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Electronic Health Record in Occupational Medicine: Specific Aspects and Requirements of Data Structuring and Standardization

Dorin TRIFF [1,*] and Andrei ACHIMAŞ CADARIU [2]

[1] Occupational Medicine Section of Professional Diseases, "Constantin Opris" Emergency Hospital of Baia Mare, 31 George Coşbuc, 430031, Baia Mare, Romania.
[2] "Iuliu Haţieganu" University of Medicine and Pharnmacy Cluj-Napoca, Medical Informatics and Biostatistics, 6 Louis Pasteur, 400349 Cluj-Napoca, Cluj, Romania.
E-mail(s): dorintriff@yahoo.com

* Author to whom correspondence should be addressed; Tel.: +4-0742064162.

Abstract: The service of occupational medicine of a specific economic agent, as integrated part of the System of Labor Health and Safety, requires efficient, well-organized information management through standardized and computerized data processing and exploitation. Legal requirements and practical aspects of information management in occupational medicine trigger necessary operational modifications in the Electronic Health File. The goal of the paper is to present basic requirements of structuring the electronic health file and the necessary standards in recording specific data.

Keywords: Occupational Health Services; Standards in Occupational Health; Classification of exposure factors; Professional diseases; Profession-linked diseases; Workplace; Workload.

Introduction

The occupational medicine service through its surgery, represents the fundamental unit of informational management in occupational medicine. Collection and data processing (medical, job-specific) are performed at this level, ensuring the decision-taking support for prevention measures, diagnosis, evaluation of work ability, therapy, recuperation, rehabilitation, adaptation, professional reinsertion and responsibility assignment of medical decisions for the employee, economic agent/company, surveillance and control bodies as well as other medical units [1]. Employment of adequate standards for data recording and processing that are relevant for the informational flow of all the structures involved in health and security promotion of workplaces imposes adequate structuring of the nucleus of any medical computer-based information system represented by the Electronic Health Record (EHR). The main goal of the paper is to present a model of EHR structuring that should comply with the legal requirements of practical management of occupational medicine information.

Characteristics of the Informational Flow

The patient/physician relationship becomes a worker/professional medicine specialist/employer relationship and EHR (Electronic Healthcare Record) should provide proper support for an effective informational flow within this framework, ensuring confidentiality of medical and company data according to legislation and standards of professional ethics. Figure 1 is a graphic representation of this relationship conglomerate. EHR is interposed in the worker-physician-company informational flow.

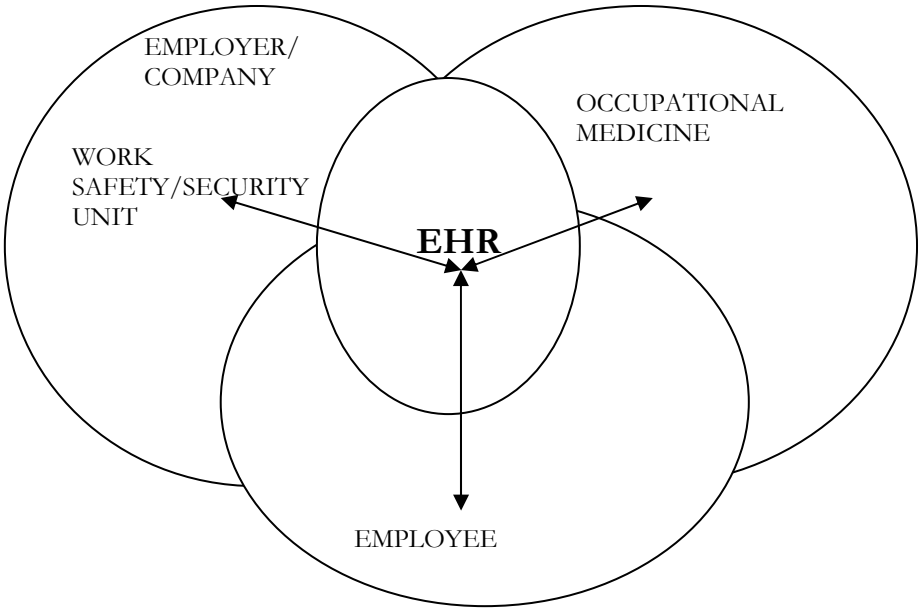

Figure 1. Physician/Patient Relationship in Occupational Medicine

At company level, professional medicine evaluates the work system elements through the angle of the mutual health-work relationship focusing on the patient-worker/performer involved in carrying out work assignments through production means, elements that are situated within the work environment [2] (Fig.2).

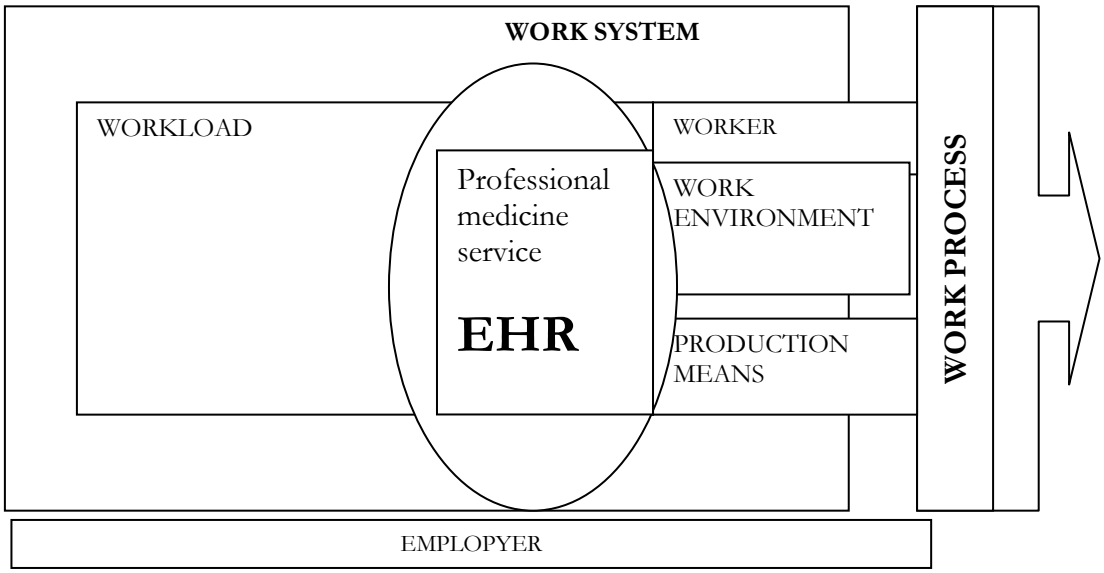

Figure 2. EHR interposed in the worker/work system/employer informational flow

The worker/performer is exposed to accidents and disease risks due to specific factors present in the workplace environment [3]. Accident risks and noxious agents' recordings, which fall within the employer's as well as the professional medicine service's duty through EHR, determine compliance with recording standards and data referring to workplaces that should provide adequate support to the medical management act.

Outside the economic agent/company, the professional medicine service provides specific reports on workers' health surveillance for surveillance and control bodies, Health Insurance Houses, and other medical units (Fig.3).

Efficient informational management calls for interoperability and computerized data processing within all the structures involved in the informational circuit/network.

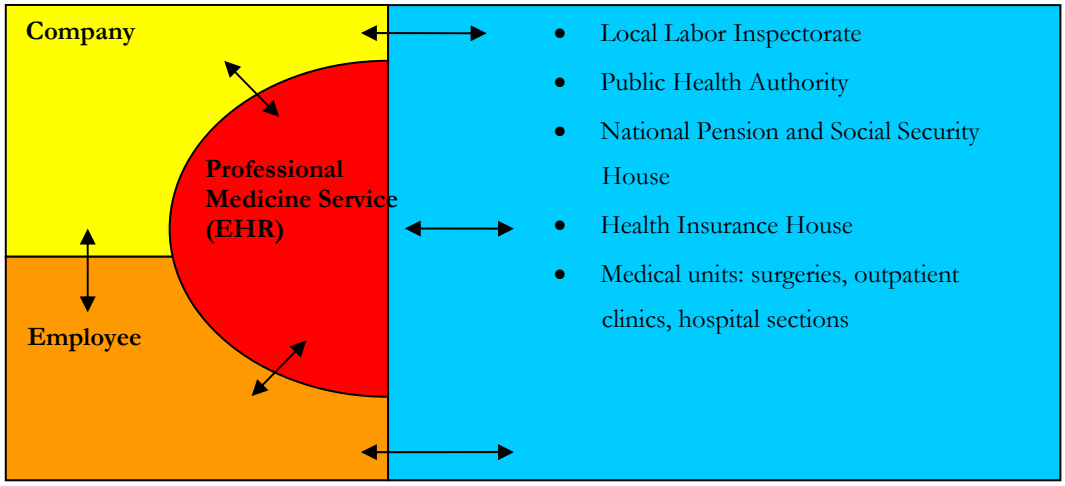

Figure 3. Professional medicine service provides specific reports on workers' health surveillance for surveillance and control bodies, Health Insurance Houses, and other medical units

Structuring of Elements

Structuring of necessary data fields as well as their format in EHR according to common standards represents one of the main objectives.

Therefore, EHR requires two basic groups of data linked with:

- The company:
  - Employer - through defining elements of performed activities, the work places as a whole and work points
  - Work place – through identification of data referring to work environments, risks of accident and noxious agents for each of them, prevention measures
  - Employee – through elements of identification, education, position.
- Patient – through medical file data.

A unitary system of computerized medical data processing management and storage (EHR) should be primarily structured on the modules below: Economic agent – employer, Workplace.

Patient/employee

These elements can be encountered at the level of user interface, basically the specialist in occupational medicine.

The modules contain many similar common fields. At the level of a highly interoperable economic agent each of these modules is likely to further represent communication interfaces within EHR with the involved parties: employer, social safety inspector, physician, with either shared or limited access to the module data.

EHR should compatibly accept data from other EHR systems, medical systems or surveillance and control bodies, health insurance houses as well as other medical units through exchanges of the message and recording types.

Significantly relevant for occupational medicine, it is important that each alteration at EHR level should be entered and stored for indefinite period of time, the health status being closely interrelated with the work process and all possible forensic implications hereof deriving from this mutual conditioning. Each of the involved parties should be clearly identified, and the attested information should be credited according to patient, medical staff and user.

Observing EHR information safety and private character derive from complying with [4]: Confidentiality; Patient consent; Access control; Data integrity; and Access audit.

Bearing on EHR structure is the question of who should be the legal holder of this medical data basis. Medical files belong to the economic agent as they reflect on the effect the company has

brought about in its present or former employees' health status, allowing comparisons with similar activities. This is a special type of ownership, with only partial access of the employer in terms of medical recommendations and ability statement for preventive measures. The lawful owner of each file is the employee who should be granted full access to its content.

This situation initiates issues regarding the usefulness of full access to all medical data for improperly instructed persons. The occupational medicine service is the real but temporary owner with full access to all the data in order to provide the necessary support for medical decisions. The final owner in case of company winding up is the competent health authority.

Therefore, EHR systems can belong to national certified bodies that should allow shared access according to the EHR structure, with the specialist in occupational medicine being entitled to enter and manage medical data. Connection can be provided through the Internet, medical data being stored and protected by the legally entrusted organizations [5]. Blocking unauthorized access to such data represents a major responsibility. Adequate financial support can be provided either by the occupational medicine service who is the lawful, though temporary, owner of the medical data or by the insurance bodies in direct contract with the economic agents. If the software belongs strictly to the occupational medicine service, it is necessary to find ways of interconnection and mutual standards to provide effective informational flow among all the involved structures inside as well as outside the economic agent. Furthermore, the medical data archives should have a similar „interposed" position, with limited user access. The specialist in occupational medicine should be granted full access to all modules. The employer and the specialist in occupational medicine can have joint access to factors of professional risk identified by the employer. In case of evaluation differences about professional risk factors between the employer and occupational medicine specialist, the former's results should be considered final, with possible recording of both evaluations, however. Any ability statement should generate explicitly or not, a registration number in the unique consultation registry of occupational medicine surgery. It will automatically lead to the patient's medical record and his health file.

Summary of entries into the registry of medical consultations:

No.	Date	First name / Surname	PIN	Employer CAEN code	Diagnosis Text +codification	Ability statement	Recommendations/ Procedures Or prescriptions	Type of medical exam (regular/ routine..)

This type of registry can store additional information such as: patient's address, sex, age, consultation location, etc. Access date, entry, unique registration number, patient identification data, employer identification data, ability statement and possibly established diagnosis, are essential. This last element can likewise be entered only in the medical file itself.

From the user's point of view, there are several structured modules that contain the following a series of types of data as are presented bellow.

Interface Modules

A. EMPLOYER Module/Economic Agent

It will be accessed by the employer and the specialist in occupational medicine. Changes are initiated by the employer either directly or through the occupational medicine specialist.

It will comprise general elements of company identification and characterization, activities performed and employees, as well as elements referring to provisions of labor security:

- General data, (IDENTIFICATION DATA) can be represented by:
  Employer/ - Unique Code of Tax Registry/ - Registration number with the Chamber of Commerce for Economic Agents / Address
- Characterization data can be represented by: Employer's type and legal organization/Classification of performed activities: main, secondary and additional according

to CAEN to the level of group, class/, number of employees corresponding to different fields of activity.

- Employees
  - Identification data: FIRST NAME/SURNAME/PIN code/RESIDENCE/SEX
  - Data concerning the type of performed activity
  - PROFESSION/ POSITION/ PROFESSIONAL STATUS/ PLACES OF WORK/ EXPOSURE
  - Data referring to work ability: ABILITY STATEMENT/RECOMMENDATIONS
  - MEDICAL LEAVE
- Prevention and protection service: contains mandatory columns according to legal regulations as well as additional elements. Its main columns can also be included in the Patient module: place of work, or can be module specific: 1. Economic agent; 2. Organization of labor safety and protection; 3. Employees; 4. Places of work; 5. Labor accidents; 6. Performed safety instruction at the place of work; 7. Sanitary education.

According to EHR complexity, this column can also include data related to labor accident requirements and standards: type of accident, material agent, causes, modality, etc. [6].

B. PATIENT Module

This module will be accessed only by the professional medicine specialist and will include columns on: IDENTIFICATION DATA, PLACE OF WORK, MEDICAL FILE, FORMS.

PLACE OF WORK

This sub-module contains obligatory columns according to legal rules and regulations (Annex 3/HG355/2007) but also additional elements such as [7]: 1. Place of work; 2. Economic agent; 3. Employee; and 4. Place of work.

- Identification of professional risk factors FORM/ SYSTEM/ WORK PROCESS/WORK STRESS EVALUATION/ EVENTS/ WORK PLACE REQUIREMENTS/ WORK PLACE PROTECTION/ SANITARY EDUCATION: INFORMATION AND FORMATION/ EXPOSURE (identified noxious agents):
- PROFESSIONAL RISK FACTORS – FORM/ EVALUATION OF WORKPLACE RELATED STRESS/ PROCEDURES OF WORKPLACE RELATED FATIGUE EVALUATION / - Professional chronogram (photochronogramming),
- EVENTS: LABOR ACCIDENTS / PROFESSIONAL DISEASES / PROFESSIONALLY LINKED DISEASES / OTHERS/TEMPORARY WORK DISABILITY – MEDICAL LEAVES
- ELEMENTS OF ESTIMATED WORK PLACE RISKS starting with elements involved in the work processes and their networks.

MEDICAL FILE

The medical file will include all the columns stipulated by current legislation: HISTORY; OCCUPATION/POSITION/professional STATUS; PROFESSIONAL DEVELOPMENT; and PROFESSIONAL EVOLUTION

Presence of specific symptoms upon employment can represent a reference point for further examinations even through exclusion of professionally-linked symptoms if these persist at further examinations. According to current regulations, the individual employment medical file does not include the symptoms column as it cannot be workplace related upon employment, however, it cannot be missing from a medical examination.

Symptoms can be classified according to ICPC-2, International Classification for Primary Care, 2nd Edition, International Statistical Classification of Diseases and Related Health Problems, 10th edition, Australian Modification (ICD-10-AM), Tabular List of CIM-10-AM Procedures, according to Australian Classification of Health Interventions, of the International Statistical Classification of Diseases and Health Problems, 10th edition, Australian Modification (CIM-10-AM) [8,9].

ICPC-2 – ICD-10 trans-codification, even within certain limits, is necessary.

ADDITONAL EXAMINATIONS, according to HG 355/2007, are: Toxicologic assessments (mainly), Specialist's evaluations, Investigations, and Applied therapy.

Their codification can be performed according to the Tabular List of CIM-10-AM Australian Classification of Health Interventions, of the International Statistical Classification of Diseases and Health Related Problems, 10th edition, Australian Modification (CIM-10-AM). Despite immediate practical applicability, integration of these codification standards is essential with a view to an integrated insurance system and comparison with other insurance systems.

Specific examinations for Occupational Medicine

Cardiovascular tests, cold provocation tests, etc. can be applied. Although standardizing elements could be employed, there are slim chances for inclusion of these data.

TREATMENT. Although there is no legal provision for this column to appear in the employee's medical file, it could be understood in the REGULAR MEDICAL EXAMINATION column: events (appeared since the previous medical examination) or Recommendations (accompanying the ability statement).

Irrespective of the current Romanian legislation and with a view to a system of functional professional disease and labor accident insurance, the medical file should necessarily include the applied treatment column, either as medical procedures or as medical therapy, the corresponding classification being represented by the Australian Classification of Health Interventions, of the International Statistical Classification of Diseases and Health Problems, 10th edition, Australian Modification (CIM-10-AM), the medical therapy including text and code fields according to ATC (Anatomic, Therapeutic, Chemical).

The conclusions of occupational medicine examination allow 2 values:

- Clinically healthy upon investigation or diagnosis, according to ICD10, COD999 and ability statement [10,11].
- MEDICAL STATEMENT
    - For performing the profession/position
    - Name/codification (according to COR and International Standard Classification ISCO-88 of professions) with its 4 values: ABILITY, CONDITIONED ABILITY, TEMPORARY DISABILITY, DISABILITY with recommendations (....) MEDICAL LEAVES (Table 1).

Table 1. Employees' values and medical leave

Outpatient/hospitalized, section	Date of issue (dd/mm/ yy)	No of days (_ _)	From (dd/mm/yy)	Until (dd/mm/yy)	Diagnosis Code 999 Codification	Acute Subacute Chronic
Medical leave upon hospital discharge	Date of issue (dd/mm/ yy)	No of days (_ _)	From (dd/mm/yy)	Until (dd/mm/ yy)	Diagnosis Code 999 codification	Acute Subacute Chronic

These data allow statistical evaluation of morbidity with temporary labor disability. Entry of data referring to morbidity with temporary labor disability, duration, frequency and severity according to different workplaces of a specific economic agent, allows real evaluation of workplace-related risks rather than prospective, potential or hypothetical evaluation, alongside implementation of health programmes. This evaluation is essential with a view to a functional system of evaluation of professional risks and diseases.

C. REPORTS AND STATISTICS Module

It contains exit results from the first modules. Based on the entered data, an application should generate besides simple and practical statistics such as parameter grouping according to a specific value - i.e. list the patients consulted in the period.... or according to a specific disease or economic

agent - statistics required by the current legislation and reports in the statistical system of professional diseases, labor accidents at Romanian or European level.

Generated reports are those necessary for current medical practice and legal requirements, either under digital form or hard copies. They are automatically generated according to the data entered in the Health File and include the following forms: • Identification of professional risk factors, • Health file, medical file, • Ability form, • Report on regular medical follow-up, • BP1 Form, • Medical report/prescriptions, • Referrals, • List of different variables according to user, for example list of employees.

The occupational medicine report on regular follow-ups is drawn by the employer and the Public Health Authority. Since these reports do not fall under the incidence of requirements and regulations of a health insurance body, no clear mandatory standards are stipulated in this respect.There are two major groups of data:

- Main findings regarding exposure to noxious agents: identified noxious agents, exposed employees according to workplace and occupations, with the above mentioned codifications
- Main findings regarding the health status statistics: • Number and type of examinations: employment/ regular medical follow-up/ adaptation/ resuming work/ special surveillance/ others; • Number and type of ability statements including one of the following: ability/ conditioned ability/ temporary inability/ inability; • Diagnosed diseases: profession-linked, professional diseases or diseases without direct workplace causality classified according to sex, workplaces, occupations, complying with the mentioned codifications; • Statististics of morbidity with temporary work inability, frequency indicator, severity, medium duration, specific weight; • Statistics of risk groups: young, old, pregnant, handicapped, invalidity pension and work ability.

Statistics of diseases in this list will not be included in reports for the employer rather for the Public Health Authority

EHR in its synthetic form and structured either on the employer module or with nominal organization on region-specific occupational medicine services including the particular columns as well as the above mentioned classification standards, represent elements of utmost importance for providing integrated, effective and qualitative informational management.

Classification Standards of Specific Data

Standards regarding specific data in the occupational medicine service that is integrated in the System of Company Management include:

- Classification of Economic activities; Occupations and professions; The employee's status; and Workplace accidents
- Occupational, professionally-linked diseases, all types of diseases and noxious agents. Recommended classifications are those currently employed: • NACE Rev1 classification, revised version, of economic activities within the European Community; • International Standard Classification ISCO-88 of occupations; • ICSE international classification of employment status; • Diseases: according to International Classification of Diseases, 10th Edition (ICD-10).
- Classification of causal agents up to 10 exposure factors according to European Classification of Exposure factors likely to cause professional diseases or classification according to national legislation regarding chemical, biological, and cancerigenic agents.
- Professional diseases according to the list of European Commission Recommendation no. 3297/2003 or according to national legislation, providing trans-codification with ICD 10 and International Disease Classification according to HWO, lists for the surgery, hospitals and outpatient clinics, respectively [12].

Conclusions

The physician/patient relationship, materialized through the employment of the status of worker to the patient and necessary consideration of the workplace characteristics, involve

inclusion of the company with all its data, activities and specific decisions into the informational network.

Employment of adequate standards for data recording and processing that are relevant for the informational flow of all the structures involved in health and security promotion of workplaces imposes adequate structuring of the nucleus of any medical computer-based information system represented by EHR.

EHR occupational medicine architecture should provide support both for associated processes involved in the medical act as well as for activity- and requirement-specific processes in the particular interrelationship between the professional medicine specialist and the employee.

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