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Royal Society of Medicine

Dear Nick

Re: Royal Society Seeks Your Views

Many thanks for asking for CFH for our views on your consultation. We answer your questions sequentially. We hope that these are of use to your working group on developments in information and communication technology relating to health and health care over the next ten to fifteen years.

1. **Technology trends which are likely to impact on health**

- One of the important advantages of IT is that it can make the right information available to the person who needs it at the right time. However, the existing technology is quite capable of doing this; no purely technical developments are necessary in most cases. One of the limiting factors is the development of ontologies and terminologies to facilitate reliable transfer of meaningful data. Within the NHS in England, this type of communication will be facilitated by the limited number of software providers. However, in an international context, transfer of information will be facilitated by improved coding methods and improved use of coding.

- Going beyond the simple transfer of information, computers can improve the quality of clinical care by providing decision support. There are broadly two types of decision support – those which have to be called into use by the clinician and those which prompt the clinician automatically under programme control. Recent systematic reviews of randomised trials show that both are effective, but the second is considerably more so than the first. The technology to put such systems into place already exists and so it is really a question of implementing existing methods on a large scale, rather than technological development, which is called for. There are some unsolved problems within this topic. Particularly the 'sensitivity specificity problem'. If too many prompts are posted, then clinicians will tend to ignore all computerised advice. The ideal compromise between comprehensiveness and usability has not yet been determined and is a potential topic for future research.

- Most decisions support systems in current use are based on simple Boolean (if/then) logic. More complex forms of artificial intelligence – Bayesian methods, fuzzy logic etc were heavily investigated some

twenty years ago but few of these systems have come into routine use. Computer departments continue to work on such topics as neural networks and ‘fast and frugal heuristics’. The development of the patient electronic record may provide a suitable infrastructure for the application of such methods to certain particular problems. We return this point.

- Computers are playing an increasing role in the control of the supply chain for risky projects such as blood transfusions and in patient identification, to prevent mis-identification (for example giving the wrong drug to the wrong person). Existing technology has relied most heavily on bar codes but more avant gard methods use biological recognition, for example based on retinal scans. We understand that the technology for such applications is already quite sophisticated.

- Future developments might include embedded chips to track patients in hospital, and the ability extending from there to assist electronic prescribing, pharmacy stock maintenance and other safety features such as prevention of mismatch transfusions.

- Also radio frequency identification (RFID) devices maybe used to improve the safety of administration and storage of medication – again technology which exists but has not had its potential in the health care field properly assessed.

2. Areas in health care which may be effected

- The areas of health care which have been most affected by decision support to date are test and medication ordering. However, one of the biggest causes of avoidable morbidity and mortality lies in the area of mis-diagnosis. Increasing coding of the clinical history and examination will enable computers to play a bigger part in prompting clinicians about diagnoses they might otherwise have missed. We believe this is a potential growth area and one where computer algorithms may need to develop beyond simple Boolean logic.

- One point of concern is the possible negative impact of computers on the clinician/patient relationship. Research carried out in Sheffield and Leeds more that two decades ago has confirmed that computers may have a negative psychological impact on patients. Such negative effects can be instigated by enabling the patient to share visual access to the computer screen with the clinician.

3. Actions that should be taken to maximise benefit and minimise harm

- Examples have already accrued where transfer of information between computer systems has corrupted clinical codes. Clearly, reducing the number of separate systems and improving coding systems will reduce this danger.

- An error in computer code will be perpetuated over a very large number of patients, and so can do great harm, where as the clinical error

typically affects patients one at a time. This suggests that software should be produced under rigorous quality control and furthermore that it should be piloted (beta tested) within the health service before it is widely disseminated.

- New computer systems may not fit in with the workflow in the organisations into which they are introduced, and this mismatch can be very disruptive to patient care and result in computer systems being rejected by staff. We discuss some of the organisational implications of introducing new computer systems below, but here suggest that simulations – either real or imaginary – should precede the introduction of altogether new computer systems. This is consistent with tenets of safety science, whereby new methods should be scrutinised by methods with labels such as 'failure modes and effectiveness analysis'.

4. Generation, release and subsequent use of personal data

- It is right and proper to take this issue seriously.

- It is an issue that health care computing shares with many other types of computing where sensitive information about individuals is held in computer data bases.

- Many of the requirements for the management of personal data are covered by law – for example the Data Protection Act and the European Human Rights Act.

- This is a complex area of legislation where judgement is necessary in the interpretation of the law.

- There is some tension between requirements for privacy and other worthwhile clinical, managerial and scientific objectives.

- This topic has been the subject of a great deal of discussion and guideline development. This is appropriate because trust, once lost, is hard to regain. For example the Care Records Standards Group chaired by Dr Harry Cayton has produced guidelines for use and release of personal data in the English NHS.

5. Medico legal and ethical issues

- The tensions between the societal needs and the right to privacy created by large-scale computer systems has led to the development of guidelines (see above) and Governance procedures.

- In the case of prospective studies, patients are often in a position to give consent to subsequent use of their data.

- A trickier situation arises when access is required or requested in circumstances where consent has not been given – say because the analysis was not envisaged when the data was collected. In England,

access to such use of data is under parliamentary scrutiny; clause 60 of the Health Act.

- There is also an issue about the legal responsibilities of those who produce and design software for clinical use and who design the algorithms on which this is based. They clearly have a duty of care, and therefore civil cases could be bought against them under the laws of tort.

6. Regulations and other mechanisms

- Regulations and laws currently ensure privacy and control access to all data – whether held on computer or not. This covers the clinical and professional standards on confidentiality and requirement to obtain research ethics approval.

- Particular standards have been promulgated for data held on computer – for example the above-mentioned guidelines from Professor Harry Cayton's board.

- The development of international codes such SNOMED – to allow high fidelity communication between professionals and between clinicians and scientists.

- Rules of access for those who wish to obtain access to information held on computer databases and a governance process for this purpose.

7. Infrastructure to promote effective use of new technology

- The following are enabling.

- A procurement procedure which incentivises commercial organisations to adapt and improve systems and promote new development at reasonable price.

- A comprehensive patient electronic record since most isolated systems are of limited value and are often ephemeral. However, it is crucially important that new generations of IT systems are adaptable and can be improved and developed – it should not be a straight jacket which fossilises in a particular configuration and which, therefore, has to either continue unchanged or be swept away completely.

- The social and organisational infrastructure is also important. IT systems are most successful when the culture is supportive.

- A national health information architecture, which allows interconnectivity. In England, this is being arranged around the NHS spine.

- A competitive commercial environment (and the avoidance of a single monopoly supplier) while at the same time limiting the number of suppliers so that the interconnectivity is realistic option.

8. Promoters and barriers to take up of new devices and systems

- Technological aspects. By far the most important technical feature of computer systems ensuring their acceptability is response times. Users in general, and clinical users in particular, are very adverse to any delay in the response time of IT systems.

- An encouraging or at least permissive culture.

- Cost (although many systems are cost effective overall, they may result in increase costs in one part of an operation, in order to achieve reduced costs overall). For example, physician order entry is often more time consuming for front line clinicians, but can save time overall – for example in retrieving results from laboratory to bedside.

9. Education and training

- It has become an accepted truth, that IT systems should be introduced only after staff have been properly trained.

- In fact experience shows that clinicians often fail to attend training sessions.

- Vendors have learnt from experience, that ‘on the job training’ needs to be provided as IT systems are introduced.

- Paradoxically, clinical users who have most experience of computer systems, are often most reluctant when new systems are introduced, especially if they perceive a new system as an imposition which they do not need.

10. Professional roles and responsibilities

- Very early IT systems operated in the background – and did not impinge upon the clinician.

- This is now changing and with the development of patient electronic records including facilities such as physician order entry and physician prescribing, frontline and senior clinicians have had to get used to computer systems.

- However, this has happened all over the world and although there have been some spectacular failures, in the main clinicians have adapted well provided that the response times are rapid and that the computers are otherwise ergonomically and socially suited to purpose.

- Nearly half of all general practices in the UK are now paperless and there are many effectively paperless hospitals in North America (most notably the Veterans Administration Hospitals).

- As mentioned above, with the development of systems offering decision support, some of the clinical responsibility is now shared between clinician and software designer.

- Computers are also assisting clinicians in following clinical guidelines and 'patient care pathways'.

- To some extent, this can be seen as an infringement of clinical autonomy, but experience at the clinical sharp-end shows that it is only the minority of clinical decisions that can be codified in this way and that there is still a huge scope for clinical judgement.

- For reasons mentioned under the previous point, IT systems facilitate evidence-based health care.

- Computers can facilitate communication, by providing patients with printouts as required. These include printouts of letters and 'prescribable leaflets'. By this we mean patient information sheets, which can be printed out as required, according to the particular circumstances of the patient and her wishes.

- IT systems can reduce the administrative burden for clinicians. For example, clinicians who do not have IT systems have to spend a lot of time phoning laboratories to get urgent results. It has also been shown that many laboratory results requested by clinicians are never seen or acted upon. In this sense, IT systems can offer protection (a safety net for clinicians and their patients), provided that the system is designed to take staff changeover etc into account.

10. **Facilitating technology to meet the needs of patients and carers**

- Need for information. Patients and carers have been shown to have a great hunger for information. Computer system can produce information on demand and are already doing so.

- However, patients would find information most useful if it was:

  i. Kite marked or quality assured in some way – the National Library of Health has this task in England.

  ii. Tailored to their particular needs.

- This can be facilitated, by giving patients access to their electronic record, and then providing hypertext links so that they can learn more about their condition.

- Patients are likely to benefit from software which enables them to take control of their own condition and medication. It has been shown that patients receiving blood thinning medication or suffering from diabetes

achieve better control if they take responsibility for adjustment to their own treatment. It is likely that software tools could help. Providing an incentive to develop and sponsor such tools would be facilitated by research showing that they were cost effective.

12. **Potential impacts and costs**

- IT systems are expensive, but failed care is more expensive still.

- Since it has been shown that many types of computer systems can improve patient care – make care safer – it is a priori likely that many computer systems are cost effective.
- One of the points that stand out from the literature is that different computer systems have very different effectiveness. We need to learn more about the effectiveness of computer systems in different situations.

- The massive computerization of the NHS provides an ideal opportunity for both observational and experimental studies of the effectiveness and cost effectiveness of IT systems as they are introduced.

- The same will apply to more futuristic uses of computers, such as implantable computerised devices and computerised beds. It is known, that patients often deteriorate in circumstances where the patients condition was not properly recorded or where the information was not acted upon. A computerised bed could automatically measure the patient's respiratory rate, pulse rate and even blood pressure. Such a bed could ring an alarm if the patient deteriorated. The introduction of new computerised systems such as this should be studied in clinical settings, as for any other health technology.

13. **Global implications**

- Need for common ontology's and terminologies.

- Many clinical questions can only be answered by large-scale studies spanning countries.

In answer to your final question, we are happy for you to mention us as a responding organisation, but, as a government department, we would prefer it if you did not hypothecate our responses.

With best wishes.

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