

Integrated Care Needs Integrated Information Management and Technology

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Abstract

Integrated care entails that professionals from different organizations have to work together in a team-oriented way to provide high-quality care for a patient. This requires that healthcare professionals share information about – and with – patients at appropriate points in the care or treatment process. The necessary infrastructural arrangements – such as shared patient records, regional collaboration and a clear, transparent incentive structure – must be in place. It is increasingly hard to imagine integrative initiatives without a strong information management and technology component. However, information is a necessary condition but not sufficient to achieve integrated care; organizational change is the more critical component.

Introduction

Integration, the bringing of different entities into unrestricted and equal association, is usually non-trivial and often resource intensive – particularly when health systems or organizations are being integrated. According to Lloyd and Wait (2006), integrated healthcare seeks to close the traditional division between health and social care. In doing so, it:

- Addresses the changing demand for care arising from the aging of the population;
- Offers care that is person-centred, recognizing that health and social care outcomes are interdependent;
- Facilitates the social integration of society's more vulnerable groups through better access to flexible community services; and
- Leads to better system efficiency through better coordination of care.

As responsibilities for providing healthcare are increasingly shared between different organizations, awareness of the need for integrated care increases (Haux 2006). Integrated care can be defined as an organizational principle encompassing continuity of care, shared care and seamless care. In integrated care, professionals from different organizations have to work together in a team-oriented way to provide high-quality care for a patient. This requires high-quality collaborative working relationships, clarity and commonality of objectives, frequent communication among team members, a clear understanding and respect of individual roles and skills within the team and the general flexibility of practitioners.

In a hospital or a clinic, coordination between healthcare workers is facilitated by frequent formal or informal meetings and by a large number of exchanged, and available, documents such as electronic health records and laboratory results. In areas such as home care, however, the team consists of distributed

healthcare professionals who rarely meet, and therefore, have trouble coordinating their work. Despite the mobile nature of home care, mobile information technology (IT) tools giving access to electronic health records are rarely available. Generally, documentation is performed on stand-alone systems or more likely on paper, and the systems used in different organizations are generally autonomous and incompatible. In non-integrated organizational structures and information systems, professionals often spend time searching for information instead of taking care of patients.

As Kwo and Irani (2008) recently published, 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 supporters and critics as well as successes and failures. Horizontal integration aims to consolidate comparable types of organizations for increasing the size and activity scope of the sector through acquisition, collaboration or other forms of cooperation, with the providers offering a similar kind and range of services. Alberta's primary care networks are Canadian examples of horizontal integration. 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 Veterans Health Administration and Kaiser Permanente in the United States are classic examples. The health regions, common across Canada save for Ontario, are examples of partial vertical integration. Either type of integration requires clinical integration with or without corresponding organizational integration. When both clinical and organizational integration are linked and empower each other, success is more likely.

Good communication across organizational and professional boundaries is arguably the most crucial aspect to successful integrated care programs (Winthereik and Bansler 2007). Effective integration of care requires that healthcare professionals share information about – and with – patients at appropriate points in the care or treatment process. This, however, will be possible only if the necessary infrastructural arrangements – such as shared patient records, regional collaboration and a clear, transparent incentive structure – are in place. It is increasingly hard to imagine integrative initiatives without a strong IM (information management) and ICT (information and communication technology) component. However, research on organizational communication has consistently shown that working across functional boundaries and sharing knowledge is extremely difficult, because knowledge is always localized, embedded and invested in practice. The boundaries within healthcare have evolved over time and cannot simply

be eliminated or done away with. Thus, the development of successful information and communication systems for integrated care inevitably requires attending to the rationales of existing boundaries and practices and focusing on the extra work it takes to implement ICT to span specialized domains of practice.

Technical Approaches to Integration

A key issue in supporting cooperation and collaboration required in today's healthcare systems is the need for information sharing between different care providers (Hagglund 2007). Today, shared patient care is hampered due to the existence of numerous electronic and paper-based information systems. These are usually unable to communicate and share information. To achieve a seamless and secure information transfer between different information systems, different levels of interoperability need to be considered.

There are three general approaches to interoperability and integration:

- **Message-based integration** is characterized by data communication between systems that rely on message communication protocols, with data structures and message content following a standardized structure. A message-based integration approach is useful mainly when the type of information to be communicated and shared is selected beforehand, as well as the destination, and is used for sharing segments of an electronic health record. Denmark is well-known as the world leader of this style of integration (Protti 2007).
- **Virtually federated integration**, also referred to as indexing or pointing, implies that information remains within the data storage of feeder systems, and the role of the integration functionality is to keep track of where information is stored and how to access it. Each feeder system regularly sends updates of its index information, a set of structured pointers referencing location of the data, but the actual information is kept in its original storage. Federated solutions to integration provide a uniform way to access patient data from different clinical information systems and provide an environment for integrated access to clinical information. Using a virtually federated integration ownership of information is straightforward, and information is stored in only one place. It is also relatively easy to add or remove feeder systems. All feeder systems must, however, be online when information is requested. Virtually federated integration is most suitable for so-called vertical integration, showing information from one feeder system at a time. The method is used mainly for accessing information, and not for interacting with or updating it. The Regione Lombardia in Northern Italy is taking this approach to its electronic health record (Beretta 2007).

- **Physically federated integration**, or publishing, implies separate data storage in the form of a mediator, or publication, database to which feeder systems publish agreed-upon information on a regular basis, triggered by a set time frame or by user-activated functions in the system. In a physically federated integration, issues of ownership and responsibility for information stored in separate data storage are more complicated to handle. It is also more difficult to add new feeder systems; a mapping process for each system is needed before information can be stored in the separate storage. The benefits are that feeder systems need not be online for information access, and it is easier to create a horizontal integration showing information from several different feeder systems in one view. Furthermore, interaction with feeder systems can be implemented, and updated or added information can be published back to the respective feeder system. In addition, information that is not available in the feeder systems, such as multimedia or information used for communication between different care providers, can be stored. The emerging Summary Care Record in the United Kingdom is a classic example of this approach (NHS Department of Health 2008).

In the United States, the generally favoured approach is to use a health information exchange (HIE) that mobilizes healthcare information electronically across organizations within a region or community, linking the personal information of a single individual held on different databases, while maintaining the relevance and meaning of the information being exchanged (Protti 2008). HIE facilitates access to and retrieval of clinical data to provide more timely, efficient, effective, equitable, patient-centred care. Regional health information organizations (RHIO) are geographically defined entities that, using a range of business and financing models, develop and manage a set of contractual conventions and terms, arranged for the means of electronic exchange of information, and develop and maintain HIE standards.

Information exchange and sharing is complex, especially in the real world of disparate legacy systems and lack of implemented interoperability standards. HIE needs interfacing and aggregating mechanisms that circumvent the lack of standardization and provide an affordable migration path for data from legacy systems into newer technologies as they become available. This requires a secure and ethical environment for informed consent, patient identification, data encryption, extraction, linkage, aggregation and exchange within Internet-based, service-oriented architectures. Solutions need to be low-cost, modular, reconfigurable and adaptable.

Challenges to Interoperable Approaches

Pirnejad et al. (2007) reported on a project that encountered numerous integration problems, many of which persisted even

after extensive technical intervention. An analysis of the problems revealed that they were mostly rooted either in problematic integration of work processes or in the way the system was used. Despite the project's ideal technical condition, the integration could be accomplished only by applying human interfaces.

For an integration process to succeed, it is necessary to combine diverse items of patient data stored in a variety of information systems (data integration) and to prevent data loss or distortion (data integrity). Many have evaluated the challenges inherent in the replacement of paper-based communication with IT communication networks or in the technical integration of diverse information systems or different standards for incorporating patient data. In several studies, the heterogeneity of information systems and standards is referred to as the main impediment to building interoperable communication networks. Pirnejad, however, showed that social and organizational factors are also paramount. He and others have pointed out that lack of attention to how the technological artifact will affect and be affected by the organization in which it becomes embedded lies at the core of many technological failures. Building an interoperable communication network through the integration of information systems, therefore, requires changes in the organization of care practices and the way people use the system.

As Pirnejad reported, two approaches can be distinguished in developing a communication network. The first, a "decentralized approach," is a bottom-up development, starting from micro-level changes among the parties that want to build communication networks. This approach consists of scattered projects based on local IT procurement and the minimal infrastructures to support local communication initiatives – as has been demonstrated in Denmark and New Zealand (Protti et al. 2007). The development process is not necessarily steered by a centrally designed plan or a detailed strategy. Rather, it usually follows a pragmatic approach with the aim of trying to address the parties' immediate needs, albeit in some structured manner. The development proceeds by small incremental advances that are the products of a dynamic negotiation among the parties that have horizontal relationships with each other in the development process. In effect, the process of network building is manageable to local circumstances, and its speed is congruent to the creation of shared interests. Since these networks develop regionally, it is a challenge to manage any macro-level changes (e.g., policy making, legislation) that are necessary for a nationwide integration.

The second approach is in many aspects the converse of the decentralized approach; hence it can be called a "centralized approach." It consists of a single, large-scale project that is governed by a central party, often determined by some form of government. The central party has the power to arrange the required macro-level changes for networking, such as providing the necessary infrastructure and supporting IT policy and laws. The course and the goals are predetermined, and there is a

strategy that offers the best solutions for potential development problems. The implementation is top-down, and the deadlines in this approach ensure that the development will progress at a desired pace. However, the speed of the process challenges the ability of the development strategy to address unexpected problems and changes. Examples of this approach are Kaiser Permanente and the Veterans Health Administration in the United States, and the region of Andalucia in Spain.

Proven “Centralized” Integrated Care Success Stories

Kaiser Permanente (KP) in California and the Veterans Health Administration in the United States are classic examples of a vertically integrated organization. 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 around the world, particularly in the United Kingdom (Lewis and Colin-Thomé 2008).

The amazing success story of the Veterans Health Administration (VHA) within the US Department of Veterans Affairs has been well documented and is generally well-known (Protti 2007). The Asch RAND study found that the VHA outperforms all other sectors of American healthcare. The Congressional Budget Office interim report (2007) on the VHA model found that the key factors behind the VHA’s high quality of care included:

- Organizational restructuring designed to share decision-making authority between officials in the central office, regional managers and key personnel at dispersed medical facilities; and
- Extensive use of health information and technology systems.

Both KP and VHA have what could be called a centralized or “single-record” clinical information system. Their systems have a striking number of similar characteristics, described below.

The KP and VHA Information Systems Are Based around a Single Electronic Health Record

Both information systems are centred on 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. Outside the core are other information systems in the first “ring,” including pathology, radiology and prescribing systems. The next ring comprises the information systems to support clinical specialties (the “ologies”) such as oncology, cardiology, surgery, pediatrics and dermatology.

The EHR is an active, real-time information system that supports individual patient care including clinical assessments,

care planning, charting and other clinical documentation, multi-disciplinary care plans and care pathways, active alerts and reminders, scheduling, test requesting, results reporting, drug prescribing and administration, clinical decision support, clinical communications (e.g., letters, discharge summaries) and clinical coding, as well as support for specialties such as accident and emergency, radiology, dermatology, diabetes and endoscopy. The KP and VHA 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 the database that all caregivers with appropriate access can share at the same time. Each patient has a “home” location designated in the EHR system. If the patient travels to an area outside “home,” the healthcare facility, if it is part of the KP family or the VHA, can instantly access the detailed patient record, including digital images, in a quick and secure way.

In both cases, the EHR works across all 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; it includes all the patient details.

The KP and VHA Information Systems Support Major Care Components

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

Embedded Chronic Care Management

Along with other health systems around the world, both KP and the VHA are targeting chronic conditions such as diabetes, congestive heart failure and asthma on a population basis. Doctors enrol their patients in one or more disease populations and add them to disease registries, based on data extracts from the EHR, in accordance with the patient’s condition(s) and risk factors. The 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. As consolidated disease registries, the EHRs ensure that essential clinical markers for each patient are tracked across all the patient’s chronic conditions and that those co-morbidities are documented and managed through coordinated alerts and reminders.

One of the tools KP uses to operate their population-based care is the case management process, where a case manager role is assigned to keep patients on track with the disease protocol across care settings, including the patient’s home (Kwo and Irani 2008). 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 helps community clinics to notify a patient who has been prescribed with an anticoagulant such as warfarin to attend a clinic to ensure proper drug compliance.

Embedded Clinical Protocols

KP and the VHA both run clinical peer reviews to assess and develop clinical protocols – which are embedded into the EHR systems. 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 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 override it and follow a different course of action. Both EHRs thus accumulate a large and growing number of detailed patient records. These separate data warehouses enable KP and the VHA to identify which clinicians have accepted the clinical protocols and which have elected to override them, and to see how patient outcomes differ between these groups.

Both KP and the VHA have reported that as more clinical data are available – both in terms of the complexity of clinical detail for each patient and the total volume of patient records – and as more overall data accumulate, their clinicians and managers find a greater appetite for analysis and gaining insight into how their organization performs clinically, operationally and financially (Kwo and Irani 2008). Integrated care requires not only integrated transaction systems (systems that handle large volumes of real-time patient activity data) but also the ability to analyze data at various levels of the organization, including at the group, hospital, clinic, clinician and patient levels (Sanders 2007).

KP and VHA Have Adopted the Philosophy of “Think Globally, Act Locally”

Both organizations report that they worked hard to achieve agreement on basic technical norms, or standards, for information systems investments across the organization. However, they worked equally hard to ensure that local provider organizations could determine their own local flavours of deploying the EHR: how to deploy, when to deploy, how quickly and so forth. This meant that ownership of deployment results was maintained by the local clinical/management team. Both organizations have learned that “the larger the scale, the less effective central command and control becomes.” (Kwo and Irani 2008).

Both KP and VHA Have Reported Clinical Outcomes and Economic Benefits from Their EHR System

The EHR records clinical events and proactively 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. Both organizations have reported that clinical efficacy, outcomes (e.g., for smoking cessation and weight loss) and patient satisfaction measures have improved as a result of their integrated information systems. Both have 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 (Asch et al. 2004).

Patients Have Electronic Access to Their Doctor and Health Record

KP's patients can use secure email to contact 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 organize repeat prescriptions and access information such as immunization records for children. The VHA's veteran web portal, HealtheVet, gives veterans access to their EHR, but on a very limited basis, as yet. This project has been slow to roll out; however, it may get renewed impetus with the new administration in Washington.

If a truly patient-centred approach at the local health community level is the desired goal, there is a need to support the adoption of a patient portal providing, among other things, access to patient records (including the ability to add to them and initiate corrections, as well as schedule appointments online) and to clinical knowledge in a patient-digestible form (Protti 2007). The successful exploitation of such a portal will require extensive education of both patients and healthcare professionals, and will support – and require – re-engineering of the care process.

A patient-centred approach will also stimulate the creation of personal health records (PHR). PHRs are Internet-based records that are under the full control of the individual. They are becoming more common, particularly in the United States. They are gradually being recognized as an important aspect of healthcare reform because they encourage patients to take a more active role in their health and treatment processes. These types of changes are the cornerstone of making patients and caregivers the *primus inter pares* (first among equals) of their care teams, and of encouraging patients to assume responsibility for their health.

Conclusion

In recent articles on integrated care organizations, there is always 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 planning and monitoring of integrated care. But one of the key messages from KP and the VHA is that information is a necessary condition but not sufficient to achieve integrated care. Information systems, and

integrated ones, are needed, in addition to information, in order to (a) help clinicians work in virtual teams to deliver patient care across care settings, (b) help clinicians deliver protocol-driven, population-based chronic care across care settings and disease conditions, (c) help clinicians and managers generate increasingly complex information to drive commissioning, outcomes measurement and research, and (d) help make the patient experience seamless across the care continuum.

Interpersonal sharing requires connectedness and semantic standards; sharing among information systems requires interoperability (technical, syntactic and semantic) standards. Optimal information sharing and exchange requires informed patients and providers; accurate, secure and confidential identification of patient, provider and location; accurate and standardized information; robust and secure information systems; and well-grounded standard operating procedures and governance protocols.

It is also essential to recognize that important organizational and cultural changes are to be expected when setting up an integrated communications network or system in healthcare. Pirnejad argued that introducing such a network in an environment where there is insufficient political determination and commitment to adopt the changes is bound to fail; significant changes will emerge only by means of changes at the level of “system incentives.” However, the best solution has to be sought in a combination of the centralized and decentralized approaches. Local communication initiatives have to be supervised and supported; incentives at the organizations’ interest level have to be created to encourage the stakeholder organizations to adopt the necessary changes.

There are many reasons for failure when implementing ICT in and across healthcare organizations. One of them relates to the confidentiality of patient information, another to the fact that ICT systems introduce new ways of working at all levels of an organization; the paper records in use today have co-evolved with working practices over many years. Politicians, technology designers and managers often underestimate the time and effort it takes to successfully adapt and incorporate a new technology into the existing “information ecology,” that is, the existing system of people, practices, terminologies, and information and communication technologies in the local environment. Successful implementation is difficult to achieve, because information ecologies are diverse and continually evolving, and there are strong inter-relationships and dependencies among the different parts. **HQ**

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