

Electronic Nursing Record System. Experience in a Large Cardiac Rehabilitation Department

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Abstract

From Jan 1st to Sept 30th 2007, 1355 patients (pts) were admitted for a residential cardiac rehabilitation program. A nursing record system (NRS) may have a positive impact on nurse practice and improve pts management, particularly in large departments.

Aim. To implement an electronic NRS, integrated in the Hospital Information System, to plan individual pts care and interventions, limit the error risk, document nurses workloads, and verify the efficacy of the rehabilitation process (outcome).

Description. The electronic NRS has a modular structure, with different sections: 1) a core component (clinical data collection at pts admission, including Barthel score), 2) the nursing diagnoses scores with the automatic generation of individual care plans and daily planning of related nursing, 3) scheduling labs analyses, 4) generation of a discharge. The NRS is accessible through a personal account (login & password) on all desktops; laptops connected via a protected WLAN are also available for data collection and scoring at pts' bed.

Results. Complete data were available in 99.7% pts. A cumulative workload of 69342 activities was recorded (average 51/pt); the workload was higher in the 77 pts (6%) admitted to ICU and in pts with >75y. As outcome measure, the Barthel score (87.9 and 94.2 on admission and discharge, $p<0.001$) and the NANDA score (from 3.1 to 1.3, $p<0.001$) improved.

Conclusions. The electronic NRS had a positive impact on nursing management. The automatic generation of individual pts' daily workplan reduced both the risk of error during therapeutical interventions and to miss activities due to lack in communication among operators. The possibility to have a detailed workload may be useful for better resources utilization. Finally, the automatic generation of a nursing discharge summary may be effective to improve the integration with the home care health system.

1. Introduction

In the last 20 years, a lot of efforts were spent to improve the diffusion of information technologies in the health care institution. The majority of health care facilities implemented some type of electronic documentation system, mostly limited, however, to administrative purposes or as a repository for imaging techniques (e.g. PACS). In the minority of the cases, the Hospital Information System (HIS) also integrates some form of computerized medical record or therapeutic order entry.

The nursing record is the formal documentation associated with nursing care. In the past, the nursing record was merely considered as a data repository that helped nurses to call to mind what they had done or what they have to do. Currently, the nursing record represents a resource of data for the reuse of primary information. To improve the usefulness of the nursing record, computer-based nursing records have been introduced as a part of the computer-based patient record. [1]. The computer-based nursing record is more than a series of documents in electronic form. With an electronic nursing record, data collected at the point of care can be used to assist the nursing care at all levels of aggregation [2]. Nursing records traditionally contain documentation in a narrative form, which is easier to simply transfer to a computer screen in the form of free text. However, when using free text it is hard to apply standard terminology and obtain data reusability. As in an electronic patient record system, the electronic nursing record should also have the ability to capture clinical information and represent it using standardized terminology.

The aim of this study was to implement an electronic nursing record system (NRS), integrated in the HIS, to plan individual patients' care and interventions, limit the risk of error, document nurses activities and workloads, and verify the efficacy of the rehabilitation process (outcome).

2. Methods

The NRS was implemented in the HIS in late 2006. A 1-month test period on late 2006 was considered, including the training of the nurses.

From Jan 1st to Sept 30th 2007, all patients admitted for a residential cardiac rehabilitation program were considered as the study cohort to verify the results of the implementation of the NRS.

2.1. System architecture overview

The electronic Nursing Record System (NRS) has been projected and developed as one software component completely integrated in the HIS. With this new software module, HIS functions now cover almost all administrative and clinical requirements.

In a patient-centred context based on a unique data base and a modular software architecture, NRS shares with HIS: administrative data, medical summaries, tests and drugs prescriptions, and the overall related documentation provided by the different Operating Units in the Hospital.

The NRS itself has a modular structure, with different sections: 1) a core component (clinical data collection at patients' admission, including the Barthel score as a measure of disability), 2) the nursing diagnoses scores according to the North American Nursing Diagnosis Association (NANDA) classification [3], with the automatic generation of individual care plans and daily planning of related nursing activities (e.g. vital signs measurement, surgical wound medications, therapy administration, specimen collection, etc.), 3) scheduling labs analyses, 4) generation of a discharge summary (including scores on admission and discharge, a summary of interventions, and instruction to caregivers for home care when indicated). (Figure 1)

According to security rules, the NRS is accessible on all desktops through the HIS personal account, i.e. single-sign-on for HIS functions, as stated by the capabilities policy; laptops connected via a protected WLAN and personal e-tokens are also available for data collection and scoring at pts' bed.

2.2. Cardiac rehabilitation department: overview

Our Cardiac Rehabilitation Department consists of 88 ward beds and 6 intensive care unit (ICU) beds. The medical staff consists of 12 physicians and a Department Chief; the nurse staff consists of a Nurse Chief and 34 RN. Nine specialized cardiovascular technicians and 5 dedicated therapists are also part of the staff.

In the Department are also included the diagnostic laboratories: echocardiography, exercise physiology and conventional exercise stress tests, electrocardiography, Holter monitoring, cardio-respiratory signals monitoring, nuclear cardiology, right heart cardiac catheterization.

3. Results

From Jan 1st to Sept 30th 2007, 1355 patients (pts) were admitted for a residential cardiac rehabilitation program. Complete data were available in 99.7% pts.

The mean age of the patients was 67 years (26% aged more than 75 years), 70% were male, and 57% were admitted after a cardiac surgery intervention; the average length-of-stay was 18 days.

A cumulative workload of 69342 activities was recorded (average 51/pt); the workload was higher in the 77 pts (6%) admitted to ICU (250 activities/pt) than the remaining 94% pts (39 activities/pt, $p < 0.00001$); patients aged more than 75 years also had a greater workload (67 activities/pt) compared to pts < 75 years (s 47 activities/pt, $p < 0.0001$). As expected, the workload was also significantly higher in the group of patients with more severe disability score (Barthel score < 60 ; 50/activities/pt) than in patients with a preserved Barthel score (Barthel score > 90 , 22 activities/pt).

The more frequent activities are reported in table 1.

Table 1.

Activity	Mean/ pt	Sum	Patients
Blood sampling (n)	2.8	3731	1355
Diuresis and fluids intake measurements	13.2	5588	245 (18%)
Body weight (n)	13.9	6922	497 36.7%)
Urethral cath. (n)	0.1	58	40 (3%)
Basic Care (washing, dressing, position changes..)	16.2	3874	240 (17.7%)
Blood Glucose daily report (6 samples/day) (n)	2.9	1649	568 (41.9%)
Blood pressure monitoring (2 measures/day) (n)	15.6	14676	942 (69%)
Temperature measurement (3 measures/day) (n)	13.7	9559	699 (51.5)
Surgical site and pressure ulcers medications (n)	12.2	7965	970 (65.6%)

As outcome measure, a significant improvement in the average Barthel score (87.9 and 94.2 on admission and discharge, $p < 0.001$) as well as in the average NANDA score (from 3.1 to 1.3, $p < 0.001$) was documented.

The improvement was significantly higher in patients aged more than 75 years for both the Barthel score (from 80 to 91, $p < 0.0001$) and NANDA score (from 4.6 to 2.1, $p < 0.0001$). The improvement in the Barthel score was also more evident in the group of patients with more severe disability impairment (Barthel score < 60) than in patients with a preserved score (Barthel score > 90) ($p < 0.001$).

4. Discussion and conclusions

Preliminary results indicate that the NRS was a significant aid the nursing management, in particular regarding the possibility to have a patient-specific care plan and work plan. In addition, NRS was useful for the assessment of the general workload, with a positive impact on resources utilization.

The nursing process consists of five interrelated steps: assessment, diagnosis, planning, implementation, and evaluation. In the nursing process, the nurse confronts a great deal of data and information. The amount of data and information may exceed the amount the nurse can process efficiently and correctly. Thus, the nurse may need assistance to improve the efficiency in the planning of nursing care, due to the difficulty of simultaneously processing a large set of information.

The electronic NRS had a positive impact on nursing management. The automatic generation of individual patients' daily workplan also reduced both the risk of error during therapeutical interventions and the possibility to miss activities due to lack in communication among operators, leading to improved patients safety [4].

Finally, the automatic generation of a nursing summary at discharge may be an effective way to improve the integration with the home care health system.

Due to the positive experience in the Cardiac Rehabilitation Department, future developments are already in progress to produce a comprehensive NRS to be used by all rehabilitation departments in the Hospital.

References

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Figure 1. Flow-chart summarizing the main components of the NRS.

