

Design and Development of a Computerized Education Records System

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ABSTRACT

An efficient and cost effective computerized education records system was developed to provide centralized and decentralized reports of education participation. Collaboration with a computer analyst and programmer was essential to integrate our education information database with the hospital's mainframe system.

The proliferation of rapidly changing health care systems, technologies, and clinical programs requires health care employers to provide increased education and training for developing the competency of multi-skilled professionals. Documentation of education activities in a meaningful, accessible format is a challenge for the nurse educator and manager. We developed a computer-based education record system to solve this problem.

Assessment of an existing manual recordkeeping system at our 800-plus-bed, tertiary care institution revealed that documentation requirements were not met adequately. At the same time, the existing system was labor-intensive and, therefore, costly. It was imperative for an efficient, effective method of collecting and reporting nursing department staff development to be incorporated into an education management information system that would provide both centralized and decentralized

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reports. We wanted to provide access to the information on each nursing unit so the nurse manager could readily identify employee participation in required technical inservice education and assess individual needs for additional training. To facilitate this, we needed to create a system for timely data input and retrieval.

A review of the literature provided information on a number of existing concepts (Dixon, Gouyd, & Varricchio, 1975; Jenkins, Carter, & Howard, 1984; Moon, 1982). Using the literature, we formulated our project outcome, plan, and the subsequent design of an education management information system designed to meet the specific needs of our own institution as well as the requirements of our state board of nursing and the Joint Commission on Accreditation of Hospitals (*Accreditation Manual for Hospitals*, 1985).

CRITERIA

Criteria for the project were presented to and confirmed by the nursing vice president, the directors of nursing, and the head nurses. The optimal system for our nursing department needed to provide:

- An individual employee education record documenting completion of orientation, specialty courses, continuing education programs, competency validations, inservice education sessions, and required department reviews. These educational components are defined in Table 1.
- Aggregate reporting by program to satisfy the requirements of accrediting agencies.

The individual records were expected to be useful in the budgeting process, in employee performance review, and in assuring a technologically up-to-date staff. Aggregate program reports were needed for annual reporting as well as for strategic planning purposes.

Functionally, the system needed to provide:

- Identification of individual skill levels for use in determining staff assignments to meet patient acuity levels.
- Ability to produce reports incrementally by individual employee, by nursing unit, and by clinical service, as well as for the nursing department as a whole.
- Timely execution of quarterly and annual reports.

PLAN

It was readily apparent that only with the support of computer technology could these essential outcome criteria be met with any efficiency. After conferring with programming specialists in our hospital information systems (HIS) department and determining that the project was feasible, we transferred our criteria to a project plan, which consisted of a chronological list of tasks:

1. Identify the elements of the education information system database.
2. Collaborate with HIS specialists to identify appropriate hardware and software, and to determine a time schedule for design and implementation.
3. Prepare a *pro forma* budget for the project.
4. Design a process for evaluation during and after implementation.

Education Information System Database

The essential elements of the record system were determined to be identification of the employee, the nursing unit, and the educational component. Because more than one employee may carry the same name, the addition of an identifying number would be essential (Jenkins, Carter, & Howard, 1984). Any method of identifying the employee's nursing unit would need to incorporate a means of tracking employee transfers from one station to another, as well as changes in employment status. Since key elements of the employee's record, such as licensure and level of education, already were captured in the personnel department information system, we saw no need to replicate these data in the education information system (Pocklington, Thomas, & Srsic-Stoehr, 1980).

We carefully defined the various components of education that were our concern and drew up a chart, which became the foundation of our system design. Fields in the database would vary for each educational component, depending upon the component characteristics (Table 2).

Collaboration with HIS Specialists

Collaboration with a computer analyst and programmer from HIS resulted in the decision to integrate our database with the hospital's mainframe system. The volume of data to be stored and the processing of the data required mainframe computer capabilities, many of which were already in place in support of other hospital functions. The IBM 4381 model Group II (with 16 megabytes of main memory, online disc storage, and multiple work stations) and the Small System Executive (SSX)/Virtual Storage Extended (VSE) as the operating program could handle the data and its manipulation.

TABLE 1
DEFINITION OF EDUCATION COMPONENTS

- **Orientation:** Introduction of new employees to the philosophy, goals, policies, procedures, role expectations, physical facilities, and special services within the health care setting.
- **Specialty Course:** Didactic and/or clinical experience focused on specific nursing specialty.
- **Continuing Education Program:** Learning experience designed to augment knowledge, skills, and attitudes and also meets criteria for continuing education units (CEUs).
- **Competency Validation:** Skill demonstration validated by a qualified observer.
- **Inservice Education:** Program on clinical unit designed for staff development and does not meet criteria for CEUs.
- **Required Department Review:** Mandatory annual review, e.g., fire and safety review, infection control, and CPR.

TABLE 2
EDUCATION DATA COMPONENTS

Components	Descriptive Characteristics					
	Title	Class Hours	Clinical Hours	Date	Evaluation Code	Credit or Contact Hours
Orientation	X	X	X	X	X	
Nursing course	X	X	X	X	X	X
Inservice program	X			X	X	
Required competency skill	X			X	X	
Department review	X			X	X	
Specialty certification	X			X		
Corporate education program	X	X	X	X	X	X
Community education program	X			X	X	X

The personnel department database management system processes employee data using a hospital-assigned employee number; therefore, any position changes or unit transfers are automatically processed to the new cost cen-

FIGURE 1A
INDIVIDUAL EMPLOYEE EDUCATION PROFILE—PAGE 1

Cost Center 5410
Employee Number 64760
Employee Name Clausen, Kathy L

Class/Course Title	Code	Components/Vendor	Eval Code	Date Complete	Class Hours	Contact Hours	Clinic Hours	Degree Credits
Orientation	1A101	Personnel	8	05/04/87	2.0			
	1A102	Safety & security	8	05/04/87	.5			
	1A103	Infection control	8	05/04/87	2.0			
	1A104	Nursing department	8	05/04/87	1.0			
	1A105	Professional practice	8	05/05/87	2.0			
	1A107	Quality assurance	8	05/05/87	1.5			
	1A112	Cardiopulmonary resuscitation	4	05/08/87	3.0			
	1A113	Mobility	4	05/08/87	2.0			
	1A111	Computer system	8	05/08/87	1.0			
	1A120	Clinical Orientation		4	06/06/85			160.0
Subtotal orientation/technical course					15.0	.0	160.0	.0

FIGURE 1B
INDIVIDUAL EMPLOYEE EDUCATION PROFILE—PAGE 1B

Cost Center 5410
Employee Number 64760
Employee Name Clausen, Kathy L

Class/Course Title	Code	Components/Vendor	Eval Code	Date Complete	Class Hours	Contact Hours	Clinic Hours	Degree Credits
Inservice Programs	30707	Cardiac transplant denervation	8	1/27/87				
	30517	Pharmacy computer/forms	8	12/03/86				
	31502	AIDS: ERTK (IC)	8	11/04/86				
	31506	Renal failure: Pt. Nrsng. care	8	03/05/86				
	50101	CPR Review	4	03/07/87				
Subtotal Inservice/Department Review					.0	.0	.0	.0
Corporate education programs	80048	Heart transplantation	5	12/09/86		8.0		
	Subtotal corporate education programs					.0	8.0	.0
Employee Grand Total					15.0	8.0	160.0	.0

ter. A method for linking the education database to the personnel department database was proposed by the computer analyst and approved by the personnel department.

The project plan was presented to the administration for review and was approved. The approval thus committed the personnel department's database management system, the information systems department mainframe

linkage and support for program development, and resources of the education department to the project.

IMPLEMENTATION

Specifications for our computerized education records system (CERS), including record and screen layouts, printer spacing charts, flowcharts, and written narrative,

FIGURE 2
ORIENTATION SUMMARY—FIRST QUARTER

Cost Center 5310		Orientation				Required Course				Contact	Hours	Total
Employee Number	Employee Name	Class QTD	Hours YTD	Clinical QTD	Hours YTD	Class QTD	Hours YTD	Clinical QTD	Hours YTD	QTD	YTD	Hours
14995	Weitzel, Kathy L	4.5	4.5									4.5
14461	Frainer, Dianne M			40.0	40.0							40.0
41568	Jensen, Peggy A	3.0	3.0									3.0
32917	Matson, Lisa K			104.0	104.0							104.0
55060	Moe, Joann K	3.5	3.5	112.0	112.0							115.5
46156	Blackwell, Sharon L	1.0	1.0	64.0	64.0							65.0
47556	Robbins, Donna	43.5	43.5									43.5
52359	Maples, Nancy L	20.0	20.0	80.0	80.0							100.0
73693	Brown, Diane M	34.0	34.0	120.0	120.0							154.0
903040	Pelteir, Theresa	26.5	26.5									26.5
	Cost Center Total Hours	136.0	136.0	520.0	520.0							656.0

were completed following several working meetings with the HIS analyst. The results of programming were tested, and screen layouts and sample reports were evaluated and modified as they evolved.

The program is menu-driven. The operator has the options of adding, updating, deleting, or simply inquiring about entries in one of two databases: the individual employee education record (employee course) or the record of the individual courses and programs presented (course catalogue). The individual employee data are entered on the employee course record add screen and become the primary source data for the processed cumulative results on the output reports.

SYSTEM OUTPUT

Detailed and summary data are produced in report format. Five separate reports are produced. The generic heading on each includes the date and time the report was generated, demographic data (i.e., cost center and employee number and name), and the report title. There are two types of reports: one for individual employee information and a series of four administrative reports. Each serves a distinct purpose. The four administrative reports are issued quarterly, cumulating to an end-of-the-year annual report for each cost center (nursing unit), and are designed not only as a means of compliance with the JCAHO standards regarding documentation (Nursing Services, Standard V), but also as management aids for head nurses and department managers.

Report 1: Individual Employee Education Profile

Report 1 lists the employee's total annual participation in education activities (Figures 1A and 1B). In addition to a bottom-line grand total, it provides subtotals for nursing courses, inservice education programs, required competency skills, and corporate education programs. The eval-

uation code defines the method of accomplishment, e.g., pretest, posttest, self-assessment, or skill validation. The date of completion and number of hours to be credited (differentiated as class hours, contact hours, clinical hours, or degree credits) are reported. Cumulative sub-totals and the grand total are automatically calculated and displayed. Two copies of the Individual Employee Education Profile are forwarded to the employee's manager six weeks in advance of the employee's hire date anniversary. One copy is given to the employee, the other is used by the manager in preparation for the employee's annual performance review. Thus, each has an opportunity to examine the report and validate its accuracy.

Report 2: Orientation Summary

Report 2 is a quarterly and cumulative calendar year report of hours of orientation and required continuing education for employees in each cost center (Figure 2). Both head nurses and nurse educators use this report to monitor new employee and transfer employee orientation; managers use it in budget planning.

Report 3: Required Inservice Attendance List

Report 3 prints out, under each required inservice education program, the employees who attended and the date of completion (Figure 3).

Report 4: Required Competency/Skill List

Report 4 prints out, opposite each required competency, those employees who have mastered it and the date of completion (Figure 4).

Report 5: Department Review

Report 5 lists, opposite each review descriptor, the unit employees complying and the corresponding dates of completion (Figure 5).

FIGURE 3
INSERVICE ATTENDANCE REPORT

Cost Center 5310

Inservice Title 30601 Diatek Electronic Thermometer

Employee Number	Employee Name	Attendance		Most Recent Attendance
		Yes	No	
92040	Robbins, Theresa M	Y		02/25/87
71139	Tarkington, Michelle A	Y		02/25/87
42918	Hyatt, Nancy J	Y		02/25/87

Inservice Title 30601 Ted Sleeves

Employee Number	Employee Name	Attendance		Most Recent Attendance
		Yes	No	
72863	Erickson, Katherine A	Y		05/11/87

FIGURE 4
REQUIRED COMPETENCY/SKILL LIST

Cost Center 5640

Required Competency/Skill Title 60J01 C-Birth Baby Receiving

Employee Number	Employee Name	Attendance		Date Last Completed
		Yes	No	
63079	Robbins, Theresa M	Y		08/13/86
56984	Riedel, Laurel J	Y		08/27/86
18145	Peltier, Kristine Leigh	Y		08/27/86
18648	Van Brekke, Marcea A	Y		03/27/87

FIGURE 5
DEPARTMENT REVIEW REPORT

Cost Center 5450

Department Review Title 50101 CPR Review

Employee Number	Employee Name	Compliance		Most Recent Date
		Yes	No	
96161	Matson, Jane E	Y		05/07/87
90837	Robinette, Barbara A	Y		05/06/87
58258	Brown, Beverly	Y		05/04/87
68181	Jensen, Dianne L	Y		06/09/86
60593	Maples, Wendy B	Y		05/06/87

SUPPORT SYSTEMS

Essential to the implementation of this information management system was the development of methods and materials for collecting and distributing the basic data. These included designing or modifying input source

documents, developing methods of coding, managing data entry, designing distribution channels, and formulating policies and procedures.

A list of standard program descriptors and codes was compiled, along with assignment criteria for new entries.

FIGURE 6
SPECIALTY ORIENTATION FORM WITH COMPETENCY SECTIONS

CRITICAL CARE COURSE 02 _____ _____ _____
 Name: Last First Initial Station/Assignment Total Contact Hours

LS _____ _____
 LS Level Employee Number Cost Center #

DATE ORIENTATION BEGUN → _____ DATE COMPLETED → _____

COMPONENTS	DATE COMPLETED	EVALUATION CODE	HRS	COMPETENCIES	EVALUATION CODE
____ 101: Basic EKG	_____	_____	16.0	60A01 Defib/Cardioversion	_____
____ 102: Respiratory Pt.	_____	_____	03.0	60A02 BCLS Certification/ Recert	_____
____ 103: Acute Resp Failure	_____	_____	03.0	60A03 EKG	_____
____ 104: Principles Resp Mgt	_____	_____	04.0	60A04	_____
____ 105: Cardiovascular Pt I	_____	_____	03.0	60A05	_____
____ 106: Cardiovascular Pt II	_____	_____	03.0	60A06	_____
____ 107: CV Surgical Pt	_____	_____	04.0	60A07	_____
____ 108: Renal Pt	_____	_____	03.0	60A08	_____
____ 109: Hemodynamic Monit I	_____	_____	04.0	60A09	_____
____ 110: Monit I	_____	_____	03.0	60A10	_____
____ 111: Neurological Pt I	_____	_____	04.0	60A11	_____
____ 112: BCLS Certification	_____	_____	04.0	60A12	_____
____ 113: GI/Metabolic Pt I	_____	_____	04.0	60A13	_____
____ 114: Neurological Pt II	_____	_____	03.0	60A14	_____
____ 115: CC Environment	_____	_____	04.0	60A15	_____
____ 116: GI/Metabolic II	_____	_____	03.0	60A16	_____
____ 117:	_____	_____	.0	60A17	_____
____ 118:	_____	_____	.0	60A18	_____
____ 119:	_____	_____	.0	60A19	_____
____ 120: Clinical orientation	_____	_____	—	60A20	_____

I have completed the required components _____
 (Employee) Date

I validate that the employee has satisfactorily completed required components _____
 (Manager) Date

Education Profile Authorization _____
 Education Specialist/Clinical Specialist _____
 (Date/Initials: Certificate Issued) _____
 Computer File Entry _____
 (Initials) (Date)

Input source documents used in the previous manual collection system, i.e., individual learner completion records and program attendance rosters, then were modified to include space for entering the predetermined program titles, program and component codes, evaluation codes, and competency codes. A sample of the modified specialty orientation form for critical care units is shown in Figure 6.

The input source document for inservice programs

includes, on the face of the sheet, space for title/subject, the station on which it was presented, date, objectives, and the name of the presenter. The reverse of the sheet serves as the attendance roster. Participants are expected to enter their employee number when they sign the roster. Assigned computer codes are recorded on the sheet before the data are entered (Figure 7).

Historically, more than half of the registrants in our

FIGURE 7
INSERVICE PROGRAM AND ATTENDANCE SHEET

ATTENDANCE RECORD—INSERVICE PROGRAM					198__		30
PROGRAM TITLE: _____							
	DATE	NAME (Please Print)	EMPLOYEE #	COST CENTER	CHECK ONE:		
					RN	LPN	OTHER
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

ABBOTT NORTHWESTERN HOSPITAL—SISTER KENNY INSTITUTE
NURSING EDUCATION

INSERVICE PROGRAM REPORT
(no credit for continuing education involved)

- ALL SECTIONS MUST BE COMPLETED BY PERSON ORGANIZING PLANNING PROGRAM.
- ATTACH ALL ATTENDANCE SHEETS.
- RETURN—WITH COMPLETE PROGRAM FILE—TO:
EDUCATION DEPARTMENT, EDUCATION BUILDING. (14201)

TITLE/SUBJECT: _____

INFECTION CONTROL (IC)
 SAFETY/SECURITY (SS)
 EMPLOYEE RIGHT TO KNOW (ERTK)

ELECTRICAL SAFETY (ES)
 QUALITY ASSURANCE (QA)

STATIONS/SERVICES _____

DATES (OR INCLUSIVE DATES OFFERED) _____

MASTER FILE OF PROGRAM INCLUDES (CHECK THOSE WHICH APPLY):

 LEARNING OBJECTIVES (LIST BELOW)

 OUTLINE OF CONTENT PRESENTED
 ATTENDANCE RECORD (REVERSE SIDE)
 OTHER _____
 HOW WAS THE NEED IDENTIFIED? _____

 WHAT FOLLOW-UP WOULD BE HELPFUL? _____

 PERSON(S) ORGANIZING/PLANNING PROGRAM? _____

 PERSON(S) PRESENTING PROGRAM: _____

continuing education programs come from outside our own corporation. Registration and recordkeeping for those programs have been computerized for several years on a stand-alone system. Since this database included not only nursing, but also medicine and other health professions, it needed to be maintained. To accommodate our CERS system, we merely added an employee identifier to the existing attendance sheet (Figure 8); relevant data are

thus quickly identifiable for input to the CERS system. The final input source document enables all of the education credit that nursing department employees accumulate from other providers to be included on their Individual Employee Education Profiles (Figure 9). Thus, a record of all completed education activities—including academic credit earned—is collected. Policies and procedures were developed to manage this

FIGURE 8
CONTINUING EDUCATION ATTENDANCE SHEET

Continuing Education		Credit Hours	
Program Title	Sample Sign-in Sheet		
Date of Program or Date of Last Session	#601		
Name	Soc. Sec. No.	Signature	ANW Employee No.
1.	:	E:	:
2.	:	:	:
3.	:	:	:
4.	:	E:	:
5.	:	:	:
6.	:	:	:
7.	:	E:	:
8.	:	:	:
9.	:	E:	:
10.	:	:	:
11.	:	:	:
Authorization			
Program Coordinator	Date	() Check if certificates issued at close of program	

system and to identify staff responsibilities. They include retention time for both the database and source materials. For example, we found it necessary to allow both the employee and the manager 60 days after they received the Individual Employee Education Report to notify the education department of erroneous entry. After 60 days, if no contrary comment has been received, the record is considered to be correct and much of the heavy paper trail of input source documents is destroyed.

SUMMARY

Critical to the ultimate success of the CERS was identification of the time frame for development and implementation. The volume and complexity of its components necessitated five phases of program testing and practical implementation. The project was initiated in early 1985 and became fully operative within two years.

The evaluation process is designed to be ongoing. A

postimplementation survey of head nurses and directors of nursing indicates that the reports do meet their current needs. Management support, in fact, increases in direct proportion to the length of time the CERS has been operative. The system already has proven effective in processing the massive volume of data into an integrated, usable set of information. It also has proven efficient in accomplishing this with reduced full time equivalent consumption. Given the capability of the computer to retrieve, manipulate, and distribute the components of the database, additional uses for the system will doubtless emerge in the future.

REFERENCES

Accreditation Manual for Hospitals. (1985). Joint Commission on Accreditation of Hospitals, 99; Chicago, Illinois.
Dixon, J., Gouyd, N., & Varricchio, D. (1975). A computerized education and training record. *The Journal of Continuing Edu-*

FIGURE 9
COMMUNITY EDUCATION COMPLETION FORM

Community Education	95	<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>	<input style="width: 95%;" type="text"/>
		Name: Last First Initial	Station/Assignment	Code
			<input style="width: 60%;" type="text"/>	<input style="width: 30%;" type="text"/>
		LS	Employee Number	Cost Center No.
		LS Level		

Title of Program Attended _____

Number of Contact Hours _____

Number of Degree Credits _____

Date(s) of Program _____

Sponsor of Program _____ Location _____

Education Profile Authorization
(Certificate or Transcript Record Validated)

<input type="text"/>	<input type="text"/>
(Employee)	Date

<input type="text"/>	<input type="text"/>
Education Specialist/Clinical Specialist	Date

<input type="text"/>	<input type="text"/>	<input type="text"/>
Computer File Entry	(Initials)	Date

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 Jenkins, D., Carter, R., & Howard, B. (1984). The development of a hospitalwide computerized employee and physician record keeping system. *The Journal of Continuing Education in Nursing, 15(5), 178-179.*

Moon, D.L. (1982). Data processing in staff development. *Nursing Management, 13(2), 23-25.*
 Pocklington, D., Thomas, C., & Srsic-Stoehr, K. (1980). The development of a nursing education record keeping system. *The Journal of Continuing Education in Nursing, 11(5), 34-43.*