along with the process of data collection to policy formulation.

The pyramid classification has several advantages:

- It allows assessment of how far down the road of computerisation an organisation is. This can be done because operational systems are usually developed before MISs (Management Information Systems) or EISs (executive Information Systems).
- It allows the highlighting of any uneven or inappropriate systems development. This is by considering the hierarchical data dependency, management information systems requiring an operational system to feed them.

By considering the dependencies illustrated on the left hand side one can identify deficiencies in individual systems as given on the right hand side. Examples of using this approach are given below.





1. The former Northern Regional HA (UK) developed a computerised planning tool (a simulation) which provided output information concerning possible future hospital requirements by projecting hospital capacities and waiting list information. However this did not have the necessary feeder systems to keep it up to date.

2. All hospitals have problems working out costings which had to be done by top down apportioning as there are no feeder systems providing data on actual usage per client. In contrast American hospitals frequently use item billing systems.

3. Several hospitals have nurse management systems the data for which is gathered manually by collecting a plethora of data on paper, much of which could be obtained from a clinical system directly.

These are but a few local UK examples and are no where near the worst to be found.

Exercise 2.

Can you think of any systems where you work were there is a mismatch between the operational feeder system and a tactical/ strategic Information system?

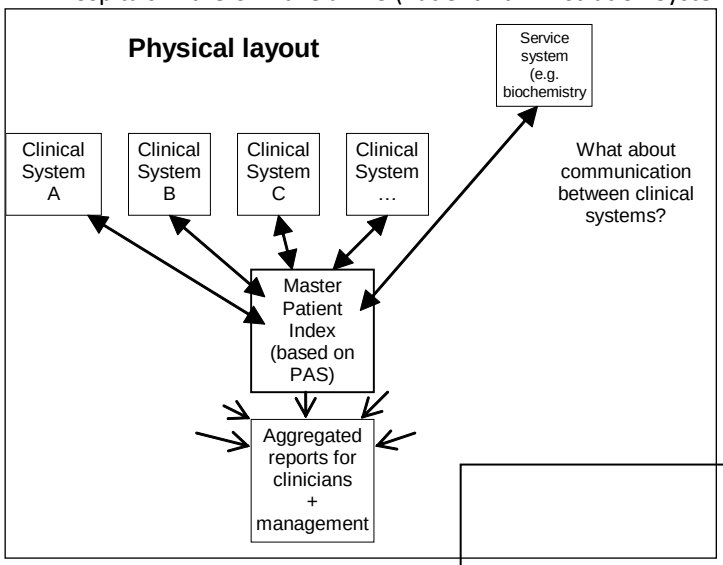
When there is a problem what is the usual strategy to get around it?

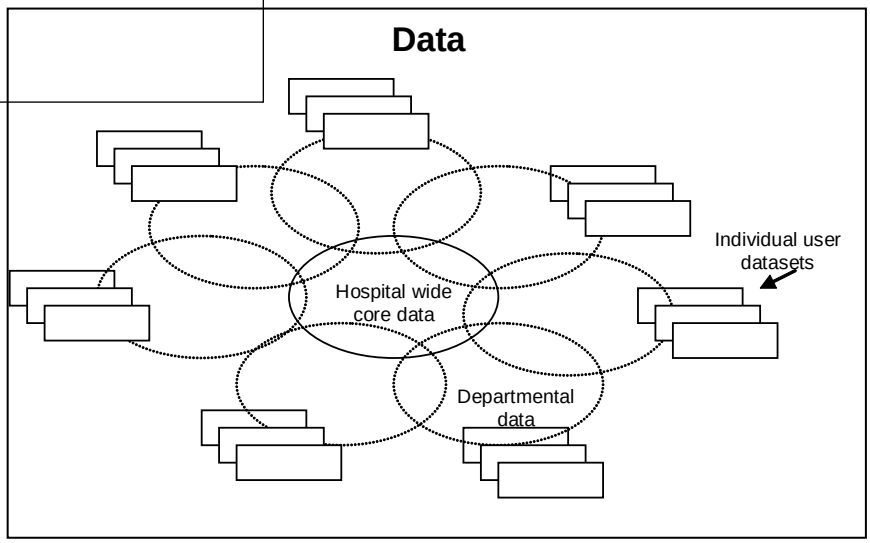
5. Clinical and Administrative Health information Systems

Another division that is often made is that between clinical and administrative systems. Yet if one considers it it is basically impossible to develop any clinical system without it depending on some type of administrative data. For example the most basic of clinical systems should allow the production of letters to GPs or patients for follow-up requiring GP and address details. The question is do such details constitute administrative or clinical information?

Considered rather simplistically the core of an integrated hospital clinical information system is nothing more than a '**master index**' consisting of the most basic of patient details ('administrative information') providing linkes to various clinical systems. Each departmental clinical system then allows individuals to set up additional 'research datasets' for specific activities. One can argue that each clinical system contains an Electronic Patient Record (EPR) or the virtual joining of each together for a specific patient represents a EPR.

All hospitals in the UK have a PAS (Patient Administration System) system to provide data, in the form of HES (Hospital Episode Statistics) reports to the DoH. This is probably defined as an administrative system because it was designed to allow retrospective data entry (i.e. information about the patient was usually entered after discharge when the notes get to medical records) and provided details of each 'episode' of care. Yet it is interesting to note that the reports, with the minimum of change had been called contracting datasets. Similarly the dataset also contains information about diagnosis, procedures and outcomes, all of which could be classed as clinical.





6. The Electronic Health/Patient Record (EHR / EPR)

A separate document at http://www.robin-beaumont.co.uk/virtualclassroom/contents.htm describes this concept in detail. There are various standards being developed such as the EU standard for the above called the Electronic HealthCare record (**EHCR**). However more excitingly there is also the development of an open (i.e. free) standard, called the openEHR.

> OpenEHR is a set of open specifications for an Electronic Health Record (EHR) architecture – but it is not a software application. Its design purpose is to enable semantic interoperability of health information between, and within, EHR systems – all in a non-proprietary format, avoiding vendor lock-in of data.
>
> All clinical knowledge concepts are captured in a structured way - known as archetypes – outside the software. The types of archetypes support the recording required for common clinical activities, with some of the key building block archetypes comprising observations, evaluations, instructions and actions. Data built according to these are stored in an EHR in larger 'composition' structures, which have their own archetypes.
>
> Compositions are comparable to a document that results from a clinical event e.g. a consultation record or a discharge summary. Archetypes can be simple, such as temperature, blood pressure or diagnosis, or complex, such as capturing the risk to a fetus if the father has a grandmother with Huntingdon's chorea. The archetypes contain a maximum data set about each clinical concept, including attendant data required such as: protocol, or method of measurement; related events; and context that is required for the clinical data to be interpreted accurately.
>
> The creation of archetypes and templates is almost purely a task for clinicians – openEHR archetypes put clinicians in the driver's seat, enabling them to create the breadth, depth and complexity of the health record to suit their needs for direct healthcare provision.
>
> Aggregations of archetypes are combined in openEHR 'templates' in order to capture the data-set corresponding to a particular clinical task, such as an ICU discharge summary or antenatal visit record. When clinicians look at templates, the information contained within them inherently makes sense and doesn't require significant training for interested clinicians to be able to create templates for their own purposes – be it domain, organisation or purpose specific. Templates can be used to build generic forms to represent the approximate layout of the EHR in a practical sense, and these can be used by vendors to contribute to their user interface development.
>
> Both archetypes and templates can be linked to terminologies or contextually appropriate terminology subsets that will support appropriate term selection by healthcare providers at the point of data entry.
>
> . . . . . .
>
> The openEHR reference model has been rigorously engineered over the past 15+ years as the foundation for a comprehensive health computing platform. It consists only of generic data types, structures and a small number of generic patterns, resulting in a small, stable and sustainable information model for IT people to maintain. This approach allows a clinical data repository to act as a future-proof data store, totally independent of software applications and technology change. In practice this means that no software application changes, or redeployment, are required when new or revised archetypes are published to reflect changing clinical knowledge. As a result, life-long, application-independent health records are possible for the first time. . . .
>
> "openEHR is being used in both active research and commercial activities. Research on openEHR is being conducted in Sweden, Australia, United Kingdom, USA, Sri Lanka and Spain. Commercial development is occurring in Australia, United Kingdom's NHS Connecting for Health, Netherlands, Belgium, Sweden, Turkey and the USA.
>
> "The United Kingdom's National Health Service (NHS) Connecting for Health program has just commenced a formal clinical modelling program using openEHR archetypes and templates to provide a common and agreed clinical content on which to base its clinical applications. In a pilot early in 2007, content developed for NHS Maternity and Emergency domains were provided to vendors for implementation in new clinical application development[5]. These archetypes are available in the public domain, and have undergone broad internal review by expert clinicians prior to being approved for NHS usage. The Emergency templates developed reflect the top 10 presentations to an Emergency Department – including chest pain, shortness of breath and collapse. The Maternity templates followed the clinical journey of a pregnant woman – from a pre-pregnancy consultation and antenatal visits, through to capturing the labour and delivery record, including Partogram data. Each template is made up of a variable number of archetypes – ranging from a few simple templates containing only 2 or 3 archetypes through to complex templates containing up to 80 discrete clinical concepts. . . . .
>
> Abstract from OpenEHR: The World's Record by Heather Leslie Pulse+IT pulse+IT magazine (4 - November) 2007
>
> http://www.openehr.org/301-OE.html

7. Financial and Clinical Health Information Systems

Another division is often made between financial and clinical systems but once again it is easy to see that patient costing, if carried out on a patient usage basis is really tagging the various items used (as would be recorded in a clinical system) with a price. However, most costing is carried out on an estimated basis based upon apportioning the total costs retrospectively or more frequently on past years costs.

One important aspect of financial systems is that of invoicing and non-payment follow-up. How complex such systems need to be in health care has not yet really been determined for the UK. In 1999 with the gradual disbanding of the purchaser provider split financial systems remained an important part with the development of commissioning.

8. Decision Support Systems (DSS)

'Decision support' is a phrase that has been bandied around for some time now and is usually linked with AI (Artificial Intelligence). Basically getting the computer to attempt to carry out some of the processing that the user does when converting the data ('facts') into information ('clinically relevancy'). While the technical abilities to develop DSS's in healthcare has been possible for well over a decade now few have been taken up to any significant extent for 'professional' organisational reasons. However in the UK this is rapidly changing with the development of 'payment by results' and the increasingly importance of adherence to NICE and PCT guidelines. However one could argue that a computer system that ensures doctors / nurses etc. adhere to such guidelines is not so much a decision support system as a 'procedure adherence system'!

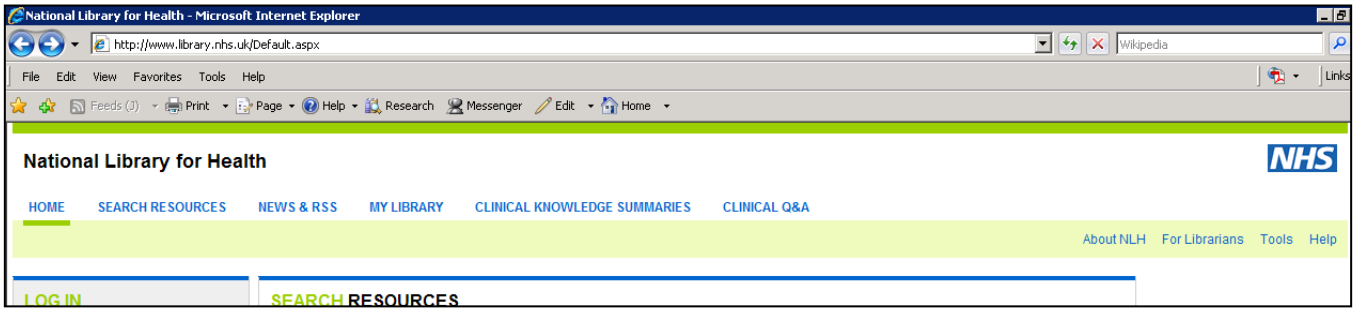
Most people consider a decision support system to offer one of three levels of support:

- Presents the data in a way conducive to cognitive processing by sorting, classifying, flagging etc. Thus facilitating decision making by the user. For example presenting a list of drugs for asthma rather than just a list of drugs for all conditions.
- Provides the results of some data manipulation. Here the system mimics part of the cognitive process e.g. provides a list of drugs only suitable to treat Asthma in an 8 year old who has no other illness.
- Provides the results of some data manipulation and carries out some appropriate action. Here the system mimics more of the cognitive process as well as the output processes e.g. system prescribes drug and arranges next appropriate appointment.

There are social implications of adopting any of these three levels which is discussed in several documents in chapter 4 at http://www.robin-beaumont.co.uk/virtualclassroom/contents.htm).

A large number of applications (pieces of software) can be considered to be 'decision support systems' at the lowest level described above. A reference manager, electronic diary, statistical package and an online library catalogue all fulfil the criteria, and incidentally are all databases. In contrast both the Internet, without some type of filter, and a word processor are not.

The NHS National Library for Health (shown below) allows some filtering of results so possibly could be considered to be a level one DSS.



9. Robotics and Simulators

Medical robotics is becoming a ever increasingly important part of surgery. A recent report is provided below.

Robot assistant gives surgeons a cutting look

The surgeon's eyes dart to the left, and instantly a robotic laser shifts position and gets to work on a new section of tissue. No, this is not telekinesis, but a new eye-tracking technology that could soon be giving surgeons a hand during tricky procedures.

The device has been integrated into a da Vinci surgical robot - a tool that allows surgeons to perform keyhole procedures by mimicking their hand movements. However, according to a team from the Hamlyn Centre for Robotic Surgery at Imperial College London, surgeons often need more than two hands when it comes to positioning additional instruments such as endoscopes or lasers.

Their device uses the surgeon's gaze to direct these tools instead. It shines an infrared LED on each eye, and cameras track the relative movement of the pupil and the "glint" of reflected light on the cornea to calculate where the surgeon is looking. The information is used to move the instrument to a new position on the patient. Since the surgeon will only want to use the feature at certain times in the procedure, the device is activated by a foot pedal.

The team hopes to present test results at the IROS 2008 conference in Nice, France, later this month. Team member Guang-Zhong Yang claims the gaze-tracker device is accurate to within 3 millimetres, although they are hoping to improve on this. He says it should provide more instant and precise control than a human assistant. "It could be useful in cardiovascular or gastro-intestinal surgery, which require lots of complex manoeuvres," he says.

From issue 2674 of New Scientist magazine, 24 September 2008, page 21

Simulators are more prevalent in healthcare education, and every one has heard of Resusci Anne (for a history of see: http://www.pooledivers.com/resusannie.html). The main company who produce Resusci Anne have now branched out to develop various other simulators such as SimMan which includes complex software to mimic various cardiovascular parameters. See: http://www.laerdal.co.uk/default.asp.

Other simulators exist of more advanced clinical training including dentistry and colonoscopy (pictures below provided by Rupert Pullan Consultant Colorectal Surgeon Torbay Hospital, UK)

10. Telemedicine, Telematics and eHealth Systems

Health Telematics systems are another type of information system. Telematics is the electronic transfer of complex data from one place to another. Usually the data is video or multimedia. Therefore **teleconferencing** (having conferences by video link) is a type of telematics. The DoH in Leeds has several such suites to allow people to hold meetings between Leeds and London. A common method nowadays is to use Web based technology.

As you can imagine telematics is thoroughly jargon ridden, we have such things as teledentistry (see http://www.jmir.org/1999/suppl1/e110) and teleconsultations etc. The problem with all this jargon is that there is often many words to describe the same concept, for example teleconsultation is also called virtual consulting or web consulting etc. For an example of this see DoctorInternet: http://www.doctorinternet.co.uk/ewelcome.html

Telematics is being used increasingly in areas of the developing world where expert resources are scarce or the population density is low. Examples are sending Images such as X-rays to be reported upon remotely; often in another country such as hospitals in Denmark sending pictures to reporters in Lithuania (see http://www.ehealthconference.info/Presentations/a_christensen_Valevicienne_ross.pdf) obviously there can be both costs and benefits associated with such practices, which the web link describes in detail.

Various varieties of Telemonitoring are also emerging, from remotely providing medial support to special care baby units to social care for the elderly.

The greatest change in the last few years, from the perspective of the patient (client / consumer etc), is the use of the web, you now have 24 hour free access to doctors and various therapies including cognitive behavioural therapy (see: http://www.moodgym.anu.edu.au/) which has undergone evaluation (Christensen, Griffiths and Korten 2002).

Health related activities that take place on the web, or facilitated by it, usually come under the title of eHealth, but once again this title has no universal definition see Pagliari, Sloan & Gregor et al 2005 for a review of various definitions.

The freely available Journal of Medical Internet Research (JMIR) at http://www.jmir.org/ provides a barometer of what is happening in the internet medical wise, from the enthusiast's perspective.

The problems with many telematics / eHealth projects is that they tend to be technology driven rather than demand driven from the clinical perspective. Jeremy Wyatt (Aberdeen) has written very sensibly on such issues, see The chapter in the *ABC of Health Informatics,* eHealth the future: promise or peril, and also the commentary in the BMJ Telemedicine trials--clinical pull or technology push? (Wyatt 1996), both are freely available to download from the BMJ

Exercise 3.

What areas of medicine do you think would be most and least suitable for Telemedicine. What criteria, if any would you use to determine their suitability?

11. Computer Simulations

This is my particular area of interest as in the nearly 1990's myself and several colleagues developed the first NHS region wide healthcare simulations in the UK, the company we formed to allow this to happen is still trading (http://www.beaumont-colson.co.uk/) , while we were unable to sustain the NHS's interest in simulation modelling, I believe we were two decades before our time, and this seems to be the case from the literature review below. I have included the original details about the Beaumont - Colson simulation at the end of this section.

Computer Simulations (in contrast to simulators used for teaching) are pieces of software ('applications') that allow you to create and manipulate a particular model. For example the games sim-city and sim-earth allow you to create cities or a whole world respectively.

Simulation is the most recent of the methods available to develop planning estimates, primarily because large simulations require powerful computers (either by using a super computer or by developing a virtual network. In

contrast to the old mathematical methods the user is not limited to any assumptions inherent in the technique. Models of any level of sophistication can now be built with relative ease given the necessary resources and data.
In the health service relatively few simulations have been built (see Baldwin & Eldabi 2004). Early examples in the UK include: The Hermes project to enable managers to predict case mix changes in acute provider units; The former NRHA acute provider unit acute capacity model developed by Beaumont Colson in the early 1990's and The Gateshead community care simulation project; The Teesside pollution / asthma incidence project. Finally a very early, but still relevant example is the EDTA Renal services simulation at St Thomas' hospital as well as that for individual units (see Davies & Davies 1986 you should not be put off by the age of this article as this is still an excellent introduction).

Other types of simulations tend to concentrate of specific problems such as costs of treating depression (Le Lay & Despiegel et al 2006), and mammography clinic flow (Coelli & Ferreira et al, 2007). In contrast others take a more epidemiological approach looking at the cost benefits of Influenza vaccination (Nichol 2001), Hypertention (Russell & Valiyeva et al 2004) or smoking on populations (Russell & Teutsch et al 2001) .

In America there are now Health care simulation consultancies providing advice to major health care organisations. There is also specific healthcare simulation software providing a point and click interface, which you can buy to develop models, such as Medmodel (see Denney, 1997 and also http://www.promodel.com/).

In the previous section discussing Operations/Tactical and Strategic Health Information Systems it was mentioned that one of the problems in the past with computer Simulations was often the lack of operational feeder systems to supply the information required to the (strategic) simulation system. However in some instances this has been overcome (see Abea & Toyabeb et al 2005). Abea & Toyabeb's paper also describes how it is now possible to run complex simulations on a Pc in minutes rather than days/weeks that it took in the early 1990's (personal experience). There is also the development of web based simulation development environments (see Bulis & DiStefano III, 2005).

An excellent source of information about Health care simulations is the Proceedings of the Winter Simulation Conference (http://www.wintersim.org/pastprog.htm), which offers a range of articles from; How to start developing a healthcare simulation (Lowery 1998) and suggestions for an NHS healthcare simulation framework (Eldabi & Young 2007) to tutorials on how to use freely available software to develop simulations (Sanchez 2006) and what makes a successful simulation.

In the last few years the development of social networking sites and virtual reality environments such as secondLife, means that a whole new environment is about to be unleashed and will probably have major consequences for Health Information Systems (See exercise 6 below).

Exercise 4.

Using your university e-journals link take some time to look at the various articles mentioned above. For those in the Proceedings of the Winter simulation conferences you will find them under 'Winter simulation conference'.

Exercise 5.

Visit the following website and take a look at SecondLife at http://secondlife.com/

- **Benefits of the Acute Capacity Model**

A simulated model allows the user to make comparisons of performances under altered conditions, to predict outcomes and to investigate the response of the system to differing stimuli.

Real world experimentation is expensive and inappropriate. The **Acute Capacity Model** provides the facility to mimic proposed changes and to investigate their potential outcomes, prior to the commitment of resources.

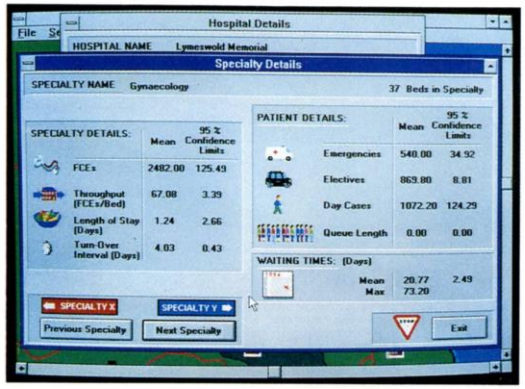
- **Hardware Requirements**

The Acute Capacity Model is designed to operate on any personal computer with **Microsoft Windows**® version 3.1 installed.

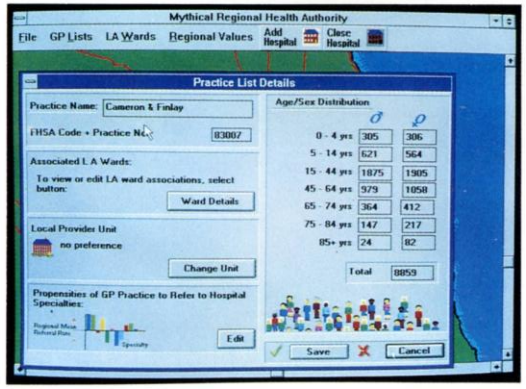
In the interests of improved performance it is recommended that at least **8MB** of RAM and a **486** processor be considered.

Full details of information requirements and data-linkage possibilities are available from the authors.

The **"Results"** unit presents an intuitive interface to a collection of performance indicators per hospital, sub-divided by specialty.



The original data file contains all that is required to model the behaviour of GP practices, and of hospital specialties.

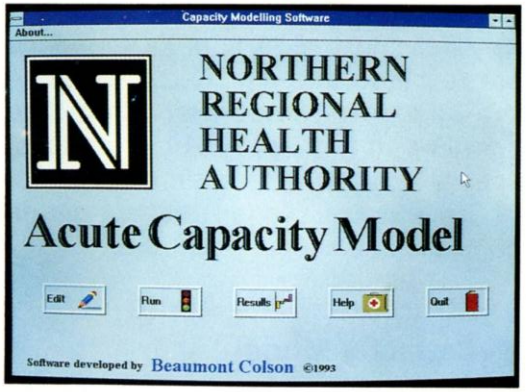


Beaumont Colson

with *Northern* **RHA**

- **Managing the NHS Market**

The **Acute Capacity Model** has been designed to mimic the behaviour of acute provider units within a geographical area. This has been achieved through close co-operation between the authors and *Northern* **RHA.**



The model is simple to use. Operating under **Microsoft Windows**® version 3.1, the package ensures that the least computer literate of users will not be challenged.

The **Acute Capacity Model** generates demand for services based upon historical data relating to the defined area and treats that demand according to the established behaviour of service providers.

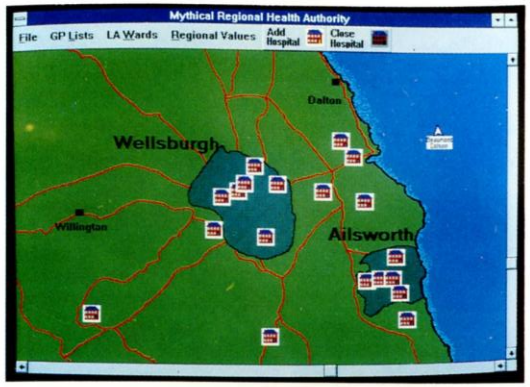
All such details are freely editable allowing users' **"What if?"** scenarios to be defined.

The hub of the **Acute Capacity Model** is a simulation. Written in an object oriented manner, the simulation effectively models the real world at the level of each individual referral.

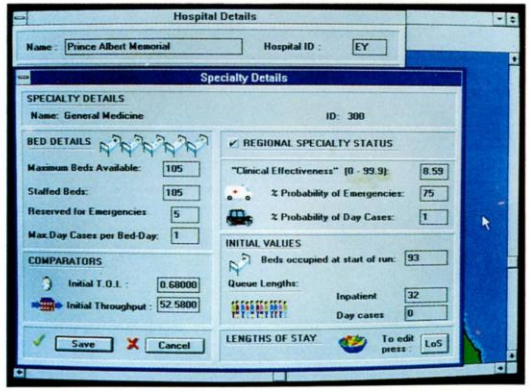
Key indicators of system performance are recorded and are used to illustrate the likely outcomes of predicted changes in the behaviour of hospital specialities, in the location of services, in General Practitioner referrals and in population numbers.

- **Structure of the Acute Capacity Model**

The software provided consists of three functional modules, an **"Edit"** facility, the **simulation** itself and a **"Results"** unit, supported by an **extensive data file**.



The **"Edit"** facility allows the user to redefine the characteristics of the system, from the GP based referral rates through bed numbers and physical locations of specialities to day-case/in-patient ratios per specialty.



The **simulation**, whilst operating, records the behaviour of the sytem under the conditions specified by the user.

The **Acute Capacity Model** was developed in response to a ***Northern* RHA** initiative, over a period of 18 months, beginning Dec 1991.

Closely involved in the project were Michael Jones of π **Associates** and Stephen Thorpe-Tracey, an independent management consultant.

Full details of the development cycle, issues raised, solutions adopted, etc. are available from the authors.

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12. Summary

In the above section we have discussed various Health Information System types along with some frameworks that have been developed for classifying several of them. Looking back over the sections one can see the difficulty of attempting to classify computer systems as well as the data they hold which is further compounded by the development of newer system types such as web based (including virtual reality) and Simulation Systems. The usefulness of using the operational, tactical, strategic classification was demonstrated along with the fact that Martin as long ago as 1980 asserted that subject (i.e. patient) centred rather than task based systems were best from a data management perspective.

13. References

General

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14. links - largely provided by students

Is PAS really only an administrative system. It seems I am not alone - see conflicting viewpoints at: http://www.bristol-inquiry.org.uk/final_report/annex_a/chapter_19_16.htm

Linked systems will gradually become the norm according to the the recent Information Revolution consultation http://consultations.dh.gov.uk/information-revolution/informationrevolution which suggests s new approach to the way the UK NHS approaches its (disparate?) systems.

Single Sign On (SSO) technology helps with log on to Hospital EMR/Radiology application/Emergency Department EMR (a separate EMR)..... brings up the same patient information on all of the above with one unique data item e.g Medical Record (MR) number, patient last name, DOB, etc.....integrating different vendors databases is a continued challenge in a any free market economy e.g. US http://en.wikipedia.org/wiki/Single_sign-on

Sometime ago, we were approached by a certain College who was embarking on their own e-portfolio for Revalidation, to sound out our experience with what we've done with our website (my team run the Appraisal Scheme in XXX and I'm responsible for the website) and how we may link up the two in the future in light of Revalidation. Next thing we know they've completely ignored every single recommendation we've made and they went and built their own system, which not only is not "interoperable" with our system - it doesn't even interoperate with their own existing system! Long story short, after much political nonsense and time wasted on "discussions", we're now back on "friendly" terms with said College and work on helping making our two systems "talk" to save our users having to duplicate work in terms of data entry / uploading of files etc - which was one of the main issues we originally highlighted!

We had a perfect opportunity of real collaborative working, straight down the toilet it went... I've always maintained that technology is never the issue, it's always politics. Always I'll get off the soapbox now. If you're interested in Interoperability stuff - this may be of interest to you (you might have come across this already): http://www.mips.org.uk/

The PCT currently work with a self-adapted version of HIDAS which takes SUS data (in and out patient episodes from all provider organisations) presenting costs of treatment and procedures performed etc. Software has been modified to present pseudonymous or patient named data dependent upon access rights. Initially purely an administrative /financial system, adaptations have effectively made it a multi-functional system albeit with several bolt ons that assist with medical research projects in addition to diagnoses reporting capabilities. Whilst evolving into something other than its original intention it is one of the few pieces of software that meets a current need across the health care economy in Hertfordshire (GPs, Provider and Commissioning)

Database design and change requirements seem to increasingly question the division between what specifies a system to be clinical or admin.

PCT = Primary Care Trust (organisations that currently commission medical services from provider organisations which include hospitals, continuing care, gps, dentists and community pharmacies) etc

HIDAS = is a software package originally created by one of the medical universities as a baseline invoice validation system (in this case allowing gps, hospitals and other providers to see the cost of a patients treatment and procedures performed)

SUS = Secondary User Service - is a single repository which holds comprehensive **data** to enable a range of reporting and analysis which, in this case includes patient clinical costings and demographic data.

MIDAS is a similar system developed by Middlesborogh pct see page page 27 of the audit commissions reports on practice based commissioning at:
http://www.audit-commission.gov.uk/SiteCollectionDocuments/AuditCommissionReports/NationalStudies/PBC_earlylessons.pdf

Many thanks for the students who provided the above information.

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