

Extending the use of DRGs to estimate mean Home-Care cost by employing an adapted ASTM E2369-05 Continuity of Care Record

B. Spyropoulos, M. Botsivaly, A. Tzavaras, K. Koutsourakis

Abstract— The purpose of this study is the presentation of a system appropriate to be used upon the transition of a patient, from hospital to homecare. The developed system is based upon the creation of a structured subset of data, complying with the ASTM E2369-0 Standard Specification for Continuity of Care Record, concerning the most relevant facts about a patient's healthcare, organized and transportable, in order to be employed during the post-discharge homecare period. The system allows for the extension of the use of DRGs to estimate mean Home-Care cost, taking advantage of the planning and the optimal documentation of the provided homecare.

I. INTRODUCTION

WE experience presently the process of the integration of Biomedical Technology, Information Technology Systems and Medical Decision Making Procedures in the specific professional and scientific context of the Modern Hospital. The emerging General Hospital will increasingly encourage Home-care, and we argue that a qualitatively new "mobile" home-care is presently emerging out of the combined employment of, first, the modern wireless mobile telephony networks and equipment, second, the contemporary digital entertainment electronics, and third, the commercially available computer hardware and software. This new mobile home-care allows us for to be optimistic about the reduction of patients' unnecessary hospitalization in the near future, as well as, the dramatic reduction of the home-care costs.

Therefore, this paper attempts to relate Home Care to the Diagnosis Related Groups (DRGs) Reimbursement system by introducing an Adapted Continuity of Care Record (CCR). The Diagnosis Related Groups system, developed initially at Yale University, has been already adopted by most of the public in the European Union and is a case-mix classification system that categories episodes of care into meaningful groups with similar resource consumption. Nevertheless, within the Greek National Health System, there is not presently an official approach neither to the Electronic Health Record (EHR), nor to the "case-mix"

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All the authors are with the Medical Instrumentation Technology Department, Technological Education Institute of Athens, 12210 Athens, Greece (Corresponding author's phone: +30 210 5385335; fax: 30 210 5385335; e-mail: basile@teiath.gr).

classification algorithms. Thus, a question emerges, that is how home-care will be medically supervised and financially reimbursed. This project presents a solution that will, first, enable the optimal documentation of the provided home care, and second, will facilitate the acquisition of all relevant financial data, leading to the remuneration of the services offered. The proposed solution consists of a typical CCR-system, equipped with an extension that, first, acquires and processes an individually designed structured set of data to be employed during the post-discharge home-care period, and second, allows for the estimation of the home-care cost versus the DRGs code issued at discharge from the Hospital, supporting, thus, a new more accurate DRGs related home-care remuneration modus.

II. CCR AND HOME-CARE ADMINISTRATION

A major problem of contemporary health services, including home-care, is the scarcity of resources. Patients' records provide information concerning the expenses incurred and the resources allocated for the treatment of the individual patient within the health care system. Homecare resources consumption must also be monitored and we argue that the most efficient and time saving way is through the employment of an appropriately adapted Continuity of Care Record (CCR).

The Continuity of Care Record (CCR) is a standard (ASTM E2369-05) [1] for exchanging basic patient data between one care provider and another in order to enable this next provider to have immediate access to relevant patient information. It is intended to foster and improve continuity of patient care, to reduce medical errors and to assure at least a minimum level of health information transportability when a patient is referred, transferred, or otherwise goes to another provider. The standard was proposed and developed by the E31 Committee on Healthcare Informatics of ASTM, an American National Standards Institute (ANSI) standard development organization.

The CCR is being developed to cover the need to organize and make transportable a set of basic patient information consisting of the most relevant and recently facts about a patient's condition. These include, first, patient and provider information, second, insurance information, third, patient's health status such as, allergies, medications, vital signs, diagnoses and recent procedures, fourth, recent care provided, as well as recommendations for future care, that is

a care plan, and finally, the reason for referral or transfer. The structure of the CCR perfectly fits to the needs of home-care, both, the administrative and the medical ones, because it is designed to be technology and vendor neutral for maximum applicability. It is being developed on the extensible mark-up language (XML) platform in order to offer multiple options for its presentation, modification, and transmission.

Through XML the CCR can be prepared, transmitted, and viewed in a browser, in an HL7 CDA (Clinical Document Architecture)-compliant document, in a secure email, or in any XML-enabled word processing document. This makes it possible for recipients to access and view the information in the manner that they prefer (electronic or paper), to extract the data as required and even to store them on a portable storage device for use as a personal health record. Because the CCR will be a simple XML document, different EHR systems will be able to both import and export all relevant data to and from the CCR document and enable automated transmission with minimal workflow disruption for individual caregivers. Thus, CCR will increase interoperability between different EHR systems, with minimal or no custom programming.

III. THE DEVELOPED COST MONITORING TOOL

We have designed and developed a prototype version of a CCR-extension for comprehensive payer-specific information. The developed model consists of various related databases, and allows for every user, first, to select one of the available DRG codes, second, to create a typical CCR that contains the appropriate demographic and administrative data, as well as the relevant clinical information, third, to set up for each DRG code a custom-made typical profile of home-care activities, and fourth, to attach them either a nominal fee, proposed by the system, which is based upon realistic, empirically collected data, or to individually price them. The developed system uses the Australian Refined DRGs (AR-DRGs), since DRGs are not yet been introduced in the Greek National Health System (GNHS).

Starting point is the loading of the International Classification of Diseases Version 9 (ICD9), the Australian Refined DRGs (AR-DRGs) and the Nursing Interventions taxonomy of the Clinical Care Classification (CCC) [2] databases. The AR-DRGs database figures out about 660 Diagnosis Related Groups, classified within 25 Major Diagnosis Categories (MDC), 30 Specialties and 3 Major Groups (Medical, Surgical and Other).

From this root databases, every Hospital Department or Medical/Nursing group is able to individually assign an appropriate set of care activities to specific diagnoses codes that are coded according to Diagnosis Related Group (DRG) codification. These activity sets consist of diagnostic, monitoring and treatment activities that can be actually performed in a home environment, together with an appropriate nursing – activity treatment plan. These profiles of care activities are custom-made and every user, i.e. every

physician responsible for discharging a patient from the hospital, is actually able to set up his own profiles.

During the formation of these profiles the user can attach to each activity a set of nominal fees. This set of fees consists first of the official Insurance Agencies reimbursement amount, which in Greece is in most cases much lower than the actual cost of the services provided, and, second, by a currently valid financial rate. This later is estimated by a software tool that we have already developed and allows for a rational approximation of the effective mean cost for several elementary medical activities, over different medical specialties [3], [4], [5]. Thus, the developed system ignites, when relevant, the corresponding revision of an implicitly associated latent financial record that allows for an approximation of the individual case-cost.

Once the modified database for specific Home-care activities has been created, the program constructs a custom-made SQL file, appropriate for medical and administrative use. The user can interactively modify any description on this database, and it is possible to add any information for specific instances, in order to adapt the home-care profile to emerging new needs. This interactively modified database is further used to create each time a typical CCR that contains all the necessary patient information.

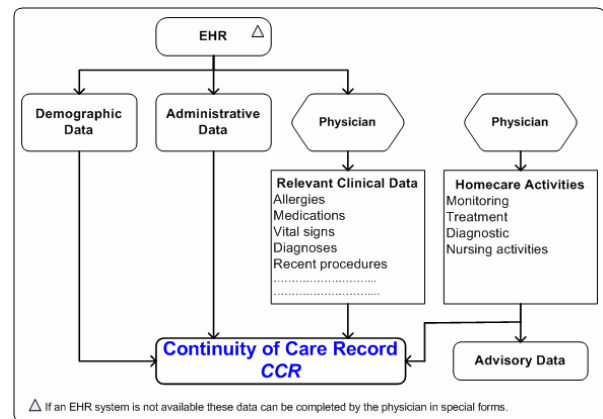


Fig. 1: Flow-chart of the developed system

The appropriate patient and administrative data, as well as the relevant medical information are acquired, either by using an already installed EHR system or even manually, if no EHR is available. Then, the individual CCR is completed by selecting the needed home-care activities which are automatically inserted in the CCR in the section of Care Plan. Simultaneously the CCR-system latently combines each of them to the predefined “cost”.

However, the system, apart from producing, electronically or in paper – format, the CCR, also produces a number of additional forms, including advisory and informational notes for the patient himself or for his relatives, and diagrams of physiologic measurements, such as glucose, blood pressure etc. that the patient should monitor. The system also provides for the production of forms that will be filled by the nursing personnel during the care visits in order

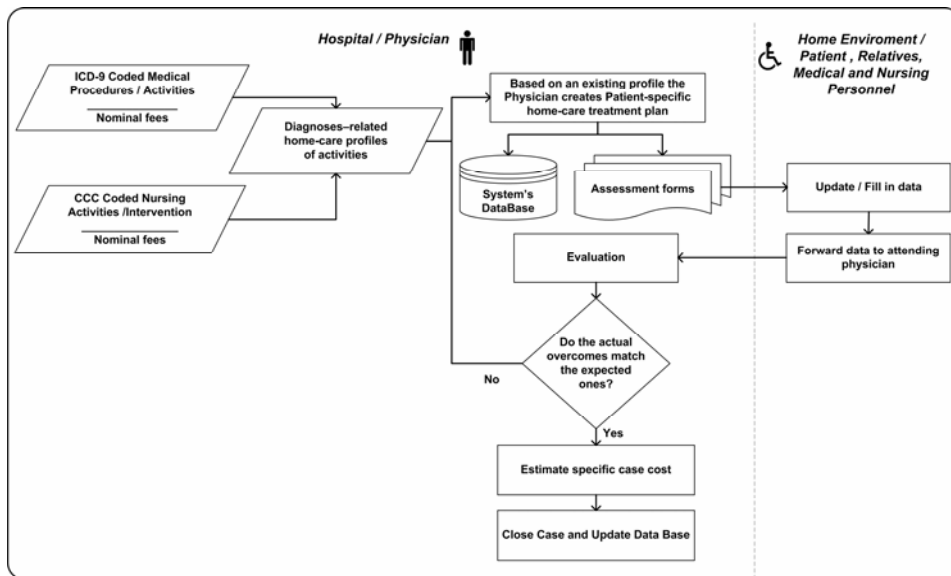


Fig. 2: Details of the Functional Diagram of the Home-Care Cost Monitoring System

to document their activities. These forms can be handled either in paper – format or electronically, using a PC or a PDA in the home environment.

The filled forms, both the ones regarding the nursing activities and interventions and the ones regarding the monitoring of physiological parameters, are returned, physically or electronically, to the responsible physician who evaluates them and, depending on his evaluation, can modify the care – plan of the specific patient in any suitable way.

The structure and data of the produced CCR are complying with the ASTM E2369-05 Specification for Continuity of Care Record, while XML is used for the representation of the data. The XML representation is made according to the W3C XML schema proposed by ASTM [6]. The CCR that is produced by the system is currently automatically transformed to HTML format, using the Extensive Stylesheet Language (XSL), in order to be viewable and printable.

When a patient is discharged a DRG-code is assigned, according to the principal diagnosis. The user then has to:

Fig. 3: Homecare activities selection for a specific patient

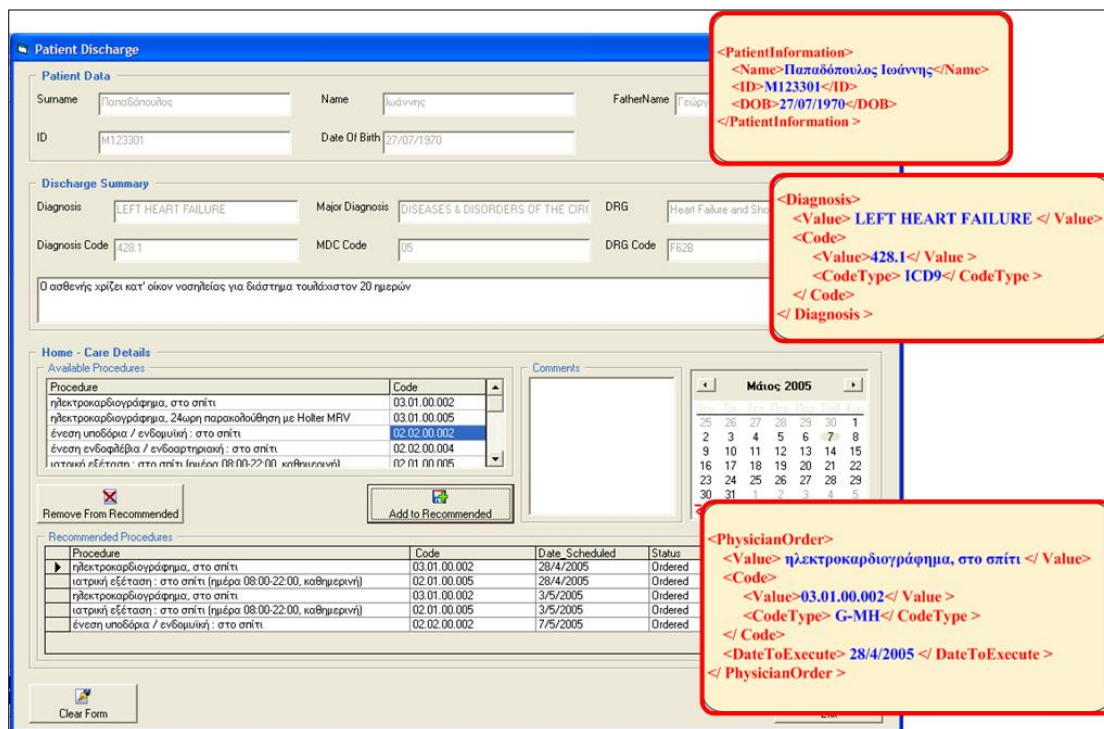


Fig. 4: Patient Home-Care CCR Editor and parts of the XML source code

IV. CONCLUDING REMARKS

The employment of this method enables the formation of a CCR, that is intrinsically, however latent, related to the costs caused and the expected reimbursement. Thus, the updating of the patients' relevant medical data, ignites, when relevant, the corresponding revision of an implicitly associated financial record, that allows for, both, first, a good approximation of the individual "case" cost, and second, the follow-up of cost evolution of a Hospital based or Freestanding home-care group.

The usual way to estimate the mean Fee-for-Service cost is the statistical approach; however, this approach is rather arbitrary and inaccurate. The developed system introduces a non-disturbing method for the home-care personnel, to combine the collection of the necessary CCR information and the creation of the associated documentation, to a latent simultaneous acquisition of important financial data. Since the developed CCR system allows for the correlation of these data to the DRG-coded principal diagnosis, it is profound that it constitutes a useful tool for the estimation of the home-care cost versus the DRGs code issued at discharge from the Hospital.

Since there is a clearly higher discharge to home-care incidence for specific DRG-coded principal diagnoses, the developed system is now being tested under virtual home-care conditions, and is being fed with financial data related to home-care activities, for some of the most frequent cases. The system is currently being tested with an EHR system that has been developed by our team. The implementation indicates, so far, that the system, whether interfaced to an

EHR or not, is stable enough for practical use and it actually provides a simple, effective and easily expanded tool for the formation of both a CCR and a homecare plan, offering at the same time a good approximation of the individual case cost and a flexible HTML format for data representation.

The system, allows for the improved approximation of the home-care cost, versus the DRGs code issued at discharge from the Hospital supporting, thus, a new more accurate DRGs related home-care remuneration modus. Finally, the system constitutes an effective educational tool, supporting personnel training, in operational cost management.

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