Refereed paper

Primary care computing in England and Scotland: a comparison with Denmark

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ABSTRACT

This paper compares the status of primary care computing in England and Scotland with that of Denmark. The rate of utilisation by Danish GPs is among the highest in the world and the MedCom national health network handles over 90% of the country's primary sector clinical communications. A high proportion of English and Scottish GPs also use computers in their clinical practices, and like their Danish colleagues, they benefit from more accurate and streamlined medications management, particularly in terms of repeat prescriptions. The historical forces and factors which influenced the development of primary care computing are identified and discussed.

Keywords: electronic medical records, GP computing, physician practice management systems, primary care informatics

Introduction

One author (DP) has recently documented the state of affairs of primary care computing in ten countries; he is of the opinion that Denmark is the international gold standard when it comes to primary care computing.

Virtually all Danish general practitioners (GPs) (and by 2006, all specialists as well) use their computers to record their clinical notes, and to send and receive clinical electronic messages. Their national health network is used by over three-quarters of the healthcare sector, involving more than 5000 different organisations. Over 90% of the country's primary sector clinical communications are exchanged over the network.

This paper compares the status of primary care computing in England and Scotland with that of Denmark. Data were collected from the scientific literature, from the Organization for Economic Co-operation and Development (OECD), government and professional association reports and websites, as well as from personal interviews with GPs and ministerial representatives in each of the three countries.

Healthcare systems: characteristics

Though the methods of hands-on delivery of care are virtually the same in the three countries being compared, the way in which the healthcare systems are financed, administered and managed vary quite widely.

There is a significant difference in population sizes; Denmark and Scotland have similar numbers of people with 5.3 million and 5.1 million, respectively. England is almost ten times as large, with 49.5 million people.

According to the OECD, in 2003, Denmark's per capita health expenditure was $2763 (US) while that of the UK was $2231.[1] In terms of total expenditure on health, Denmark was close to the European average at 9.0% of gross domestic product (GDP) while it was 7.7% in England and Scotland (a figure which has changed substantially in the last two years).[2]

The percentage of GPs who work alone is estimated to be 30% in Denmark and only 15% in England and Scotland. Denmark has 3500 GPs while Scotland has 4000[3] and England has 29 000.

Since 1970, most decisions regarding the form and content of healthcare activity in Denmark have been made at the county and municipal level. Working in close co-operation with the Government and municipalities, the existing 14 counties are responsible for hospitals and primary care.[4] As of January 2007, there will only be five regions and they will not have taxation powers as the counties used to. The number of municipalities will be reduced from 275 to 98.

Until July 2006, there were 28 strategic health authorities (SHAs) in England; this number has now been reduced to 10. SHAs make sure that national health priorities (such as cancer programmes) are integrated into local health plans.[5] From October 2006 there will be 152 Primary Care Trusts (PCTs) in England (reducing from 303); PCTs are responsible for services such as: GPs, dentists, pharmacists, opticians and NHS walk-in centres. PCTs receive about 75% of the National Health Service (NHS) budget and control funding for hospitals, which are managed by National Health Service (NHS) hospital trusts.

Scotland was covered by a separate piece of legislation than that in England. The 1947 National Health Service (Scotland) Act established different procedures for appointing consultants (that is, specialists) and allowed greater participation by universities in the running of the service.[6] In 1999, devolution of power from the London-based British Government to Scotland transferred responsibility for health to the Scottish Executive. NHS Scotland is divided into 15 NHS health boards, which manage both acute and primary care.

History and evolution of primary care computing

Denmark

In the late 1980s, a GP – who also worked part time in a hospital biochemistry laboratory – and a pathologist, who was professor at the university, convinced the

head of information technology (IT) in Funen County that sending clinical messages electronically would be of particular benefit to GPs.[7] A project was proposed to Funen County for the next round of their IT strategic planning.

In 1990, the FynCom project was created to connect two GPs on one system with a hospital system and a laboratory system. The project (later entitled MedCom) went ahead without formal approval and before it became a part of the Funen County IT strategy. By 1992, laboratory results and discharge letters were being transmitted electronically. Medication prescriptions and reimbursements were added in later.

By 2000, an update to the national health information strategy further increased the emphasis on communication between hospitals and physician offices. At that time, MedCom became a permanent non-profit organisation whose mission became: 'To contribute to the development, testing, dissemination and quality assurance of electronic communication and information in the healthcare sector with a view to supporting coherent treatment, nursing and care'.[8]

England

The real growth in general practice computing in England did not occur until after 1987.[9] This was due to:

- the introduction of the government 'no cost' computer schemes. Interestingly it was the Department of Trade, not the Department of Health, that liaised with the Royal College of General Practitioners
- the 1988 buy-in of the provider academics (College) and professional organisations (British Medical Association) to valuing IT and providing resources to support training of providers and their staff
- the agreement by the Department of Health in 1990 to reimburse part of the cost of purchasing and maintaining computers in general practice
- the introduction of the new GP contract in 1990 and the publication of the 'Health of the Nation' in 1991 with its emphasis on information collection and analysis, particularly in relation to health promotion targets
- a further boost was given by the 2003 General Medical Services (GMS) contract, in which one-third of practice income is derived from quality indicators (the Quality and Outcomes Framework), measured directly from the data in GP computer systems. This is a UK-wide contract, and thus covers Scotland as well.

Scotland

The origins of computers in Scottish physician offices date back to 1984, when Dr David Ferguson, a Glasgow

GP, developed a repeat prescribing programme for his own use.[10] Dr Ferguson offered his system to all UK health departments. In Scotland this offer was accepted and a temporary project – General Practice Administration System for Scotland, or GPASS – was established.

By 1994, GPASS was used by 800 practices in its multi-user form. GPASS is operated by the Information and Statistics Division (ISD) of the Common Services Agency (CSA) and funded by the Scottish Executive Health Department (SEHD). Direction is by a single GPASS programme board which comprises representatives from the Scottish Executive, the CSA, Royal College of General Practitioners Scotland, the GPASS User Group and health boards.

Driving forces

As evidenced by Table 1, there is no one reason why the three countries have a high degree of utilisation of computer technology by their GPs.

A factor influencing the uptake in all three countries was the accreditation of vendor systems. In England, the Requirements for Accreditation (RFA) was first introduced in 1993 to ensure GP computer systems provided agreed core functionality and conformed to national standards. It also determined whether remuneration of GP purchasing and support costs were allowable based on performance in a number of defined areas of functionality. Similarly, in Scotland, the Scottish Enhanced Functionality (SEF) set the minimum standards of general practice computer systems. In Denmark, MedCom began certifying all vendor systems in 2000.

Professional colleges and/or medical associations played an influencing role in all three countries. In September 2003, the British Royal College of General Practitioners and the Department of Health issued the 'Good Practice Guidelines for General Practice Electronic Patient Records'.[11]

Clearly, a major contributing factor to the use of computer technology in Scotland and England was that the government pays for all or most of the GP's expenses. Such, however, was not the case in Denmark.

In 1990, NHS Scotland introduced financial rewards for doctors who achieved specific NHS Scotland health priority targets (such as cervical cytology screening and immunisation).[12] In 1993, additional financial incentives were available to physicians who could demonstrate that they were proactively managing specific chronic conditions such as diabetes and asthma.

Peer influence – collegial pressure – played a significant part in the Danish GP computer movement. Early adopters often hosted their colleagues to show them how the computer system affected their work life. At the yearly, one-week GP education seminars – referred to as 'GP days' – there were always IT workshops covering topics ranging from basic computer use to advanced use of diagnostic coding.

Non-financial support from the counties was a significant influencer in Denmark. In 2000, the counties started to provide a help desk and training by a 'data consultant' who visits GPs on a regular basis. The counties fund 'practice co-ordinators' for each specialty (general practice, psychiatry, general surgery, and so on). These physicians work two to three hours/month and co-ordinate the wishes of their colleagues to hospitals and vice versa. An equivalent to the 'data consultants' in Denmark is the work of PRIMIS+ in England, funded by NHS Connecting for Health, in providing training, support, analysis and feedback services to all practices.[13]

Current state of affairs

Virtually all Danish GPs (and by 2006, all specialists as well) use their computers to send and receive electronically clinical messages such as prescriptions, laboratory results, laboratory requests, discharge summaries,

Table 1 Incentives and influencing forces

Country	Government billing mandate	Government funding support	College or association leadership	Peer influence	Accreditation of vendor systems	Non-financial support received
Denmark	No	No	Yes	Yes	Yes	Yes
England	No	Yes	Yes	No	Yes	Yes
Scotland	No	Yes	Yes	No	Yes	No

referrals, and so on. Sixty standardised messages (up from 32 in 2002) – including their 'one letter solution' – have been implemented in approximately 100 computer systems, including physician office systems, hospital systems, laboratory systems and pharmacy systems. The national network is used by over three-quarters of the healthcare sector, altogether more than 5000 different organisations. All hospitals, pharmacies, laboratories and general practices take part. As of January 2006, all private physiotherapists (1750 in 550 clinics) and all private dentists (2800 in 1600 clinics) were also connected to the network. By the end of 2006, all 240 private chiropractor clinics and all 675 private psychologists will also be part of the electronic network.

The majority of specialists and all of the local authority health visitor services now communicate electronically via the healthcare data network. Over 90% of the country's clinical communications in the primary sector are exchanged over Denmark's national network.[14] This high level of connectivity means that most Danish GPs run paper-light offices.

There are currently around 8900 GP practices in England, of which 97% have a GP clinical computer system.[15] (2005 figures; by June 2006 only 10 practices do not use a computer system. [*Personal communication; Ed.*]) All practices use their systems for NHS acute prescribing and for repeat prescribing. Exceptions to this rule are those prescriptions generated during home visits or when prescribing controlled drugs, which at present by law must be handwritten. This might change in the near future to electronic prescribing due to the findings of the 2004 Shipman inquiry.[16]

Many practices are using electronic appointment systems and an increasing number of practices scan all hospital letters, reports, and so on, which are then attached to the individual patient record. There are estimates of up to 30–35% of practices running 'paper-light' systems today. In those practices which are paper-light, a full-time GP will spend 24–27 hours using their computer while in direct contact with their patients. Those with document management and pathology reporting will require an additional four to eight hours of computer time; the need for continuous access by clinicians is significant and utilisation rates are growing. Anecdotal evidence suggests that GPs use their computers up to 16 hours/week on average; practice managers use it 13 hours/week.

The majority of the data in English GP electronic medical records is structured and coded using Read codes; most systems use version 2 though a significant number are now using Clinical Terms version 3. No system has yet implemented SNOMED-CT, though this is likely to change in late 2006/early 2007.

Currently, there are ten different physician office systems in England. The three EMIS systems account for 57% of the market, while the IPS Vision system has 22% and iSoft/Torex has 14%.

Today, over 90% of GP practices in Scotland are computerised although only 3% would consider themselves to be paperless.[10] All systems include an electronic medical record in addition to administrative functions and some degree of decision support (for instance, drug–drug interactions) is generally provided. The majority of GPs use their computer in their office and enter their own clinical notes and data. Much of the data in the medical record is structured around Read diagnosis codes. SNOMED-CT was approved for adoption in Scotland by the Scottish Executive Health Department in 2001 but early SNOMED-CT implementation tests only began in late 2005.

GPASS is still the dominant system in Scotland with around 85% of the market. Other systems in use include InPractice Vision (around 6% of the market), EMIS (5%), iSoft (2%) and Protechnic Exeter (1%). As of mid-2005, around 85% of GPASS users are using Release 5 of the GPASS software.

Characteristics of computer systems in GP offices

Table 2 gives an overview of some key features of electronic health record (EHR) use in the three countries.

The most common clinical application in all three countries is the automation of medication prescriptions. There are very few handwritten prescriptions in the three countries and the majority of GPs enter the original medication prescription into their computer themselves and, at a minimum, print a script for the patient to take to the pharmacy. Informal surveys of GPs in each country suggest that it is the application which perhaps provides one of the biggest benefits to GPs, as it addresses legibility concerns, can be a significant time saver (particularly for repeat prescriptions), and offers the potential to make use of decision support capabilities. Simplified prescribing, including access to lists of generic drugs, is often seen to be of value as well.

At this time, over 85% of prescriptions in Denmark are sent electronically to pharmacies. This capability has just begun in England as a result of the Electronic Prescribing Service.[17] Electronically transmitted medication prescription pilots are being undertaken in Scotland.

A major reason Danish physicians use their computer is because of the communication benefits it brings them.[18] They report a much-improved dialogue

Table 2 Characteristics of computer systems in GP offices

Country	% with computers	Year technology use became common	% GPs who use computer themselves	% GPs with automated medication prescriptions	% recording progress notes	Coded data in records	% who operate 'paper-light' offices
Denmark	99	1994	99	99	95	Little	Most
England	99	1992	90	99	90	Most	35
Scotland	>90	1997	80	95	65	Most	Few

with hospitals (for instance, where they used to wait five days for test results, they now receive them almost as soon as they come off the laboratory equipment). They are automatically notified when the patient is registered in a hospital emergency department. Discharge summaries now arrive within one to three days (compared with four or more weeks).

Danish physicians also report that they have much quicker access to all of their patient data – particularly recent reports and results; they are then able to finish all that needs to be done while the patient is still present. Recent studies in Denmark have found that 50 minutes is saved per day in each GP practice, telephone calls to hospitals are reduced by 66% and 2.3 euros are saved per message, of which there are 60 million/year.[19]

It is useful to note that clinical computer usage in England has markedly increased since the advent of the new 2003 GMS contract containing the Quality and Outcomes Framework (QOF). The most significant change in the GMS contract was the introduction of quality targets in place of the majority of Items of Service as a mechanism of funding. The QOF has both clinical and organisational targets giving a total of 1050 potential points. In 2005–06, these points were worth £120 each for an average size practice, thus giving GPs an extra income over the set income (based on patient list size) as a result of achieving quality targets. By implication, as the QOF covers 11 disease areas and practices are financially rewarded for having objective evidence of the quality of care they provide, data entry into GP clinical systems is taking precedence over handwritten records in these areas.[20] This GMS contract is also in place in Scotland and therefore also provides performance-related payments for achievement of QOF targets.

In 2004, the national programme for IT (NPfIT) in England – now referred to as 'NHS Connecting for Health' – introduced a central system to collect electronically, over the national network, the anonymised QOF data from practices to indicate their monthly performance. The Quality Management and Analysis System (QMAS) is a new single, national computer system, which gives GP practices and PCTs objective evidence and feedback on the quality of care delivered to patients.[21]

The transmission of laboratory results is by far the most common electronic clinical communication application (see Table 3). In all of the three countries, at least 50% of results are transmitted electronically to physician office computers in England; it is over 90% in Denmark and Scotland.[22] There are 65 biochemistry

Table 3 Networks and electronic communications

Country	National health network in use	Organisations connected to the national network	Receiving discharge summaries	% GPs using electronic data exchange	% GPs receiving laboratory results	No. of suppliers of practice management systems
Denmark	Yes	Most	Most	98	98	16
England	Yes	Most	Few	97	50	10
Scotland	Yes	Most	Many	90	90	5

laboratories, 17 microbiology and 16 histopathology laboratories in Denmark and all use the national personal identification number as their patient identification. Laboratory requisitions are ordered electronically using a national Lab Requisition server; by July 2007, all requisitions will be sent electronically. Each county has a database of all results produced by the laboratories – the large majority of which are hospital-based.

A unique communications application in England is the GP-to-GP transfer of patient records currently under testing; by this means the complete electronic patient record is transferred directly to the new surgery's computer system, rather than being sent in paper format and then having to be inputted again manually. The ability to transfer records electronically has consistently ranked high on GPs' IT wish lists.[23]

Conclusion

Clearly, over the past 20 years, a marked increase in the use of information technology in primary care is common to all three countries. This is consistent with the growth seen in other European countries and is in sharp contrast to the stunted growth in Canada and the United States. It has been suggested that one reason for the failure of North American GPs to take up EHRs is the fragmentation of the market – particularly in the US. All three of the countries discussed in this paper have very centralised health systems, which could be another contributing factor to success.

The drivers behind the uptake of electronic medical records in the three countries have been different and it is difficult to build a case that one way is better than another. A secure and robust national network would seem to be a key success factor in all three, as was the earlier influence of peers and professional colleges.

Though the Danes appear to be the most advanced overall, they trail England and Scotland in terms of structured and coded clinical data. Danish EHRs contain little coded data, which makes it harder to use them to provide outcome data for, say, trials and epidemiological research in a fashion that English and Scottish EHRs are able to.

It is also evident that information technology is shaping policy and practice as evidenced by the new QOF pay-for-performance system in England and Scotland, and the emergence of new patient-oriented portals in England, Scotland and Denmark.[24–26] Such portals offer great promise, although there are concerns that the information provided by them may not always be of high quality.[27]

The Danish national health portal was created in 2005 so as to provide information about the Danish National Health Service to its citizens and patients. It is also beginning to serve as a unified hub for electronic communication between patients and the Health Service. The new health portal permits both providers and patients to access laboratory results online via the internet. Additional services already available on the portal include: access to medication profiles, waiting list information, online scheduling of GP appointments, email contact with GPs and online renewal of prescriptions by patients. *Healthspace* in England, though not yet offering such a wide range of services, undoubtedly will in the future.

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CONFLICTS OF INTEREST

None.

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