1 Introduction

The NHS Next Stage Review supports the development of more integrated services for patients and proposes piloting new ways of allowing primary, community and hospital clinicians and social care organisations to achieve this integration. One of the models proposed to achieve such integration is through development of Integrated Care Organisations (ICO), based on the registered patient lists for groups of GP practices and facilitated by Practice Based Commissioning (PBC).

The Department of Health is inviting proposals for these pilots and has generated a high level of interest from clinicians and managers in the National Health Service as evidenced by a briefing workshop in August 2008.

This paper explores the practicalities of integration within the English healthcare system and the vital role of information systems in integrated care organisations, drawing upon international healthcare experience with using information systems to make integration successful. The paper will make recommendations on how integrated information systems should be developed in the UK to support integrated care in the future.

2 What is Integrated Care?

Integration can be considered from several perspectives and it can serve as a means to achieve several goals. International literature on integration of healthcare systems offers several examples of two widely used models of integration—horizontal and vertical healthcare integration. Each of these approaches has its fair share of supporters and critics as well as successes and failures.

Horizontal integration aims to consolidate comparable types of organisations for increasing the size and activity scope of the sector through acquisition, collaboration or other forms of cooperation, with the providers offering similar kind and range of services. In primary care, for example, this could be achieved by encouraging general practices and
primary healthcare teams to work together and share responsibility for developing high quality, patient focussed services for their local communities, along the lines of Primary Care Federations proposed by the Royal College of General Practitionersiv.

Vertical integration commonly refers to the ability of one provider system to provide the full range, levels and intensities of service to patients and healthcare consumers from a geographically contiguous region when clients present themselves to that system. The integrated care organisation, as proposed in the NHS Alliance report ‘in sickness and in health: achieving an integrated NHS”v would be a practical approach to achieving vertical integration in the NHS.

Either type of integration requires clinical integration with or without corresponding organisational integration. However, when both clinical and organisation integration are linked and empower each other, success is expected to be more likely.

3. Integrated Information Systems for Integrated Care at Kaiser Permanente

The hypothesis adopted by the authors in preparing this paper is that: integrated care organisations require integrated information systems.

In order to begin to test this hypothesis, and to gain greater clarity on the term ‘integrated systems’ in the context of integrated care, we interviewed Mr David Watson, the former head of information systems (Chief Technology Officer) at Kaiser Permanente (KP) in California.

KP is an example of a vertically integrated organisation. KP’s history of providing ‘cradle to grave’ integrated care to over 8 million patients in its constituency has had a significant influence on previous integrated care experiments in the NHSviviviii, on health policy research in the UK and on the emerging Department of Health policy on integrated care.

A qualitative study of KP’s information systems implementation experience was published in the British Medical Journal in 2005ix. However, the information systems “blueprint” at KP has never been widely publicised.
We discovered that KP’s information systems have the following characteristics:

(a) KP’s information systems are based around the electronic health record

KP’s information systems are centred around the detailed patient record, known as the electronic health record (EHR). The EHR contains the full patient clinical record in terms of what clinicians will use as their primary record for seeing and treating patients.

The EHR forms the core of the information systems architecture at KP. Outside of the core, there are other information systems in the first ‘ring’ of the blueprint including pathology systems, radiology systems, prescribing systems, etc. The next ‘ring’ comprises the information systems to support clinical specialties (the ‘ologies’) such as oncology, cardiology, surgery, paediatrics, dermatology, etc.

A group of KP clinicians helped to define the EHR requirements and develop the clinical scenarios used to test the validity of the EHR system. The EHR was not a bespoke development but a software package from a company called EPIC (according to some industry authorities, the most highly rated EHR system in the US).

The electronic health record, commonly referred to as electronic patient record (or EPR) in the UK, is an active, real-time information system that supports individual patient care including: clinical assessments, care planning, charting and other clinical documentation, multidisciplinary care plans and care pathways, active alerts and reminders, scheduling, test requesting, results reporting, drugs prescribing and administration, clinical decision support, clinical communications (letters, discharge summaries, etc.), and clinical coding as well as support for specialities such as accident and emergency, radiology, theatres, maternity, child health, dermatology, diabetes, endoscopy, etc. EHRs are integrated because they provide all these functions within a single overall system, with a common look and feel, and a single record for each patient in its database that all caregivers with appropriate access can share at the same time.
(b) KP’s electronic health record system works across all care settings

KP’s EHR works across primary, community and hospital care settings. This means that the primary care doctor can see the whole, detailed patient record including past hospital and community clinic encounters. The EHR is not a summary record, but includes all the patient details.

(c) KP’s patients have electronic access to their doctor and health record

KP’s patients can use secure email to access their doctor, thereby reducing the number of visits required. At the same time, patients can access their own electronic health record, what they sometimes call a ‘self-service’ record, in order to organise repeat prescriptions and access information such as immunisation records for children.

(d) KP’s information systems support two major KP care components

In addition to KP’s information systems being integrated, in terms of providing cross-setting and detailed patient records, they also support two other important and related elements: population care and clinical protocols.

a. Embedded chronic care management

Along with other health systems around the world, KP is targeting chronic conditions such as diabetes, COPD, congestive heart failure, asthma, etc. on a population basis and does this under the banner of what it calls ”Population Care”. KP doctors enrol their patients into one or more disease populations and put them onto disease registries, based on data extracts from the EHR system, in accordance with the patient’s condition(s) and risk factors. The EHR information system then helps the doctors and chronic care teams to apply monitoring protocols to prevent disease, keep the patients out of the hospital and maintain health, and of course, reduce the costs of chronic care.
One of the tools used by KP to operate Population Care is the use of ‘case management’ processes where a Case Manager role is assigned to keep patients on track with the disease protocol across care settings, including the patient’s home.

KP’s EHR system supports case management processes by, for instance, sending an automatic email reminder to patients with Type II diabetes to make an appointment for a retinopathy test at the local ophthalmology screening clinic. Similarly, it will help community clinics to notify a patient that has been prescribed with a statin such as warfarin to attend a warfarin clinic to ensure proper drug compliance.

As a consolidated disease registry, the EHR system will ensure that essential clinical markers for each patient are tracked, across all the patient’s chronic conditions and that co-morbidities are documented and managed through coordinated alerts and reminders.

b. Embedded clinical protocols

Also along with other health systems, KP runs a clinical peer-review organisation, called the Care Management Institute, to assess and develop clinical protocols. At KP, these protocols are embedded into the EHR system.

Typically, the clinician uses the EHR to document assessment findings and will select structured diagnostic term(s) in the patient’s electronic health record. If the patient has a condition for which a clinical protocol has been deployed, a screen appears with the appropriate clinical protocol for the clinician to follow in terms of recommended tests, drugs and other actions. At that point, the clinician has a choice to either agree with the recommended protocol, or over-ride the protocol and follow a different course of action. In this way, ‘clinical freedom’ is not seen to be compromised.

KP’s EHR thus accumulates a large and growing number of detailed patient records. This database enables KP to identify
which clinicians have accepted the clinical protocols and which have elected to over-ride them and to see how patient outcomes differ between these groups.

These are still early days for KP in terms the sophisticated and elaborate use of these databases. However, the direction of travel is clear and KP is confident that the direction is the correct one to follow. They have encountered a host of issues in implementing this integrated way of working, supported by integrated information systems, including those of clinical accountability and clinical leadership, but are now spending less time on the process of bringing data together from different places.

It is reported that 99% of the care provided by KP to its patients is done in the one integrated information system boundary, the Electronic Health Record.

(e) KP’s EHR enables ‘just in time’ remote access to detailed records

Each patient has a ‘home’ location designated in the EHR system. If the patient travels to an area outside the ‘home’, for instance to go on holiday, the healthcare facility there, if it is part of the KP family, can instantly access the detailed patient record, including digital images, in a quick and secure way.

(f) KP’s adopted the philosophy “think globally, act locally”

KP reports that they worked hard to achieve agreement on basic technical ‘norms’ or standards for information systems investments across the organisation, including how systems should ‘talk’ to one another. However, they worked equally hard to ensure that local provider organisations within the KP family could determine their own local flavours of deploying the EHR: how to deploy, when to deploy, how quickly, etc. This meant that the ownership of the deployment results was maintained by the local clinical/management team. KP learned that “the larger the scale, the less effective central command and control becomes”.
(g) KP has reported clinical outcome and economic benefits from its EHR system

The EHR records clinical events and pro-actively embeds intelligence in terms of clinical protocols and guidelines.

For instance, if the patient had an MRI a week ago, the system shows this to the doctor, along with the MRI image and report, and asks the doctor if another is needed. KP has reported that clinical efficacy, outcomes (e.g. for smoking cessation and weight loss) and patient satisfaction measures have improved as result of KP’s integrated information systems.

KP has indicated that improved clinical care through the EHR has saved money due to fewer duplicate tests, reduced adverse drug events and increases in patient safety.

(h) KP’s EHR reports a correlation between data complexity and data volume

KP has reported that the more clinical data that is available, both in terms of the complexity of clinical detail for each patient and the total volume of patient records, the more overall data that accumulates and the greater their clinicians’ and managers’ appetite for analysis and gaining insight into how KP performs clinically, operationally and financially.

To manage this challenge, KP has outsourced its large scale operational, business and clinical data analyses to an external analytics firm called MedeFinance who provide management scorecards, KPIs (key performance indicators) and the like. This is because KP has reported that integrated care not only requires integrated ‘transaction’ systems (systems that handle large volumes of real-time patient activity data) but also the ability to analyse data at various levels of the organisation, including the group, hospital, clinic, clinician and patient levels. They state that this ability is a specialist one which is not easily “done in-house” even for a large organisation as KP.

(i) Summary of KP’s integrated care system
The key points that arise from this brief review of KP’s integrated care system are that:

- KP’s EHR contains a full and detailed patient record
- KP’s EHR is integrated and covers the vast majority of clinical specialties
- KP’s EHR is functionally rich and supports all doctors, nurses and other providers
- KP’s EHR operates across all its care settings: primary, community and hospital
- KP’s EHR is accessible by the patient who can use it to communicate with doctors
- KP’s EHR supports population care with disease registers for chronic conditions
- KP’s EHR is intelligent with active embedded peer-reviewed clinical protocols
- KP’s EHR is available on a ‘just in time’ basis for ‘out of location’ clinicians
- KP’s EHR is at the core of its information systems architecture
- KP’s EHR generates complex data which requires specialist analytical tools
- KP’s EHR was implemented on the basis of ‘think globally, act locally’.

We observe that KP’s EHR is an essential component of its integrated care provision.

4. How do UK information systems compare to those of KP?

The information systems in the UK are fragmented and, as electronic health records, compare unfavourably with KP’s systems in most respects.

- NHS EPR* systems are reasonably developed for individual GP surgeries but rudimentary in the vast majority of acute hospitals in terms of a ‘full and detailed electronic patient record’
• NHS EPR systems are reasonably integrated for GPs, but are very varied for acute hospitals in terms of integration and coverage of clinical specialties

• NHS EPR systems are reasonably functional for individual GPs, but generally poor in acute hospitals and do not support the vast majority of doctors, nurses and other clinicians in hospitals

• NHS EPR systems do not operate across care settings and even within settings, e.g. primary care, work only tend to support individual clinicians rather than for integrated, multidisciplinary care teams

• NHS EPR systems are not accessible by the patient and do not support communication with the patient’s clinical team. (Patients are beginning to be able to store their own clinical information in myhealthspace, but that is not as clinically detailed as the information in the EPR database).

• NHS EPR systems, as used by clinicians for individual patient care, do not support population care or chronic diseases. Disease registers do exist in the NHS but are used for retrospective, population based studies, policy analysis and chronic disease research. They are not generally used to treat individual patients in real-time. There may be some exceptions to this rule, but even these tend to be single-disease oriented.

• NHS EPR systems do exist with some clinical protocols embedded but these tend to be in primary care with only a few examples in acute care. The acute care EPRs have clinical decision support tools, but are still several years away from wide deployment, given the pace of NPfIT roll-out. However, the basic problem with NHS EPRs overall is that they do not work across settings. Hence the need for the patient to repeat the same clinical information given to the GP again to the hospital doctor.

• NHS EPR systems are not the core of the NPfIT but instead are overshadowed by the national spine, or Summary Record system. It is as if the EPR systems in primary care and acute care are mainly there to feed the spine summary record (some call this an instance of ‘tail wagging dog’).

• NHS EPR detailed records are not available to ‘out of location’ clinicians because it is considered that the spine summary record is sufficient for their purposes.

• NHS EPR systems have generally not been sufficiently deployed in the NHS to cause NHS clinicians or managers to be aware of the need to manage large complex databases carefully.

• NHS EPR systems have largely been centrally procured but not always deployed sufficiently at the local level in terms of local ownership and self-determination.
5. Discussion

The NHS seems to find itself behind Kaiser Permanente in terms of its progress in providing integrated care to patients and in developing integrated care systems to support integrated care.

Whether the NHS should follow KP’s particular approaches to integrating care and integrating systems remains to be seen. The NHS has declared an intention to provide integrated care and the idea is to try out different paths to it through ICO pilots.

What is clearly missing, however, is an acknowledgement that integrated care needs integrated information systems.

(a) Information is not enough

In recent articles on ICOs, there is mention of the need for better information to achieve integrated care in terms of local population health data, outcomes measures and information to support the commissioning and monitoring of integrated care.

But one of the key messages from KP is that information is a necessary but not sufficient condition to achieving integrated care. Information systems, and integrated ones, are needed in addition to information in order to (a) help clinicians to work in virtual teams to deliver patient care across care settings; (b) help clinicians to deliver protocols-driven, population-based chronic care across care settings and disease conditions; (c) help clinicians and managers to generate increasingly complex information to drive commissioning, outcomes measurement and research; and (d) help to make the patient experience seamless across the care continuum.

We consider that, based on the evidence from KP, our hypothesis is confirmed and that ICOs do require integrated information systems.

(b) Integrated systems need local IT vision and strategy
Ever since the National Programme for IT started in 2003, there has been a lack of real debate about IT vision and strategy in the NHS particularly at local levels. There is a general disinterest, mostly due to years of frustration and disillusionment, about future IT strategy at local levels. This trend must be reversed in order for integrated systems to be developed (integrated) with integrated care organisations, whatever their shape. No matter who leads ICOs, what their scope of chronic diseases, how the payment incentives are arranged, or what outcome measures are applied, they will need information systems, and integrated ones, of a robust sort in order to ensure that care is delivered in the new and better ways, at the patient level.

In the initial days of the NPfIT, there was a prevailing design for integrated EPR systems that would support the whole care community (or health economy) as the building block of EPR deployments. This design, articulated by the London cluster, was based on a single EPR system operating across all care organisations and settings in the London region, including detailed patient care records driven by clinical protocols and multi-disciplinary integrated care pathways and care processes.

The authors have identified the technical options for developing integrated information systems for local ICOs and these will be described in a subsequent text.

6. Recommendations

In the light of the manner in which Kaiser Permanente has harnessed integrated information systems to deliver integrated care, and the considerations discussed above, the authors recommend that:

(a) The Department of Health and PCTs ensure that integrated information systems, however these are defined for local needs, are part of ICO pilot selection criteria

(b) The leaders of ICO pilots, such as GPs, hospital clinicians and manager colleagues, should ensure that integrated information systems are part of their ICO project design and bid. These integrated information systems should include some or all of the following characteristics:
• Detailed integrated electronic patient record systems that operate seamlessly across primary, community, acute and social care boundaries

• EPR systems linked to population health based chronic disease registries

• Clinical protocols that are embedded in the EPR to produce evidence-based real-time alerts and reminders at the patient level

• Integrated EPR systems that support integrated care pathways, case management systems, for multi-disciplinary clinical team working across settings (into private sector and social care organisations)

• Integrated EPR systems that are accessible and shared by the patient and the doctor (in secure ways)

• Integrated EPR systems that provide cost and utilisation data to clinicians to enable healthcare resources to be managed efficiently.

(c) The leaders of Connecting for Health (CfH) should ensure that NPfIT delivers national support, where required, to local ICOs and their integrated information systems in the future. For instance, where the same EPR system is used across settings by both GPs and hospital clinicians, the information governance and data security policies will need to be defined to cover increasingly complex cross-organisational access to patient data.

(d) Healthcare managers should ensure that their ICO pilots are supported by robust data analysis tools, along the lines that KP have followed, to produce insightful information to support integrated care. The ability to handle complex clinical and resource information will be essential as more electronic patient records are implemented and generate increasingly complex and granular clinical information.

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For this paper, the terms electronic health record, EHR, electronic patient record and EPR are used synonymously.

Exchanging electronic messages between standalone systems does not constitute true systems integration

The care continuum also includes private sector providers and a design is needed to include them equally in all ICOs