

Predefined Headings as a Base for Intellectual Capital in Swedish Health Care Sector

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Abstract: The health care sector is a knowledge-intensive sector with valuable assets. This stock of knowledge is defined as intellectual capital. Management of intellectual capital in the health care sector faces several challenges; particularly challenging is the lack of integration between the different IT systems and thereby the lack of integrated information. Semantic interoperability allows the right information to be available to the right people at the right time across systems. Structured and standardized predefined headings can be a tool to enable semantic interoperability. The aim of this article is to argue that predefined headings are an expression of knowledge-based healthcare and therefore can be a base for intellectual capital in the Swedish health care sector. Predefined headings are employed in both electronic health records and in national quality registries. National quality registries are sources of “knowledge of improvement” because they contain data integrated into clinical workflows which, after analysis, can lead to documented evidence-based practice and practice-based evidence. The predefined headings in national quality registries are expressions of important indicators to follow up. The source for the data in national quality registries is data registered in patients’ electronic health records. The predefined headings in electronic health records are expressions of knowledge and experience of what information is necessary to provide good health care. Consequently, predefined headings are expressions of knowledge-based healthcare and can therefore be a base for intellectual capital in the Swedish health care sector.

Key-Words: - Electronic Health Records, National quality registries, Knowledge-based healthcare

1 Introduction

Sweden, when compared with other countries, produces high quality health care and is in first place in the efficiency index where the overall quality of health care is related to the cost of achieving this quality [1].

The health care sector in Sweden is heavily decentralized with 21 county councils and regions responsible for financing and providing good health care for all inhabitants in the country. The principle

of local self-government gives each county council and region the right to design health care services with reference to local conditions. [2]

However, this principle enables differences between county councils and regions in terms of both organizational infrastructure and IT infrastructure. The National Board of Health and Welfare (NBHW) has recently pointed out remarkably large differences between county councils and regions regarding access to health care services, medical results and financial results. [3]

In addition to these differences between county councils and regions, the Swedish health care sector, like health care sectors in other countries, is facing massive challenges: demographic changes, medical and technological advances, growing expectations of citizens, and stabilizing financial resources [4-6]. However, as Elg et. al. express; ‘financial resources allocated to health care are not expected to increase’ [4], p. 102]

The health care sector is a complex system involving different stakeholders: health care professionals, patients, researchers, IT suppliers, government, administrators and others. Health care professionals, such as physicians and nurses, have to work together in order to deliver good quality health care for their patients. Their decisions are dependent on knowledge and it is important that knowledge created by one part is shared with other parts as there is the need ‘to deliver the right information, at the right time, to the right person, and in the right format.’ [7], p. 497]

The health care sector is a knowledge-intensive sector with valuable assets. This stock of knowledge is defined as intellectual capital (IC) [8]. Chang et. al. describe IC as the knowledge-related intangible assets embedded in an organization [9]. It is widely accepted that IC is a crucial factor for organizational success [10]. Effective management of IC, together with physical capital, contributes to sustainable and competitive advantages [11]. IC is also perceived as a factor which can partly explain variations in the performance of healthcare organizations [8].

In the literature, it is difficult to find contributions regarding the study of IC management in the health care sector. The research field has focused mostly on single organizations, for example hospitals. [11-13]

Management of IC in the health care sector faces several challenges; particularly challenging is the lack of integration between the different IT systems and thereby the lack of integrated information [7].

Over the years different solutions of technical interoperability have been invented and implemented. However these solutions are ineffective because they do not solve the lack of semantic interoperability. Semantic interoperability allows the right information to be available to the right people at the right time across products and organisations [14, 15].

In a recent study we argued that structured and standardized headings (defining health information

similar to physical labels on boxes [16]) can be a tool to enable access to health-related information at the right time, to the right person and in the right format.

2 Aim

The aim of this article is to argue that predefined headings are an expression of knowledge-based healthcare and therefore can be a base for intellectual capital in the Swedish health care sector.

3 Intellectual Capital

Traditionally IC is described as the stock or sum of knowledge which organizations use for value creation and competitive advantage [8, 17, 18]. There are three different types of IC: human, structural and relational capital, see figure 1.

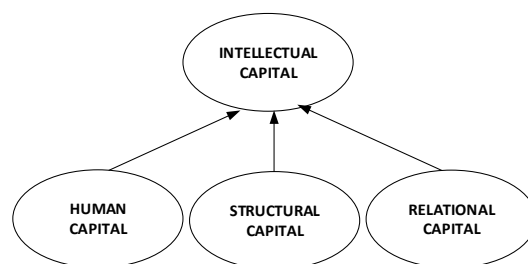


Fig. 1: Conceptualisation of Intellectual Capital (after Bontis, N., 1999)

Human capital is defined as the knowledge, skills and experiences owned and utilized by individuals. In the health care context this knowledge is an important factor in achieving high performance [20].

Structural capital, also called organizational capital, is defined as institutionalized knowledge. The individual knowledge is codified, stored and shared. This knowledge together with routines, procedures, IT systems, research and organizational culture constitutes organizational capital. [11]

Relational capital, also called social capital, is defined as the knowledge available through, derived from, and utilized by networks of relationships. It is the knowledge at group level. [19]

These three types of IC are interdependent and they form the stock of knowledge in an organization [8]. IC is created by individuals and needs to be shared before it becomes knowledge at the group or organizational level [8, 20].

According to Nonaka it is important to highlight the distinction between information and knowledge. Information is defined as a flow of messages and knowledge; 'is created and organized by the very flow of information, anchored on the commitment and beliefs of its holder. This understanding emphasizes an essential aspect of knowledge that relates to human action.' [20], p. 15]

Nonaka's 'Spiral of organizational knowledge creation' explains how tacit and explicit knowledge held by individuals can be transformed, legitimized, enlarged and enriched [20].

4 Knowledge-based healthcare

According to the Patient Act each patient must receive health care services in accordance with scientific knowledge and accepted quality standards of practice [21].

The NBHW is a government agency under the Ministry of Health and Social Affairs. In 2009 the NBHW launched the concept of Good health care which should be knowledge-based, safe, patient-centered, efficient, equitable and available. Knowledge-based means that the health care should be built on the best available knowledge. Safe means legal security and preventing the patient from health care injuries. Patient-centered means individualized health care built on the individual patient's needs, values and expectations and with the opportunity for the patient to participate in their care. Efficient means that the health care is built on the utilization of available resources in order to achieve the best health care goals. Equitable means that good health care quality is provided and distributed on equal terms to all patients. Available is about accessibility and health care being provided in a timely manner. [22]

Knowledge is a central concept for "Knowledge-based health care". In a report the NBHW describes different types of knowledge, for example knowledge of facts, understanding skills, practical skills and familiarity skills. [22]

Knowledge-based health care is a principle which relies on science, i.e. evidence-based practice (EBP) and practice-based evidence (PBE) where "EBP is about using evidence to guide practice. PBE is about obtaining evidence from practice." [23], p. 50].

5 National quality registries

National quality registries (NQRs) in Sweden are part of an overall knowledge system enabling monitoring of quality and results within the Swedish health care sector [24]. On a national level the reports from NQRs constitute important input to monitoring and comparing performance of health care among county councils and regions; an example is 'Open Comparison and Assessment' [25].

This knowledge system is also a base for evaluation, development and continuous learning in the health care sector [24]. NQRs are sources of "knowledge of improvement" because they contain data integrated into clinical workflows, which, after analysis, can lead to documented evidence-based practice and practice-based evidence of, e.g., methods and material used in health care. This, in turn, leads to better outcomes for patients. [24].

In Sweden, NQRs have a long history. From the beginning, they were created by the individuals who themselves would benefit from them in their professional lives.

Today there are about one hundred NQRs in Sweden; examples include the Swedish Hip Arthroplasty Register, National Quality Registry for Stroke (Riksstroke), and National Diabetes Registry. The NQRs contain individualized data concerning health information about patients such as medical interventions, procedures and outcomes. [24] The data is protected by the Patient Data Act [21] and all county councils and regions are recommended to register data in NQRs.

Reports from NQRs are available to health care professionals and managers in county councils and regions [24]. NQRs are also a unique base for research in health care. Some NQRs are freely available to all inhabitants via the Internet.

The source for most of the data in NQRs is data which has been manually registered in patients' electronic health records (EHRs) by health care professionals. Registration of data to most NQRs is via forms on a website. For some NQRs there are special technical solutions which enable transfer of data from EHRs in county councils and regions, see figure 2.

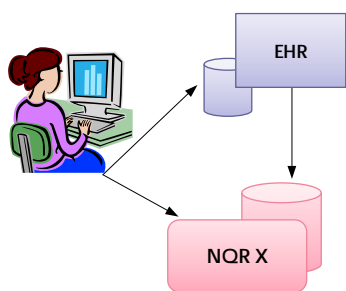


Fig. 2. From patient's EHR to NQRs - two different ways of data registration

Both ways have disadvantages. Registration via forms on a website is done by health care professionals which is both expensive and time consuming. The special technical solutions unique for each NQR are expensive for both county councils and regions and NQRs. There are ongoing national efforts to facilitate data transfer from EHRs to NQRs by implementing national standards [24].

6 Electronic health records

An EHR is defined as an electronic record of health-related information on an individual which conforms to nationally recognized interoperability standards and which can be created, managed, and consulted by health care professionals across health care organizations. Health-related information includes, among others, treatment and discharge summaries, investigation results and reports, prescriptions and health care professional notes. [26]

The primary purpose of EHRs is to support the continuity, efficiency and quality of health care. The information in an EHR is retrospective, concurrent, and prospective [27]. For health care professionals and patients, the EHR represents opportunities in terms of accessible, systematic, and comprehensive patient information. [28]

The EHR is expected to provide information when and where it is needed about the patient [29, 30]. Previous research has shown that predefined headings are employed to structure health information about patients in EHRs [31, 32]. Most EHRs in Sweden are similar to the previous handwritten health records structured by predefined headings in predefined templates [33], see figure 3.

Anamnesis
 -Contact cause
 -Heredity
 -Previous diseases
 -On-going health issue
 -Hypersensitivity
Status
 -Heart/circulation
 -Blood pressure
 -Rate
 -Lungs/respiration
 -Saturation
 -Neurological
 -BMI
Assessment
 -Assessment health issue
Activities
 -Investigations
 -Interventions
Diagnoses & action code

Fig. 3. An example of a predefined template with predefined headings in an EHR.

7 Predefined Headings in EHRs and NQRs

Predefined headings are expressions of knowledge-based healthcare. As early as 1730, criteria for proper documentation of disease progression was the focus in a medical thesis [34]. At the first hospital in Sweden, Serafimerlasarettet in Stockholm, 50 rules governed health care activities in 1755. Some of these rules governed documentation in health records. The documentation should include diagnosis, therapy, cure, surgery, food and disease progression. [35] One hundred years later, at the same hospital, health records were structured by predefined headings; examples of predefined headings employed in 1851 include previous diseases, cause of disease, symptoms, diagnosis and prognosis [35]. In 1984 a structure of predefined headings for a basic health record was introduced to the Swedish health care sector. The structure of predefined headings was developed by physicians and examples of predefined headings included hereditary, previous diseases, hypersensitivity and symptoms. [36] Health care professionals defined the headings based on their knowledge and experience of what information is necessary to provide good health care [37].

Underneath each predefined heading, the health care professional enters narrative text, one or more predefined statements, or a numeric value, see figure 4.

Anamnesis	
- Contact cause	Difficult to talk, weak right hand
- Heredity	Mother died of stroke
- Previous diseases	Heart failure
- On-going health issue	Hypertension
- Hypersensitivity	Peanuts
Status	
- Heart/circulation	Regular rhythm
- Blood pressure	160/85 mmHg
- Rate	60 beats/min
- Lungs/respiration	Normal breathing noise
- Saturation	99%
- Neurological	Dysphasia. Reduced power right side.
- BMI	27.4 kg/m ²
Assessment	
- Assessment health issue	Suspected stroke
Activities	
- Investigations	CAT Scan Brain
- Interventions	
Diagnoses & action code	I63.9 Cerebral infarction, unspecified

Fig. 4. An example of a completed template in an EHR.

Predefined headings are also employed for NQRs. Each NQR has defined their headings based on the indicators which are important to follow up for their specialty. Two examples of important indicators are Albuminuria for diabetes and Acute exacerbation for Chronic obstructive pulmonary disease (COPD). Further, there are predefined headings which are common both for diabetes and COPD, e.g. Blood pressure.

The problem is that due to the tradition of local self-government each county council and region has their own terminology of predefined headings in their EHRs. An example is blood pressure that in one EHR has Blood pressure as a predefined heading, in another EHR has Systolic pressure and Diastolic pressure as predefined headings and in a third EHR has Systolic blood pressure and Diastolic blood pressure as predefined headings.

The result of a study showed that the number of shared and standardized predefined headings in EHRs across three county councils and regions was just 2% [38]. This means that health information about the same patient cannot be exchanged between county councils and regions. The solution is semantic interoperability, which means that the information is unambiguously understood in content, meaning, and purpose by the receiver [39, 40].

8 Conclusions

Predefined headings are expressions for health care professionals' knowledge, skills and experiences. When deployed in EHRs the information and

knowledge can be shared within the county council or region, and by deployment in NQRs the information and knowledge can be shared among county councils or regions. As a result predefined headings should be regarded as intellectual capital.

There is an assumption that there is semantic interoperability between EHRs and NQRs, e.g. that the predefined headings in NQRs are shared with EHRs. However, the fact is that each county council and region has its own terminology of predefined headings in their EHRs and each NQR has its own terminology of predefined headings which means a lack of semantic interoperability between EHRs and between EHRs and NQRs.

Thus, there is a lack of regional and national management of predefined headings deployed in both EHRs and NQRs. This lack results in multiple documentation, e.g. health care professionals must first document in an EHR and then register the same information in another way in a NQR. Consequently this is time-consuming and impacts the workload, data quality, and partly the performance of health care.

We believe that predefined headings in a form of a shared and standardized terminology can be a base for an intellectual capital in the Swedish health care sector. Therefore we recommend management of predefined headings on a national level in order to identify areas of health care which are most valuable to share across health care professionals and county councils and regions. We believe that a national management of predefined headings can contribute to health care which is knowledge-based, safe, patient-centered, efficient, equitable and available.

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