

Molloy University

DigitalCommons@Molloy

Faculty Works: NUR (2010-2023)

Nursing

2-2011

Field-Testing a PC Electronic Documentation System using the Clinical Care Classification© System with Nursing Students

Jennifer Emilie Mannino Ph.D., R.N.
Molloy College, jmannino@molloy.edu

Veronica D. Feeg Ph.D., R.N., FAAN
Molloy College, vfeeg@molloy.edu

Follow this and additional works at: https://digitalcommons.molloy.edu/nur_fac



Part of the [Higher Education Commons](#), [Medical Education Commons](#), [Nursing Administration Commons](#), and the [Other Nursing Commons](#)



This work is licensed under a [Creative Commons Attribution 4.0 International License](#).

[DigitalCommons@Molloy Feedback](#)

Recommended Citation

Mannino, Jennifer Emilie Ph.D., R.N. and Feeg, Veronica D. Ph.D., R.N., FAAN, "Field-Testing a PC Electronic Documentation System using the Clinical Care Classification© System with Nursing Students" (2011). *Faculty Works: NUR (2010-2023)*. 1.
https://digitalcommons.molloy.edu/nur_fac/1

This Article is brought to you for free and open access by the Nursing at DigitalCommons@Molloy. It has been accepted for inclusion in Faculty Works: NUR (2010-2023) by an authorized administrator of DigitalCommons@Molloy. For permissions, please contact the author(s) at the email addresses listed above. If there are no email addresses listed or for more information, please contact tochter@molloy.edu.

Field-Testing a PC Electronic Documentation System using the Clinical Care Classification© System with Nursing Students

Jennifer E. Mannino*, MA, MS, RN and **Veronica D. Feeg, PhD, RN, FAAN**
*Division of Nursing, Molloy College, 1000 Hempstead Avenue,
Rockville Centre, NY USA*

Submitted August 2010. Accepted for publication February 2011.

ABSTRACT

Schools of nursing are slow in training their students to keep up with the fast approaching era of electronic healthcare documentation. This paper discusses the importance of nursing documentation, and describes the field-testing of an electronic health record, the Sabacare Clinical Care Classification (CCC©) system. The PC-CCC©, designed as a Microsoft Access® application, is an evidence-based electronic documentation system available via free download from the internet. A sample of baccalaureate nursing students from a mid-Atlantic private college used this program to document the nursing care they provided to patients during their sophomore level clinical experience. This paper summarizes the design, training, and evaluation of using the system in practice.

Keywords: clinical care classification (CCC) system, electronic documentation, electronic health record (EHR), nursing education, usability

1. INTRODUCTION

Just over half of all US hospitals use some form of electronic health record (EHR) [1]. With the new federal incentives urging all hospitals to have fully implemented EHRs by 2015 [2], there will be a surge in demand for adequate preparation of graduating nurses who are ready for working in the electronic environments. As hospital information systems gear up to integrate discipline-specific documentation, nursing will need to have the care documentation systems available and the users prepared to work with them. Schools of nursing must step up and offer students the opportunity to learn health information technology (IT), nursing terminology, and electronic documentation for their futures. In order for nurses to be comfortable with health information technology, they must be comfortable with computers.

*Corresponding Author: Jennifer E. Mannino, Molloy College, Division of Nursing, 1000 Hempstead Avenue, Rockville Centre, NY 11571. Phone: (516) 678-5000 ext. 6929 E-Mail: jmannino@molloy.edu
Other author: vfeeg@molloy.edu

In light of the many systems available, there is no single approach to teaching and learning computerized charting. Access to a free computerized documentation system creates an opportunity for nurse educators to embrace technology and bring students into the era of information technology.

The PC version of the Sabacare Clinical Care Classification (CCC©) System was developed by a team using the terminology developed by Virginia Saba. It is a free, downloadable, easy-to-install electronic documentation system that classifies and links the Nursing Diagnoses directly with coded Nursing Interventions. “The CCC© is a standardized, coded nursing terminology that identifies the discrete elements of nursing practice. It provides a unique framework and coding structure for capturing the essence of patient care in all health care settings” [3]. The PC application uses Microsoft Access® and can be saved on a student’s flash drive, making it a portable care planning system that electronically documents and aggregates nursing interventions. As a teaching tool, the instructor is able to teach the nursing process, demonstrate electronic documentation, and capture all of the students’ works over a period of time. The reports available in the system summarize their activities and information about their patients thus making measurable the quality of care delivered by nursing students.

2. LITERATURE REVIEW

The Clinical Care Classification (CCC) nursing terminology has been accepted by the U.S. Department of Health and Human Services (HHS) as a named standard [4]. The CCC contains two nursing taxonomies, nursing diagnoses and nursing interventions, that are coded using a five alphanumeric coding structure based on the format of the *International Classification of Diseases, Tenth Revision* (ICD-10). It is recognized by the American Nursing Association (ANA) as appropriate for documenting nursing practice in the electronic health record (EHR), registered as a Health Level Seven (HL-7) language, integrated in the Logical Observation Identifiers, Names and Codes (LOINC), indexed in the Cumulative Index of Nursing and Allied Health Literature (CINAHL) and available in Systematic Nomenclature of Medicine - Clinical Terms (SNOMED-CT).

The terminology was developed by Saba [5] and revised to be applicable in all health care settings. The system uses the steps of the Nursing Process (Table 1) to assess patients for their care needs. The term “*Nursing Process*,” coined by Lydia Hall over 50 years ago, is fundamentally a problem solving approach to delivering nursing care. Over the decades, notable nursing theorists have worked to evolve the nursing process into the six-step process we have today: assessment, diagnosis, outcome identification, planning, implementation and evaluation.

A nurse uses this guide to identify and document a plan of care individualized for each patient. The CCC System is being used to document nursing care in the EHR, computer-based patient record (CPR), and Personal Health Record (PHR) Systems. The terminology consists of atomic level coding for each element in the language associated with the Nursing Process (Figure 1).

Table 1. Summary definitions for the nursing process model.

Nursing Care Process Steps – Documentation System

The steps of the nursing process include the following:

Assessment

Diagnosis

Outcome Identification (Expected Outcome)

Intervention (Planning)

Type of Action – Implementation (Monitor/Perform/Teach/Refer)

Evaluation (Actual Outcome)

Care Components: Assessment

Care Components provide the standardized framework to document and track the care with each patient contact/encounter. Care Components link and map the six steps of the care process, and provide the analysis and measures for evidence-based practice.

Nursing Diagnoses: Diagnosis

Nursing Diagnoses are used to identify the specific atomic-level diagnostic conditions based on the signs and symptoms, assessed care components and/or patient problems that require care.

Expected Outcome: Outcome Identification

Each Nursing Diagnosis requires an *Expected Outcome* as the goal of the care. The three qualifiers used for the Outcome Identification are: to *improve* patient's condition; to *stabilize* the patient condition; or to *support* the patient's deteriorating condition.

Nursing Interventions: Planning

The *Nursing Interventions* are atomic-level services identified to plan and implement patient care. They are needed to satisfy each care component, diagnostic condition, or patient problem assessed as requiring nursing care.

Type Intervention Action: Implementation

Each Nursing Intervention requires a *Type of Action* as the major focus of the core nursing intervention. It provides the evidence used to measure care and determine the resources. The 4 qualifiers used to provide the Type Action are:

1. Assess/Monitor/Evaluate/Observe = Action evaluating the patient condition.

2. Care/Perform//Provide/Assist = Action performing actual patient care.

3. Teach/Educate/Instruct/Supervise = Action educating patient or caregiver.

4. Manage/Refer/Contact/Notify = Action managing care on-behalf of the patient or caregiver.

Actual Outcome: Evaluation

Each Nursing Diagnosis requires an *Actual Outcome* as an evaluation of the outcome of the care process – interventions and type actions. The same three qualifiers are used to predict the care goals and to evaluate whether they were met or not met.

Patient's condition **Improved**, **Stabilized**, or **Deteriorated**.

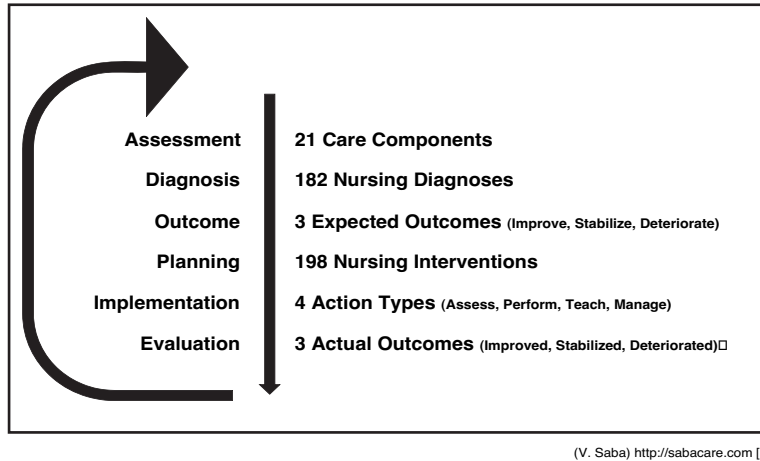


Figure 1. CCC terminology applied to the nursing process.

2.1. Challenge of teaching electronic documentation

The drive towards computer literacy among nurses began around the late 1970s with Dr. Judith Ronald teaching nurses basic computer skills [6]. In the 1980s, the National League for Nursing (NLN) published “Guidelines for Basic Computer Education in Nursing” outlining the need for nurses to have basic computer competencies [7]. Almost a decade ago, the Institute of Medicine in *Crossing the Quality Chasm: a New Health System for the 21st Century* [8] urged health educational programs to include the use of health information technology, i.e., EHR, thus anticipating the elimination of most handwritten clinical information. In 2006, the Technology Informatics Guiding Educational Reform (TIGER) Initiative proposed a three-year plan to “enable practicing nurses and nursing students to fully engage in the unfolding digital era of health care”[9]. Still today, we are striving to fulfill these goals.

As the use of computers and advanced technology proliferate in the healthcare industry, computer competency among nurses is even more necessary. However, schools of nursing continue to face oppositional pressures of preparing students for electronic documentation. In the last two decades, academic institutions have demonstrated minimal success in preparing students beyond basic computer skills, not including preparing them for hospital IT [10].

While integrating students to multiple hospital settings, it is impossible for faculty to learn then teach every computer system. In the past, faculty and students had access to paper charts; today many hospitals disallow non-hospital personnel access to computerized patient records. In addition, students who are not already computer savvy face increasing pressure. They are coupled with the challenge of learning basic computer skills while attempting to master a difficult nursing curriculum.

For institutions of education, the cost and maintenance of electronic documentation systems can be prohibitive. Finding a system that meets the needs of instructors and

students requires innovation and financial support. For example, Gloe [11] suggests forming a committee and interviewing at least four separate vendors to evaluate each system's technical support, cost, functionality and ease of use. Realistically, however, academic institutions are torn between providing technology and raising tuitions and fees – and although they may need to make sacrifices, practicality is premium. No one system is without flaw.

While many schools of nursing identified their students as using computers across the curriculum, the use was to perform online literature searches and/or prepare power point presentations [12]. Although the students were using computers to fulfill requirements, they were not actually engaging in health information technology. A national survey [12] revealed incompatibilities among how faculty and students viewed informatics as compared to what nursing informatics really is, defined by the NLN. These findings lead to the NLN moving forward in their position statement recommending that nurses be educated in informatics so that they may perform in technology-rich environments [7].

Integration of health IT in nursing education has become a recommendation of professional organizations including the American Nurses Association (ANA) and the American Association of Colleges of Nursing (AACN). However, the large health IT systems connected to hospitals are often physically and organizationally distant to the nursing education laboratories and courses. Early efforts to incorporate clinical information systems with academic programs faced faculty resistance and lack of support [13]. There have been some partnerships such as the University of Kansas/Cerner Corporation initiative in developing their Simulated e-Health Delivery System (SEEDS), which allows students to practice using a live information system designed for care delivery [14]. Another partnership between Johns Hopkins University and Eclipsys Corporation have supported integration of IT systems with undergraduate and graduate programs [15]. But these examples are rare.

2.2. The PC version of the CCC

To provide nursing students with an opportunity to use nursing terminology in an electronic documentation system, an application was developed for the PC using a ubiquitous database management system. The application was designed with Microsoft Access® as an inexpensive alternative to teach electronic charting for use in a laboratory with simulators or live patients. The application differed from commercial electronic charting but offered the nursing student an opportunity to interact with software using the CCC terminology [16].

The PC-CCC was tested by Feeg, Saba and Feeg [16] using a randomized controlled trial (RCT) with nursing students in a simulated laboratory experience. In this study, 30 students were randomly assigned to the database version of the PC-CCC or a type-in text charting screen installed on laptops at the bedside of two patient-actors. Each student interviewed the patients and recorded their documentation on the assigned laptop. The quality of the documentation, evaluations by the students, and time to completion of the task were compared. The investigators supported the hypotheses that the quality of care plans, time to completion, and student reported evaluations would be

improved with the PC-CCC compared to the type-in text version. Results demonstrated that care plans were better using the data-based system over the type-in text version. Students' evaluations were more positive for the data-based laptop version of the documentation than the type-in text entries, although students tended to use all the time allowed to completion. The results demonstrated that the PC-CCC using the standardized terminology was effective for students' learning electronic charting and care planning that may become more efficient with repeated use.

3. OBJECTIVES

While it was clear that the simulated activity of the Microsoft Access PC version of the CCC was effective, it did not answer the question of whether or not the system could be implemented in a real setting where the learning is affected by multiple variables and the environment is not controlled. It was therefore ready for field-testing.

3.1. Purpose

The purpose of this study was to integrate and evaluate a stand-alone, free, evidence-based electronic documentation application for students during their clinical experiences. The logistics of training and implementing a course-wide assignment using the PC-CCC were planned and the software would be put into action. Student feedback about the process and quality of the documentation assignments were part of the evaluation.

3.2. Goals

The goals of the project included the following:

- To provide a free, easy-to-install computer-based documentation system for use with nursing students early in the curriculum. The software would introduce students to health IT and provide the novice computer user with a basic set of computer skills.
- To provide a unique approach to teaching nursing students the Nursing Process. The PC-CCC fosters the students' understanding of the steps recognized as essential for nurses. It encourages critical thinking without memorization. The terminology can become part of routine language of diagnosis and interventions.
- To monitor, track and evaluate student experiences at multiple clinical sites. The PC-CCC system allows for documentation, storage, analysis and retrieval of information. It aggregates and categorizes interventions by type and frequency, thus capturing the students' clinical experience electronically. Further statistical analyses allow the instructor the ability to evaluate student experiences meaningfully.

4. SYSTEM DESIGN

The PC-CCC system, designed to run in Microsoft Access® (2007), is downloaded from the Internet (<http://faculty.molloy.edu/pccccc>). The software was developed with multiple tables as its core and a user interface launched from the switchboard.

Students must have computers to run the program or they are encouraged to work in the lab with Windows workstations configured with at least Windows XP®, Office

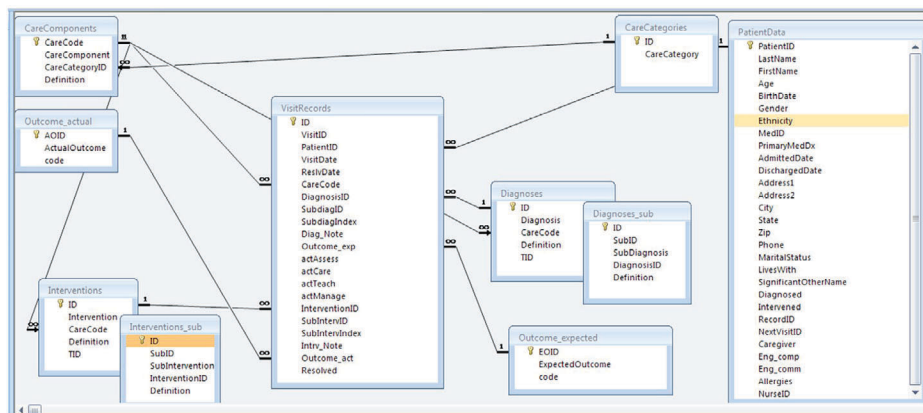


Figure 2. Microsoft Access® relationship links between the elements of the database.

2007® and Internet connectivity. The program also works on Macs® with Windows capability that can run Office applications. To save the program and for maximum portability, the students must purchase a 1.0 gigabyte flash drive.

4.1. Database design

Microsoft Access® provides the database functionality to hold the CCC language in relational tables and creates a practical user interface for the users to enter, submit, store, and present information. Figure 2 depicts the multiple tables and relational links for the system.

4.2. PC Clinical Care Classification Design

The program was set up for users to perform functions that are part of documenting practice - nursing diagnosis and interventions. The switchboard provides the patient's name (fictitious) as primary key to the problems and treatments selected for each entry. Figure 3 depicts the algorithm of flow for nursing care planning congruent with the nursing process.

5. METHODS

Field-testing the PC-CCC has begun over multiple cohorts of student groups and evaluations are ongoing. Usability evaluations are a continuous part of field-testing.

5.1. Sample

The pilot group consisted of a select sample of baccalaureate degree nursing students enrolled during the Summer 2009 session (n=8). Field-testing of the PC-CCC continued in the Fall 2009 and Spring 2010 semesters with new students (n=49). The pilot and subsequent sample cohorts were enrolled in a Level II nursing course consisting of lecture, laboratory and clinical components. The combined samples had a mean age of 23, with 84% percent being younger than age 30; 74% were white and 96% percent

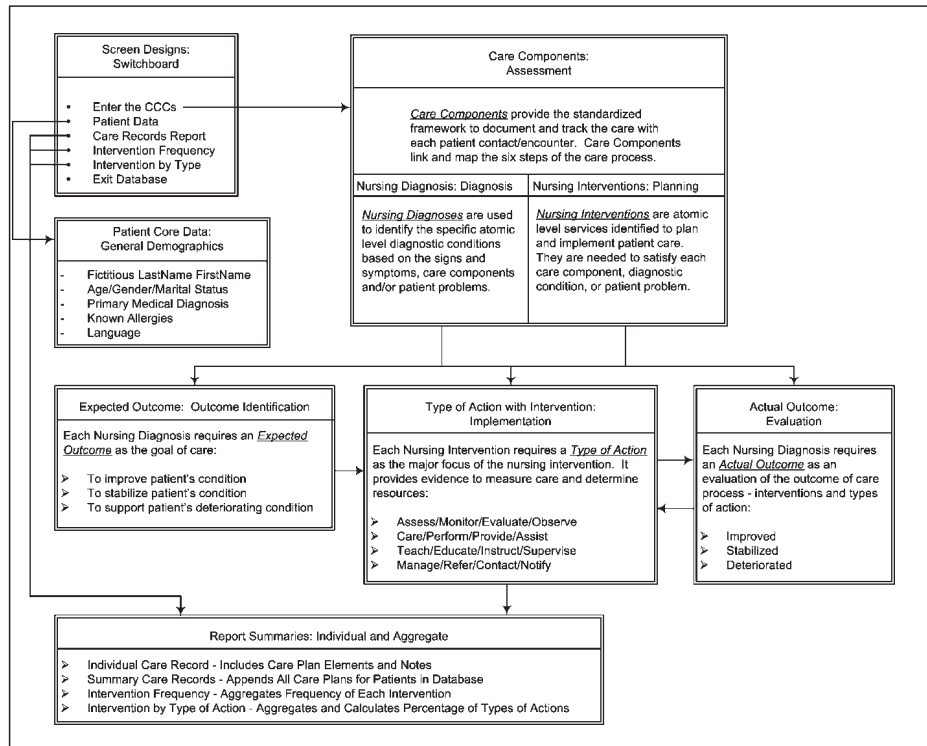


Figure 3. Diagram of operational flow for nursing care planning.

were women. By comparison, the students were younger aged and less racially diverse women, suggesting that they were not naïve to using computers.

5.2. Process

Based on randomized trial procedures reported in the literature [16], the students downloaded, renamed and saved the Microsoft Access® version of the Sabacare CCC© system from the website. They were guided in a tutorial, given rich examples, assigned to use the system, evaluated for the quality of their care planning, and surveyed on their satisfaction. The instruction included: (1) a brief overview of EHR, (2) review of the nursing process and nursing terminologies, and (3) specific steps on how to use the PC-CCC (Table 2).

Students in the pilot group received a 30-minute lecture presentation stressing the importance of EHR and its relationship to quality and safety of patient care. This introduction to electronic documentation was followed by two hours of instruction in a computer laboratory. Each student was assigned an individual computer terminal, provided with rich patient examples, sample documentation and step-by-step instructions. One-on-one guidance took place during the two hours.

Table 2. Method of instruction.

Instruction	Objectives Method	Time
Electronic Health Records PC-CCC	<ul style="list-style-type: none"> • Introduce health IT • Obtain basic set of computer skills <i>Didactic and Demonstration</i>	30-45 min
Step-by-Step Guidance (Pilot Group only)	<ul style="list-style-type: none"> • Ensure basic set of computer skills <i>Computer Lab – Common Patient</i>	2 hours
Home Assignment (Hospital/Clinical Experience)	<ul style="list-style-type: none"> • Foster understanding of the Nursing Process • Encourage critical thinking • Document patient data electronically <i>Individual Clinical Patients</i>	Submitted

The pilot group session revealed that the one-on-one guidance was unnecessary and subsequent sessions were streamlined. The subsequent groups attended a more efficient training session. They received a 45-minute introduction to electronic documentation and a real-time demonstration all within the classroom. Using audiovisual technology and Internet capabilities, the instructor demonstrated how to access, download and use the program. Students still received rich patient examples, sample documentation and systematic instructions but downloaded and navigated the system on their own.

Students entered the data of example patients into the database and created hypothetical care records for each. Once completed, they saved and electronically sent, as an email attachment, the entire database to the instructor. Upon completion of this task coupled with the satisfactory completion of the traditional clinical paper work, students began using the PC-CCC to document their actual clinical experience.

Students enrolled in this level II nursing course participated in weekly classroom lectures, laboratory practice, and hospital clinicals. The clinical experience is equivalent to 79 clinical hours. Each clinical group consists of one instructor and eight students. In order to prepare for the clinical experience, instructors provided each student with pertinent information on one patient the evening before going to the hospital. One patient per week is the typical assignment for this level of course. After providing nursing care for the patient, the student has an allotted amount of time to turn in the assigned homework: a plan of care, a physical assessment and a self-evaluation of their experience.

For the first few weeks of clinical, the students completed the course wide “Plan of Care” (a.k.a. “paper plan”). This plan was available as a downloadable Microsoft Word® document. In subsequent weeks, students documented the patient care electronically using the PC-CCC. Students sent a PDF version of the “Individual Care Record” to their clinical instructor for evaluation of content and quality, and sent the complete database to the lead instructor for further evaluation. This product is PC based and not HIPAA compliant as a stand-alone system; therefore, rules similar to paper care

plans must be stressed. Students used fictitious names and no identifying demographic or health data to preserve patient anonymity and maintain HIPPA compliance. Students are reminded of the ANA Code of Ethics related to the use of real names. As the students progressed through the course, they added patients to their databases. On the average for each semester, a student added six patients to the database, each with one to three nursing diagnoses and interventions (results varied).

Throughout the semester, faculty provided feedback to students about the quality of their care planning documentation. Each electronic care record was assessed for completeness. Faculty looked for a properly stated and well-supported nursing diagnosis with appropriate nursing interventions. Each intervention required a rationale. At the end of each semester, students completed a questionnaire to evaluate the usability of the PC-CCC. The data were analyzed for students' responses to using the computer application in relation to learning about the Nursing Process and about electronic documentation on the computer.

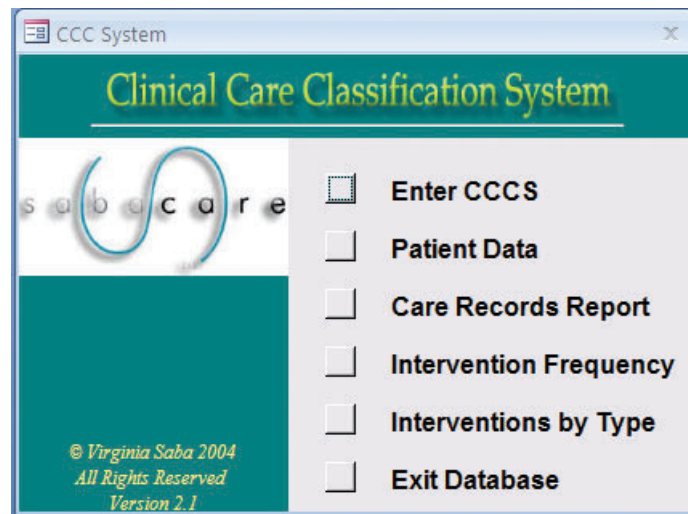
5.3. The Program in Action

Upon logging into the program, the dashboard screen appears (Figure 5-Screen A). The dashboard screen works similarly to a computer's desktop screen. From here, the user can: (1) Enter the PC-CCC to access/create/print/send individual care records or reports on existing patients (Figure 5-Screen B); (2) Enter new patients into the system (Figure 5-Screen C); (3) View/print/send all plans of care in the database (Figure 5-Screen D); (4) Create an aggregate report of the total number of interventions performed on all patients in the database (Figure 5-Screen E); or (5) Create an aggregate report of the percent of time the student nurse spent performing a particular action. The system automatically updates each time the student adds new information.

5.4. Sample Documentation

Figure 5-Screens B, C, and D display electronic data of a fictitious patient: *Mary Smith*. Screen B has three areas. The shaded gray tool bar across the top identifies the visit date, problem number, and patient name, as well as allowing for switching between screens, creating a report or exiting. The students create a care record by clicking field choices and free-text typing in the middle shaded gray area. Because the system is linked, as the student makes choices in one field, their choices are limited in the remaining fields. Once the entry is complete, an abbreviated view of the care record is added to the patient's problem list. The problem list is located in the lower section of Screen B. Upon clicking "Report", located at the top of Screen B, the information is transformed into an "Individual Care Record" (Figure 5-Screen D). The black print on the "Individual Care Record" represents the items imbedded within the system, while the gray print represents free text typed by the students.

Figure 5-Screens E and F are reports of three patients in the sample database. These reports represent the encounters a student had with three patients during a typical clinical experience (clinical experiences vary from group to group). At a quick glance, one can see that most of this nursing student's encounters (27.5%) were spent performing patient assessments and providing patient education (Figure 5-Screen F).



(a) Screen A: The dashboard.

Problem ID	Date	Diagnosis	Expected Outcome	Type of Action	Intervention	Actual Outcome	Status	Resolve Date	Display	Delete
8	10/1/2009	Airway Clearance Impairment	(I)	A-C-T	Pulmonary Care		In progress		Display	Delete
6	10/1/2009	Comfort Alteration	(I)	A-C-T	Comfort Care		In progress		Display	Delete
3	10/1/2009	Breathing Pattern Impairment	(I)	A-C-T	Oxygen Therapy Care		In progress		Display	Delete
2	10/1/2009	Activity Intolerance	(I)	A-C-T-M	Energy Conservation		In progress		Display	Delete

(b) Screen B: Patient care classification system.

Figure 5. PC-CCC application screens. (a) Screen A: The dashboard. (b) Screen B: Patient care classification system. (c) Screen C: Core patient information. (d) Screen D: Individual care record. (e) Screen E: Frequency of interventions. (f) Screen F: Interventions by type of action.

Patient Data

CORE PATIENT INFORMATION

Select patient: Mary Smith

Last Name Smith		First Name Mary		Gender <input type="radio"/> Male <input checked="" type="radio"/> Female
Age 75	Birth Date 9/1/1934	Ethnicity White/Non-Hispan	Marital Status Married/Living with Partner	
Medical ID Code 		Nurse ID Code 		
Primary Medical Diagnosis Pneumonia				
Known Allergies NKA			Admitted Date 	
			Discharged Date 	
Living Arrangement With spouse		Significant Other's Name Jack		Phone #
<input type="checkbox"/> Available Caregiver		<input checked="" type="checkbox"/> Able to comprehend English		<input checked="" type="checkbox"/> Able to communicate in English

Add New Patient
Remove Current Patient
Exit

Record: 14 of 3

(c) Screen C: Core patient information.

Individual Care Records

Patient: **Mary Smith**

Problem ID	Date	Diagnosis RELATED TO/AS EVIDENCED BY	Expected Outcome	Type of	Intervention ACTION/RATIONALE/Reference	Actual Outcome	Status	Resolve Date
8	10/1/2009	Airway Clearance Impairment R/T retained secretions, infection AEB rhonchi upon auscultation, increased anxiety and restlessness, ineffective cough, dyspnea, febrile.	(I)	A-C-T	Pulmonary Care ASSESS: vital signs, breath sounds and SaO ₂ , rationale to monitoring status (Cravens Ch 35); TEACH: patient and family about proper nutrition, adequate fluid intake, to avoid exposure to infected people, practice good hygiene, receive an influenza vaccine, rationale to prevent malnourishment & prevent infection, Teach patient about proper breathing techniques including taking deep breaths, rationale to expand alveoli and promote an effective cough to prevent pulmonary complications (Cravens Ch 35); CARE: assist with postural drainage & provide chest PT & coughing and deep breathing, rationale changing positions of client to shift mucus where it can be coughed out and to prevent it from pooling (Craven Ch 35); ASSIST: patient with deep breathing exercises, rationale taking deep breaths 8-10 times an hour to help produce effective cough, provide oxygen therapy as needed rationale to maintain SaO ₂ >93% (Cravens Ch 35)		In progress	

(d) Screen D: Individual care record.

Figure 5. (Continued)

Frequency of Interventions		
Component	Intervention	Frequency
A ACTIVITY	A01.2.2 Care Energy Conservation	3
	A01.2.4 Manage Energy Conservation	3
	A01.2.3 Teach Energy Conservation	3
	A01.2.1 Assess Energy Conservation	3
C CARDIAC	C08.0.1 Assess Cardiac Care	3
	C08.0.2 Care Cardiac Care	3
	C08.0.4 Manage Cardiac Care	2
	C08.0.3 Teach Cardiac Care	3
D COGNITIVE	D10.0.1 Assess Behavior Care	1
	D10.0.4 Manage Behavior Care	1
	D10.0.3 Teach Behavior Care	1
I METABOLIC	I27.0.1 Assess Diabetic Care	2
	I27.0.2 Care Diabetic Care	2
	I27.0.4 Manage Diabetic Care	2
	I27.0.3 Teach Diabetic Care	2
L RESPIRATORY	L35.0.3 Teach Oxygen Therapy Care	3
	L35.0.1 Assess Oxygen Therapy Care	3
	L35.0.2 Care Oxygen Therapy Care	3
	L35.0.4 Manage Oxygen Therapy Care	2
	L36.0.2 Care Pulmonary Care	2
	L36.0.4 Manage Pulmonary Care	1
	L36.0.3 Teach Pulmonary Care	2
	L36.0.1 Assess Pulmonary Care	2
	L37.0.3 Teach Tracheostomy Care	1
	L37.0.1 Assess Tracheostomy Care	1
	L37.0.2 Care Tracheostomy Care	1
	L37.0.4 Manage Tracheostomy Care	1
Q SENSORY	Q48.0.3 Teach Comfort Care	2
	Q48.0.1 Assess Comfort Care	2
	Q48.0.2 Care Comfort Care	2

(e) Screen E: Frequency of interventions.

Interventions by Type of Action		
Intervention Type	Frequency	Percentage
Assess	19	27.54%
Care	15	26.09%
Manage	13	18.84%
Teach	19	27.54%
Grand Total	66	100.00%

(f) Screen F: Interventions by type of action.

Figure 5. (Continued)

Table 3. Computer competencies demonstrated by students using PC-CCC.

Computer Competencies
Basic Computer Skills: Access, download, retrieve and use a program from the internet Copy, cut, paste and rename folders and files Navigate screens, use drop-down menus and use check boxes Create, send and retrieve an email with an attachment Database Skills: Understand language and database components (tables, fields, records) Add, modify and delete individual data elements and complete records Access and retrieve existing records in database Generate reports based on data

6. RESULTS

The program successfully met all three goals. The students learned about health IT during the lecture and participated in EHR documentation through their use of the PC-CCC. All groups installed and used the program at no additional cost to themselves, the instructors or to the college. Both the beginner and advanced computer users developed new and useful computer competencies (Table 3), that may help them as they learn future new electronic documentation systems. With the modest skills acquired in this experience, nursing students improved over time and gained confidence in using the system to document thoughtful care planning.

6.1. Student Usability Evaluations

Students rated the usability of the application by specifying their level of agreement/disagreement in a thirteen-question evaluation tool based on the original eight-question tool previously developed [16] using a Likert scale of *Strongly Agree*, *Agree*, *Disagree*, *Strongly Disagree* and *Not Applicable/Did Not Use* as possible responses (Table 4).

6.2. Discussion

In general, the students' responses were positive for using the system in the way that they were instructed, although they were less positive about "using the program at the bedside" or "enjoying the task," which was not surprising given their anxiety levels in computer activities. These students were novices to the hospital environment and cautious about their actions. Some students used the paper worksheet to "think through" the computer program due to their lack of experience. After creating several care plans, the need for the paper worksheet resolved. Students expressed their frustrations on occasion with the limited editing ability of the software and the need to re-enter their data. With some items reflecting more than 20% disagreement on the usability ratings, it will be important to reconsider the operational changes in future integration and modifying the software for the future.

Table 4. Summary: student reported usability of the PC-CCC (n=49).

PC-CCC Usability Items	Strongly Agree/ Agree	Strongly Disagree/ Disagree
This program aided my ability to understand and prioritize Nursing Diagnosis	86%	14%
This program aided my ability to understand and prioritize Nursing Interventions	94%	6%
Using this program aided my ability to understand Nursing Care Plans	86%	14%
Using this program aided my ability to create Nursing Care Plans	92%	8%
I would recommend future Nursing 209 students use this program	78%	22%
I would like to continue using this program for all nursing courses that require the development of Nursing care plans	69%	29%
The screen design was organized and clear	84%	16%
The format was easy to follow	80%	20%
The information was easy to understand	84%	16%
The system allowed me to chart my care plan	84%	16%
The system was efficient to enter the data	73%	27%
I enjoyed the method of entering the data	67%	33%
I would recommend using this program at the bedside	65%	35%

The PC-CCC program fostered the students' understanding of the Nursing Process. Having learned the Nursing Process in earlier courses, the students were ready to see it in action. The PC-CCC created by a nurse provided the unique opportunity to use electronic documentation within the framework of the Nursing Process. The students learned diagnoses and related nursing interventions that can improve patient outcomes. The system did not replace the necessity of critical thinking. Although guided in choices, students demonstrated their critical thinking skills by free texting the supporting rationale. Faculty reviews of student care plans found the electronic care records contained evidence of use of the nursing process. All nursing diagnoses had identified outcomes with actions and interventions necessary to achieve those outcomes.

The ability to evaluate student experiences at multiple clinical sites was a unique feature of this program. When the instructor reviews a student's database, they get a picture of that student's individual clinical experience. Upon reviewing all students' databases, the instructor can see a snapshot of the entire clinical experience as a whole. Based on the information contained within databases of this group, it is evident that the students gained rich clinical experiences and the clinical sites offered a varied patient population requiring nursing care appropriate to the students' level of learning.

The PC-CCC may be considered a useful application as well for clinical nurses in documenting nursing care with a standardized terminology. Although this version was field-tested with student nurses who are new to the clinical environment, there is potential for its use integrated with existing fully implemented electronic health systems in hospitals, nursing homes, and community settings. Future studies with practicing nurses should be undertaken using the CCC terminology to demonstrate the effectiveness of capturing the nursing process on the EHR.

7. LIMITATIONS

This continuing study is not representative of the entire nursing student population, but rather it is one class of second year nursing students. Students at this fundamental level have not had practical experience using the Nursing Process. They learned the Nursing Process during a theoretical lecture course during the previous semester and began to apply knowledge in practice beginning with this course. These students are assigned only one patient per clinical week and are required to document one plan of care with one identified nursing diagnoses. On occasion, the advanced students receive two patients and document on more than one nursing diagnoses.

To facilitate follow-up discussions and to compare survey responses to the actual documentation turned in, students were asked to include their names on the program evaluation survey. Responses might have been impacted by the Hawthorne effect or simply by being linked to responses that skew results.

The program is best downloaded using Mozilla Firefox or Microsoft Internet Explorer 7. Users encountered technical difficulty when attempting to download the program using Microsoft Internet Explorer 8 or other web browsers. Once downloaded and saved to a personal computer, the application is automatically given the extension “.mdb.” Most computers prevented users from opening the program directly from the hard drive. Students needed to find the program in the “downloads folder” or on their computer “desktop”, then “cut and paste” or “drag” the program directly to a USB removable drive. Once on the removable drive, the program was access able. For those non-savvy computer users, the task of ensuring that Mozilla Firefox or the correct version of Microsoft Explorer was used then having to move the program to a removable drive was an arduous one.

Transportability of this program is limited. In order for students to send instructors a PDF version of the individual care record via an email attachment, students needed to use a computer installed with a version of Access that could export to PDF. Although campus computers were complete with Adobe Acrobat conversion patches, some students preferred to send their individual plans after working on them at home. Students expressed dissatisfaction with the need to return to campus to send their work. An alternate option was to send their clinical instructors the entire database.

The PC-CCC program, as it is currently designed, does not permit users to edit data once entries are “recorded”, nor does it save data if it has not been “recorded”. Practicing nurses know it is illegal to edit patient records without making proper notation. However, this data is not part of the patient record; it is an assignment to facilitate learning. As such, students needed to edit their assignments. Because the

program did not allow the students to start a plan then return to it later, most students needed to create hand written drafts and transcribe the final work into the program. Other students learned how to “cut/copy and paste” data from earlier plans to later ones. Even with these challenges, students responded favorably to using the program and continuing to use it in future classes.

8. CONCLUSION

Preliminary results of using the PC-CCC from the first academic year are favorable. If these continue to be positive, emphasis will be placed on faculty orientation and recommendations for full-program implementation. Program monitoring and evaluation will be ongoing. Students in the Fall 2009 group, in a follow-up survey, reported that although the system took some time to master, they are now better prepared to learn future EHR documentation systems and would like to use the PC-CCC for future nursing courses.

ACKNOWLEDGEMENT

The authors wish to thank Molloy College Division of Nursing for the support in carrying out this field-testing. They also want to acknowledge the work of Virginia Saba and thank her for the encouragement in the development of this software and projects.

REFERENCES:

- [1] Sensmeier, J. Deep impact: Informatics and nursing practice. *Nursing Management*, 2008, Sep: Supplement: 2, 4, 6.
- [2] Kennedy, R., Delaney, C. and Warren, J. Nursing Informatics Impact on the National HIT Agenda. (April 23, 2010). Presented at the American Nursing Informatics Association (ANIA) Annual Conference, Boston, MA.
- [3] Saba, V. A (2004) Welcome to Sabacare.com Accessed May 2010 at sabacare.com
- [4] Breaking News: Nationwide Health Information Technology Standard for Nursing (2007) News from the American Academy of Nursing. Accessed April 2010 at www.aannet.org/i4a/pages/index.cfm?pageid=3562
- [5] Saba, V. A Classification of Home Health Care Nursing Diagnoses and Interventions. *Caring*, 1992, 11(5): 58-60.
- [6] Ronald, J. S., & Skiba, D. J. *Guidelines for Basic Computer Education in Nursing*. 1987, New York: National League for Nursing.
- [7] Skiba, D. Moving Forward: The Informatics Agenda. *Nursing Education Perspectives*. 2008, 29(5): 300-301.
- [8] Crossing the Quality Chasm: a New Health System for the 21st Century (2001) The Institute of Medicine (IOM) Accessed March 2010 www.iom.edu/Reports/2001/Crossing-the-Quality-Chasm-A-New-Health-System-for-the-21st-Century.aspx
- [9] DuLong, D. Informatics: “The Tiger Project” *OJIN: The Online Journal of Issues in Nursing*, March 31, 2008, 13(2), Accessed May 2010 (<http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/Columns/Informatics/TheTigerProject.aspx>).
- [10] Fetter, M. Collaborating to Optimize Nursing Students’ Agency Information Technology Use. *CIN: Computers, Informatics, Nursing*, 2009, 27(6), 354-362.
- [11] Gloe, D. Selecting an Academic Electronic Health Record. *Nurse Educator*, 2010, 35(4), 156-161.
- [12] Thompson, B. and Skiba, D. Informatics in the Nursing Curriculum: A National Survey of Nursing Informatics Requirements in Nursing Curricula. *Nursing Education Perspectives*. 2008, 29(5), 312-7.

- [13] Jones, A., Skiba, D. & Phillips, S. Creating a 21st century learning lab environment for nursing. In S. Grobe & E.S. Pleyter-Wenting (Eds). *Nursing Informatics: An International Overview for Nursing in a Technological Era*. North Holland, Canada: Elsevier; 1994.
- [14] Warren, J., Connors, H., Weaver, C. & Simpson, R. Teaching Undergraduate Nursing Students Critical Thinking: An Innovative Informatics Strategy. In: Park HA, ed. *Consumer-Centered Computer-Supported Care for Health People*, Virginia, USA: IOS Press, Inc.; 2006.
- [15] Johns Hopkins University School of Medicine. Hopkins and Eclipsis working to reengineer nursing curriculum with clinical IT; 2004; Retrieved October 15, 2004 at <http://www.son.jhmi.edu/newsandmedia/newsdetail.asp?ID=216>.
- [16] Feeg, V., Saba V., and Feeg, A. Testing a bedside personal computer clinical care classification system for nursing students using Microsoft access. *CIN: Computers, Informatics, Nursing*. 2008, 26(6), 339-349.

