

A Retrospective Analysis of Health, Health Care, and Legal Requirements as Reflected in Predefined Headings in an EHR

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Abstract

Objectives: To study health, health care, and legal requirements as reflected in predefined headings that were applied by users in a Swedish multi-professional electronic health record (EHR). **Method:** Predefined headings ($n = 3\,596$) applied to 20 398 104 occasions by health care professionals in a module for care documentation in an EHR were analysed. A qualitative content analysis was used to explore health and health care as reflected in the predefined headings. Furthermore, a comparison was made between the health and health care aspects and the Swedish Patient Data Act (PDA) to examine whether the aspects corresponded to legal requirements. **Results:** The analysis yielded a meaningful structure that included five categories and 23 subcategories. The categories were Description of the patient, Health care process, Resources employed, Administrative documentation, and Development and research. Of the 23 subcategories, 15 corresponded to four of the seven legal requirements in the PDA. No corresponding subcategories were observed for three of the legal requirements. **Conclusions:** The predefined headings of the multi-professional EHR were possible to analyse and categorise. The analysis showed that the headings reflected a wide range of health and health care and that synonyms or similar terms occurred as headings. The majority of the subcategories corresponded to the legal requirements of the PDA. The legal requirements that referred to patient rights did not have any corresponding subcategory. Subcategories that were found and that concerned goals to be attained and intervention outcomes were not explicitly expressed as legal requirements in the PDA.

Keywords: Documentation; Electronic Health Records; Legislation; Qualitative content analysis

1 Introduction

Health records are written, pictorial or tape-recorded information established or received in connection with patient care. The information in health records contains details about patient's health or other personal circumstances or health care interventions performed or planned [1]. Previously, written information about the patient's health and health care was exclusively accessible to the professional group that had written the information [2]. Communication of information comprising the patient's health and health care between health care professionals is an important factor that contributes to

the effectiveness of health care [3]. To improve the quality of care the widespread use of electronic health records (EHRs) is current practice [4-5]. In relation to providing care the EHR is theoretically expected to be the main instrument for information and communication between health care professionals [6-7]. To be functional EHRs must be clearly structured and searchable [8]. However, usability is often reported to be restricted because of difficulties in finding information in EHRs [9]. The restriction may be attributed to the fact that health care professionals do not apply a shared language for specific purposes in EHRs [10-11]. Thus, the lack of a shared language may severely lower the

quality and usability of multi-professional EHRs.

1.1 Modules, templates, and headings

EHR systems consist of different modules (e.g., care documentation, medication, and care management). The module for care documentation contains templates [12-15] made up of predefined headings [16-17]. The templates and headings are defined according to what health care professionals perceive as necessary information to provide quality and safe patient care. The headings serve to structure the information into larger or smaller units [18] and to provide the units with context [19]. Each heading briefly defines the content in each unit as a label on a box [18]. Applying templates and predefined headings can help meet the requirement that the EHRs must be usable [17, 20-22]. Hence, the predefined headings aim to support the user to enter and search information in a systematic and structured way [16]. When recording, users initially choose a template followed by selecting predefined headings in the template they consider the most appropriate for the information entered into the EHR. An example of an applied template in an EHR is illustrated in Figure 1.

1.2 Predefined headings

In order to provide health care professionals with an efficient electronic tool, development of terminologies including headings for the use in EHRs has taken place. Internationally, SNOMED CT is one example [23] and Contsys [24] is another. In Sweden the National Board of Health and Welfare has the objective to provide the Swedish health care with a national information structure including terminology and headings and to recommend its use [25-27]. One part of this was to translate concepts in SNOMED CT into Swedish and since 2011 the translated concepts are optional to apply. But, a national information structure including SNOMED CT is still not available for those who choose to apply it [26]. In Sweden, as well as in several other countries, headings in templates of health records have been predefined by professional groups, [19-20, 28-33] and medical specialties [19, 22, 34-36]. In two Swedish studies professional groups shared less than 2% of predefined headings [11, 22]. In addition, less than half of the predefined headings were shared by two or more professional groups in a multi-professional EHR [11]. These results suggest that the professional groups apply their own clinical language as predefined headings. From these findings, it follows that there is risk for headings that are homonyms (same heading for different concepts) and synonyms (different headings for the

same concept) [28, 37]. In one study it was difficult to compare information from different EHR systems because synonyms were applied [38]. Furthermore, in one of the Swedish studies predefined headings were categorised to reflect the ambiguity level of each heading. The distribution across four categories was 13% for Specialist terms, which were the least ambiguous headings, 46% Terms for specific purposes, which were less ambiguous than Common words (28%), which were the most ambiguous headings. The remaining headings (13%) were categorised as Unclassified headings [11]. In a Nordic perspective an additional three studies were identified concerning predefined headings. A comparison of headings in four physical examination templates from Sweden and Denmark mapped to SNOMED CT revealed a core set of headings for physical examination [32]. Two studies of headings applied in EHRs by physiotherapists and physicians in Finland demonstrated that the physiotherapists' decision-making process was difficult to follow [33] and that the headings reason for care, patient history, health status, follow-up care plan, and diagnosis were meaningful for the physicians [19].

1.3 Swedish legislation

The Swedish Patient Data Act (PDA) [1] proposes that information management in health care should be organised to meet the demands of patient safety and quality of care, as well as to promote a cost effective delivery of health care. The information that EHRs must contain is prescribed in the Swedish PDA. Legislation requires the following content: patient identity, background information for care, information concerning diagnosis and reason for interventions, information on interventions performed and planned, information provided to the patient, statements made in the selection of treatment options, and the possibility of a new medical assessment [1]. Because the legislation rules what the EHR must contain in only general terms, the health care professionals must determine what types of information need to be documented in the EHR [39]. However, it is not known how extensive the information should be in the EHR [8]. Only one paper from Finland has explored the relation between EHRs and legislation. This study reported poor correspondence between the local EHR and the following legal requirements: reason for encounter, patient history, acute problem, status, treatment, and prescriptions [40].

1.4 Problem

The EHR serves as an important tool for systematic documentation and exchange of health care information

Anamnesis	
Current health issue	January 28 respiratory failure and staphylococcus sepsis from an olecranon bur-
On-going health issue	sitis. January 30 suffering from hypoxic cardiac arrest due to mucus plug.
Former health issue	Parkinson's disease, osteoporosis
	1991 and 1997 surgery, bilateral knee prostheses
State	
Communication	Looking up at times, difficult to contact
Heart/circulation	Circulatory stable
Body temperature	37.5°C [36 – 37.5]
Lungs/respiration	February 10 tracheotomy
Nutrition	Enteral, no retention
Height	165 cm [50 – 200]
Weight	62 kg [0 – 300]
BMI	22.8 kg/m ² [22 – 30]
Elimination	Catheter, good diuresis
Skin	
Sacrum	Red area with abraded skin approximately 10 x 10 cm
Assessment	
Assessment health issue	Stable, but decubitus (pressure) ulcer at sacrum
Interventions	
Special care	Start anti-decubitus interventions

Figure 1: An example of an applied template (day note) in an EHR. The predefined headings are on the left-hand side and the entered information on the right-hand side.

[12, 16, 40-41], but it can also serve as a source of information for patients [1]. The quality of care and patient safety is expected to improve by providing complete and unambiguous information that is easily accessible through searchable predefined headings. In Sweden, predefined headings are typically locally composed of terms suggested by medical specialists and professional groups. Thus, there is no common national inter professional standard of predefined headings that is mandatory to apply. Studies on predefined headings in EHRs are few and those that do exist are mainly from the Nordic countries. One study showed that predefined headings applied in a multi-professional EHR system did not constitute a joint language for specific purposes [11], which may restrict the quality and usability of the EHR. These findings indicate the need for further studies to determine which aspects of health and health care the predefined headings reflect as well as to examine their correspondence to legal requirements.

2 Aim

The aim was to study health, health care, and legal requirements as reflected in predefined headings as applied by users in a Swedish multi-professional EHR. Two research questions were addressed:

- What aspects of health and health care do predefined headings reflect?

- Do the aspects of health and health care as reflected in predefined headings correspond to the requirements of the Swedish PDA?

3 Methods

Because knowledge in this area is just evolving, an explorative descriptive design was used.

3.1 Context

All county councils and regions (in total 20) in Sweden have a considerable degree of autonomy (self-government) and have independent powers of taxation. Each county council or region, as the main provider of health care at the regional level, has to organise and manage their health care so that all patients have access to high-quality health care in accordance with national policy, principles, and guidelines [42]. At the time of data collection, one of the county councils in central Sweden had implemented a multi-professional EHR system for all health care divisions, except for dentistry. The various divisions consisted of a university hospital, a county hospital, primary care, and the division responsible for habilitation and assistive technology services in the county. The EHR system at that time was made up of modules for care documentation, medication, and care management.

3.2 Sample

During a 12-month period in 2007, all predefined headings in the EHR system's module for care documentation as applied by health care professionals obligated to document according to the Swedish PDA [1] were included in the study. Since 2007, no major revisions of the predefined headings have taken place. The health care professionals, representing 66% (n=5 509) of all system users (n=8 348), were dieticians (n=43), medical social workers (n=176), occupational therapists (n=137), physicians (n=1 788), physiotherapists (n=266), psychologists (n=171), registered nurses (n=2 886), and speech and language pathologists (n=42). Predefined headings applied by professional groups not found in all divisions were excluded (e.g., dentists, midwives, optometrists, and research nurses). All applied predefined headings were consecutively stored in a local database. The first author obtained access to the database from the chief medical officer (the owner of the EHR system) and the county council's lawyer. After testing different search terms, the following terms were used to obtain the unit of analysis: predefined heading, profession, number of professionals, and number of notes. The same search terms were used twice and the same data appeared both times.

3.3 Unit of analysis

The unit of analysis in this study consisted of 3 596 predefined headings, applied to 20 398 104 occasions by health care professionals. The predefined headings consisted of single terms, multiple terms, expressions, or phrases. The predefined headings were compiled in alphabetical order in a spreadsheet program.

3.4 Data analysis

3.4.1 Aspects of health and health care as reflected in predefined headings

Qualitative content analysis [43-45] was used to analyse what aspects of health and health care the predefined headings reflected. The analysis started by having the first author read through the spreadsheet with the predefined headings several times to acquire an overall sense of the material. Thereafter, the first author treated the predefined headings as codes and sorted them into subcategories based on shared commonalities (e.g., professions' denominations and medical equipment terms) or based on shared formats for the entered information (e.g., dates and values). Next, all four authors compared and thoroughly discussed the subcategories and their content of predefined headings. After repeated

discussions, the first author merged or rearranged the subcategories so that they were all based on shared commonalities. The predefined headings that could not be sorted into any subcategory were excluded from the analysis (n=192). These excluded predefined headings included abbreviations (e.g. 'HMT'), proper names (e.g. 'Fischer'), specifications of predefined headings (e.g. 'Pressure'), or combinations of predefined headings (e.g. 'Heart/circulation'). The subcategories were compared and then aggregated into categories. The authors discussed the denominations chosen for the subcategories and categories until consensus was reached.

3.4.2 Aspects of health and health care as reflected in predefined headings corresponding to legal requirements

To examine how the aspects of health and health care as reflected in the predefined headings corresponded to the PDA each subcategory was compared with each legal requirement. With the purpose of putting the PDA into practice, the National Board of Health and Welfare published regulations [46] and a handbook [47]. These two publications were thoroughly read to arrive at a deeper understanding of the legal requirements. In the text that follows seven legal requirements are briefly described. The first requirement is Patient identity, which consists of the patient's personal identification number, surname, and first name. Background information for care comprises an essential description of heredity as well as previous and current states related to health. Information concerning diagnosis and reason for interventions is made up of all established diagnoses, medical assessments of the patients' health, including whether they are hypersensitive to drugs or other material, whether the patient is a disease carrier and reason for medication, reason for surgery or other forms of prevention, investigation, and treatment. Information on interventions performed and planned is composed of an essential and summarised description of performed and planned prescription of drugs, surgery, or other forms of prevention, investigation, treatment, and outcome of the investigation. Information provided to the patient consists of a description of what information the patient has received concerning diagnosis, reason for interventions, and any planned and performed interventions. Statements made in the selection of treatment options comprise both a description of the treatment options and the statement of treatment, including potential exclusion of treatment. The seventh requirement is the Possibility of a new medical assessment, which consists of information pertaining to the case when a patient has been given the opportunity for a new medical assessment, i.e. a second

opinion [1, 46-47]. The authors discussed the legal requirements in relation to the subcategories several times until consensus was achieved.

3.5 Ethical considerations

The study was reviewed by the Regional Ethical Review Board in Uppsala, Sweden (Dnr 2009/186).

4 Results

4.1 Aspects of health and health care as reflected in predefined headings

The analysis resulted in five categories and 23 subcategories of predefined headings (Table I).

Below, examples of predefined headings are presented to illustrate the subcategories. These headings were translated into English from Swedish and are presented by 'inverted commas'.

4.1.1 Description of the patient

The category Description of the patient focused on the individual, the subject of care.

- Activities in daily life referred to the individual's own activities. Examples of predefined headings were 'Personal care' and 'Employment'.
- Current functioning specified the individual's normal functions, abilities, skills, and behaviours. Examples of predefined headings were 'Cough function', 'Skin elasticity', 'Skin ductility', 'Physical performance ability', 'Reading skills', and 'Communicative behaviour'.
- Current state of health referred to the individual's current health state. Examples of predefined headings were 'Post-surgery state' and 'State of health'.
- Environment and financial situation indicated the individual's physical and social environment and economic security. Examples of predefined headings were 'Residency', 'Social network', and 'Sickness benefit'.
- Health history alluded to the individual's development and prior experiences related to health. Examples of predefined headings were 'Bodily development' and 'Onset of symptoms'.
- Ill health reflected deviations from health, such as diagnosis, symptoms, behaviours, experiences,

signs, and problems. Examples of predefined headings were 'Diabetes', 'Oedema', 'Dependency disorder', 'Anxiety', 'Signs of psychosis', 'Urinary disorder', and 'Social problem'.

- Intake of food and drink concerned the individual's eating habits, daily meal routines, and types and amount of food consumed. Examples of predefined headings were 'Eating behaviour', 'Lunch', 'Vegetables', and 'Size of portion'.
- Lifestyle related to health denoted the individual's lifestyle, including beliefs and culture. Examples of predefined headings were 'Spiritually' and 'Philosophy of life'.
- Person identification pertained to the determination of the individuals and their demographic characteristics. Examples of predefined headings were 'Surname', 'Age', and 'Gender'.
- Physical structure related to the individual's body with focus on structures, cavities, fluids, gases, and substances. Examples of predefined headings were 'Prostate', 'Bronchus', 'Synovial fluid', 'Arterial gas', and 'Faeces'.

4.1.2 Health care process

In the category Health care process the focus was on the different steps taken. These steps included ascertaining the individual's health state, via influencing the individual's health state to the outcomes of health care actions.

- Activities and tools for investigations and evaluations concerned different ways of determining the health state of the individual, such as estimating, measuring, recording, scoring, and testing, as well as examination, inspection, observation, palpation, inspection, interview, culturing bacteria, sampling, microscopy, and screening methods. Examples of predefined headings were 'X-ray', 'Rectoscopy', 'Visual inspection', 'Fluid registration', 'Energy intake', 'Gynaecological ultrasound', and 'Coagulation inquiry'.
- Statement of assessments referred to statements of the individual's health and included assessments of cause, need, risk, indication, forecast, priority, and classification. Examples of predefined headings were 'Assessment of health problem', 'Contact cause', 'Nutritional need', 'Fall risk', and 'Surgical indication'.

Categories	Subcategories
Description of the patient	Activities in daily life
	Current functioning
	Current state of health
	Environment and financial situation
	Health history
	Ill health
	Intake of food and drink
	Lifestyle related to health
	Person identification
	Physical structure
Health care process	Activities and tools for investigations and evaluations
	Statement of assessments
	Goals to be attained
	Planning of actions
	Care interventions
	Outcomes of actions
Resources employed	Medical specialties
	Health care professionals
	Equipment and material
Administrative documentation	Care management
	Forms related to care
Development and research	Quality registries
	Research participation

Table 1: Categories and subcategories of predefined headings.

- Goals to be attained denoted the expected or desirable health state to achieve. Examples of predefined headings were ‘Expectation’, ‘Goal of rehabilitation’, and ‘Interim goal’.
- Planning of actions concerned schedules of care actions. Examples of predefined headings were ‘Care planning’ and ‘Discharge planning’.
- Care interventions pertained to efforts to impact the individual’s health. Examples of predefined headings were ‘Intervention’, ‘Interventions’ ‘Pain relief intervention’, ‘Psychiatric physiotherapy’, ‘Catheterisation’, and ‘Plastering’.
- Outcomes of actions related to outcome of investigations, such as test results, as well as outcome of interventions, such as stomas, anastomosis, and catheters. Examples of predefined headings were ‘Microbiology reply’, ‘Gastrostomy’, and ‘Vein anastomosis’.
- Medical specialties reflected specialties involved in care. Examples of predefined headings were ‘Phonology’, ‘Neurosurgery’, and ‘Rheumatology’.
- Health care professionals referred to professionals involved in care. Examples of predefined headings were ‘Midwife’, ‘Vascular surgeon’, ‘General practitioner’, and ‘Occupational therapist’.
- Equipment and material concerned apparatus, materials, and pharmaceuticals used in care. Examples of predefined headings were ‘Bladder scan’, ‘Bronchoscope’, ‘Implant’, ‘Pacemaker’, and ‘Psychopharmacological drugs’.

4.1.4 Administrative documentation

Administrative documentation was the category focusing on the administrative support in the provision of care.

4.1.3 Resources employed

The category Resources employed focused on the use of resources in performing care.

- Care management reflected administrative information in the provision of care, such as contacts, visits, collaboration, and legal aspects. Examples of predefined headings were ‘Encounter type’, ‘Court

decision', 'Consent of information', 'Permission', and 'Information provider'.

- Forms related to care denoted written documents, such as certificates, statements, medical referrals, schedules, notifications, applications, letters, notices, and plans. Examples of predefined headings were 'Medical referral reply', 'Medical report', and 'Health declaration'.

4.1.5 Development and research

The category Development and research focused on the individual's participation as a means to increase quality of care.

- Quality registries referred to participation in quality registries. An example of a predefined heading was 'National Quality Registry'.
- Research participation pertained to participation in research. An example of a predefined heading was 'Protocol number'.

4.2 Aspects of health and health care as reflected in predefined headings corresponding to legal requirements

Comparing aspects of health and health care as reflected in the predefined headings with the legal requirements indicated that 15 of 23 subcategories corresponded to four of seven legal requirements in the PDA (Table II).

Eight subcategories did not correspond to any legal requirement in the PDA and three legal requirements in the PDA did not correspond to any of the subcategories.

5 Discussion

In this study the analysis of aspects of health and health care as reflected in the predefined headings produced a meaningful structure of five categories and 23 subcategories. The categories were Description of the patient, Health care process, Resources employed, Administrative documentation, and Development and research. The analysis revealed that 15 of the 23 subcategories corresponded to four of seven legal requirements in the PDA. Three of the legal requirements had no corresponding subcategories.

5.1 Aspects of health and health care as reflected in the predefined headings

The five categories and 23 subcategories represented a range of aspects of health and health care and constituted a meaningful structure. This structure enables a

detailed monitoring of each patient and offers conditions for management control. Thus, most health care professional obligations and health care management demands are met. More than half of the subcategories in the present study (e.g., Health history, Lifestyle related to health, Statement of assessments, and Planning of actions) are generally consistent with findings from a literature review of research [21]. However, the present results also offer information on aspects that have not been given any special attention in the literature. One example is the subcategory Environment and financial situation in the category Description of the patient. This subcategory emphasises the context of the individuals rather than the individuals themselves. Nearly 3 600 predefined headings were analysed in this study. The results showed the occurrence of synonyms or similar terms, a finding that corroborates previous studies of EHRs [17, 19]. Synonyms or similar terms may contribute to difficulties in finding information in EHRs. Such difficulties were reported in an analysis of clinical queries in an EHR search utility [9]. Removing synonyms or similar terms will most likely decrease these difficulties.

5.1.1 Description of the patient

In this study multiple aspects were found describing the patient. To begin with, some aspects were related to the patient's bodily details (e.g., 'Arterial gas') and the patient's context (e.g., 'Social network'). Concerning patient, some aspects reflected the past (e.g., 'Bodily development') but also the present (e.g., 'Reading skills') with respect to the patient's health. Moreover, some aspects represent the healthy individual (e.g., 'Exercise habits') as well as the ill patient (e.g., 'Urinary disorder'). Objective (e.g., 'Sickness benefit') and subjective aspects (e.g., 'Spiritually') were both observed. The results confirm a previous study showing variation of headings in EHRs [17]. However, it may be that having a large number of aspects is actually a barrier to finding information in the EHR and that some aspects of information are not necessary in providing high quality and safe care. Thus, to determine which aspects are necessary in EHRs requires considerable effort. First, it is suggested that systematic surveys are needed to describe all aspects in EHRs. Second, health care professional group representatives with experience and understanding of the usability of EHRs need to discuss and provide a proposal of essential aspects.

Subcategories	Corresponding legal requirement
Person identification	Patient identity
Activities in daily life, Current functioning, Environment and financial situation, Health history, Ill health, Intake of food and drink, Lifestyle related to health, Physical structure	Background information for care
Current state of health, Statement of assessments, Activities and tools for investigations and evaluations, Outcomes of actions	Information concerning diagnosis and reason for interventions
Planning of actions, Care interventions	Information on the interventions performed and planned
Goals to be attained, Medical specialties, Health care professionals, Equipment and material, Care management, Forms related to care, Quality registries, Research participation	–
–	Information provided to the patient
–	Statements made in the selection of treatment options
–	Possibility of a new medical assessment

Table 2: Comparison of subcategories to legal requirements in the PDA. The subcategories are on the left-hand side and the corresponding legal requirements on the right-hand side.

5.1.2 Health care process

Aspects concerning what health care professionals plan to do and what they have done, as well as the results of these actions were the primary content in the category Health care process. The subcategories corresponded to what other authors [15] have suggested to be potential divisions of information in EHRs. However, the subcategories are not unique for health care. Rather, they are recognisable steps in the process of solving a problem.

5.1.3 Resources employed, Administrative documentation, and Development and research

The three categories Resources employed, Administrative documentation, and Development and research comprised aspects indicating health care process support. However, these aspects were not expected to appear in the module for care documentation because the EHR system already included a special module for care management in which those particular aspects would have been better suited.

5.2 Aspects of health and health care as reflected in predefined headings corresponding to legal requirements

The present results showed that the subcategories corresponded to four of seven legal requirements in the PDA. Thus, three legal requirements had no corresponding subcategories. Lack of correspondence between information in EHRs and legal requirements was also

found in a Finnish study [40]. The legal requirements without any corresponding subcategory in the present study were Information provided to the patient, Statements made in the selection of treatment options, and the Possibility of a new medical assessment. These legal requirements refer to the rights of the patient as opposed to obligations of the health care professional. As Winkelman and Leonard stated, the structure of the EHR seems to be primarily based on the needs of health care professionals [48]. The lack of subcategories corresponding to the above-mentioned legal requirements in the present study regrettably supports this statement. However, the unit of analysis was restricted to predefined headings sorted into subcategories and therefore it cannot be ruled out that information corresponding to these legal requirements may be found in notes documented under any predefined heading in the EHR. The finding of aspects related to goals to be attained and outcome of interventions is not explicitly expressed as legal requirements in the PDA. However, such information is vital with respect to evaluation [49]. Evaluation is important both for the patient (to see whether goals were attained) and for the provider (to be able to assess the quality of health care and cost effectiveness). The lack of such legal requirements is unfortunate considering that the PDA posits that information management in health care should be organised to promote cost effectiveness [1]. The eight subcategories in the categories Resources employed, Administrative documentation, and Development and research did not correspond to any legal requirement in the PDA. However, the Na-

tional Board of Health and Welfare has published regulations [46] and a handbook [47] with a strategy to put the PDA into practice. These publications clarify the various legal requirements in the PDA and comprise additional requirements on what EHRs should contain. In these additional requirements information about equipment, material, issued certificates, medical referrals, and correspondence documents are expressed as requirements that correspond to the subcategory Equipment and material in the category Resources employed and the subcategory Forms related to care in the category Administrative documentation. However, the lack of obvious congruence between the regulations and handbook to the PDA may threaten to jeopardise the purpose of the regulations and handbook to put the PDA into practice.

5.3 Methodological considerations

The study focused on an EHR used in four of five health care service divisions in one county council in Sweden. The results may not be applicable to other Swedish EHR systems because as of yet there is no standardised terminology in use nationally. Consequently, EHR systems used may to a varying extent differ between county councils. On the other hand, the results corresponded to those found in previous studies on what aspects of health and health care predefined headings reflect [21] and their (limited) correspondence to legal requirements [40]. The analyses were based on a retrospective, large dataset i.e. 3 596 predefined headings applied by eight professional groups (n=5 509) to 20 398 104 occasions. With regard to the size of the material and the number of health care professional groups involved, it is to our knowledge, the first study of its kind. A limitation of the study was that the content of the documented notes was not investigated. However, because the predefined headings are essential to search ability they are important to investigate in a multi-professional EHR. The predefined headings in Swedish EHRs in all county councils are typically developed by professional groups themselves. No county council has fully implemented SNOMED CT for predefined headings in their EHR. Therefore the consequences of predefined headings developed by professional groups and medical specialities are highlighted in the study. It would have been interesting to compare the applied EHR predefined headings to the concepts in SNOMED CT according to e.g. mapping rules [50] However, it was refrained from because of the size of the material (3 596 predefined headings). The data analysis chosen, qualitative content analysis, enabled to interpret, structure and reduce the large amount of data, and made the results more accessible and un-

derstandable [44, 51]. The analysis was also chosen because it is recommended to use when new insights is acquired into an area in which knowledge is still growing and evolving [43]. The analysis strictly followed the defined steps when conducting a qualitative content analysis [43-45]. The method of analysis afforded a comprehensive picture of the different aspects of health and health care as reflected in predefined headings in an EHR and yielded results corresponding to previous studies. The analysis of the correspondence of predefined headings to legal requirements was based on subcategories related to health and health care and not on the predefined headings themselves or the content of the documented notes. It cannot be ruled out that additional correspondence to legal requirements might have been revealed using alternative procedures. The procedure used was preferred because it was manageable considering the size of the material. That the PDA came into force in 2008 and the fact that data were collected during 2007 might be seen as a limitation. However, in 2006 a PDA proposal was published [52] and widely discussed at that time. Regarding information in the EHR, the proposed requirements did not change until the act came into effect in 2008. Thus, there were possibilities that already in 2007 predefined headings that could meet the legal requirements of the PDA were included in the data collected in this study.

5.4 Trustworthiness

Trustworthiness of a qualitative study is discussed in terms of credibility, dependability, transferability [45], and confirmability [53]. In general, credibility refers to how well the research method investigates what it intends to investigate [53]. In the present study credibility was strengthened by collecting a variety of data in the form of all predefined headings as applied by eight professional groups in a multi-professional EHR. Credibility was further secured by the fact that the analysis and comparison were conducted by the first author who is experienced with EHRs. Dependability concerns how consistent the results are for the collected data [53]. In the present study dependability was addressed by transparently describing the research process and presenting examples of predefined headings. Transferability refers to the extent to which the results in a study can be transferred to other settings and groups [53]. The present study was conducted in a particular Swedish setting and if the results can be transferred to other Swedish EHRs or abroad is up to the reader to decide. Confirmability in qualitative research is the extent to which the results in a study are derived from the data collected and not from the authors' preconceptions [53]. To avoid bias

all authors thoroughly discussed all steps in the data analyses until consensus was reached.

6 Conclusion, recommendations, and future research

The predefined headings in the studied multi-professional EHR were possible to analyse and categorise by using a qualitative content analysis. The analysis yielded a meaningful structure that included 23 subcategories distributed to five categories (Description of the patient, Health care process, Resources employed, Administrative documentation, and Development and research). The analysis showed that the predefined headings reflected a wide range of aspects of health and health care and that synonyms or similar terms occurred as headings. The results indicated that 15 of 23 subcategories corresponded to four of seven legal requirements in the PDA. The three requirements that did not have any corresponding subcategory concerned rights of the patients rather than obligations of the health care professionals. Goals to be attained and outcome of interventions, both of which are pivotal in evaluation, are not explicitly expressed as legal requirements in the PDA. The structure indicated that the EHR primarily met the obligations of the health care professionals and health care management demands rather than patient legal rights to receive information on their own health conditions and to participate in care decisions. This observation is inconsistent with both the health care consumer rights and patient participation as a prerequisite for health promotion and quality of care. A complete and searchable EHR should cover patient rights as well as obligations of health care professionals and health care management demands. To accomplish this goal requires the combined contributions from policymakers, clinicians, and researchers. To improve headings in the EHR policymakers are recommended to ensure compliance with the PDA, promote a uniform EHR structure, and consider adding information about both health care goals to be attained and outcome of interventions as legal requirements in the PDA. Thus, a common national inter professional standard terminology including predefined headings taking all these considerations into account seems to be needed. Future research suggestions include to study the usability of EHR headings from the perspective of all users (health care professionals and patients) and to study patient safety in terms of incident reporting related to difficulties in finding information in the EHR.

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Authors' contributions

The first author planned and collected the data. Together with the co-authors, the first author analysed the data and wrote the manuscript.

Conflicts of Interest

There are no conflicts of interest.

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