Nursing Education Application of a Computerized Nursing Expert System

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ABSTRACT

Nurse educators are required to be knowledgeable about a wide variety of complex health care problems in order to provide quality education. At the same time, they are given a multitude of other responsibilities such as participating in scholarly activity, advising students, maintaining an active role in nursing practice, and performing community service. These educators must find innovative ways to present current lectures while at the same time meeting their other obligations. The use of Creighton Online Multiple Modular Expert System (COMMES), a computerized decision support consultant, was evaluated as a technique for faculty use in developing and organizing new lecture content. The study found that COMMES was beneficial as a systematic prompt for lecture content, as a tool for organizing content, and as a means to verify completeness of lecture material.

Introduction

For over 12 years, members of the faculty of the Creighton University School of Nursing have contributed to the development of computerized decision support consultants for nursing as a part of the Creighton Online Multiple Modular Expert System (COMMES). Although this system has been tested in nursing practice and has been purchased for use in several large clinical agencies, there has been no evaluation of its usefulness in nursing education. This article describes a study conducted to determine the value of COMMES to faculty and students in Creighton’s School of Nursing.

Review of the Literature

COMMES has been described as a computerized decision support system (CDSS) (Cuddigan & Norris, 1988). According to Brennan and McHugh (1988), a CDSS has minimum characteristics which are:

- completed software is used to assist the nurse in making a decision;
- the nurse and the computer play an active part in the decision making process.

A CDSS should be used as a tool to assist nurses to make better decisions.

The COMMES project was initiated by the Health Science Schools at Creighton University in 1975 and was originally funded through a grant by the W.K. Kellogg Foundation of Battle Creek, Michigan. Early efforts at knowledge base validation and evaluation were focused on the quality of instructional goals, the relevance and currency of information in the faculty-recommended learning resources, and the overall completeness of information. The primary mechanism of evaluation was the peer review process via the school’s curriculum committee. However, the evaluation process extended beyond the school when a geographically representative panel of nursing experts was asked to rate the validity of significant content areas of the system. Raters found the COMMES protocol consultant information to be equal to or significantly better than comparable guidelines written by human experts in nursing. This study was funded by grant number 1R01 NUD1279-01 by the U.S. Department of HHS-Division of Nursing (Norris and Cuddigan, 1987).
A MINI-CURRICULUM FOR THE FOLLOWING GOAL:
1. Postoperative care: Plan postoperative care for patients undergoing a laryngectomy. (3.0;3.0;2.5; *; 20M/10H30M) 01370-0054
You can achieve the goal by completing these subgoals using the resources cited:
1.01. Prevention of complications: Identify postoperative care and possible complications following laryngectomy—and take appropriate precautionary measures—atelectasis, airway obstruction, hemorrhage, loss of skin flap viability, loss of independence, and depression. (2.0;3.0;2.0; *; 5M/30M) 013701-0055
1.02. Management of airway: Provide for adequate removal of secretions and prevention of infection—hydration, suctioning, tracheostomy care, and positioning, wound drainage. (3.5;3.0;2.5; *; IOM/45M) 013701-0056
1.03. Nutritional needs: Describe the common methods used to assist the patient with nutritional intake IV tube feeding to initiation of oral intake. (3.0;3.0;2.0; *; 5M/15M) 013701-0057
Enter: d for Direct g for Goal p for Protocol help for Help s to Stop RP 1810, END

Figure 1: Printout of a mini-curriculum.

Options that are provided within the consultant framework of COMMES include:
- Minicurriculum (MC) selects and organizes educational goals and specific key bibliographic sources in response to a nurse’s request for information on a given topic. Minicurriculum may be used by the nurse for self-study to solve clinical problems or to update his/her own knowledge base. (See Figure 1 for an example of a Minicurriculum.)
- Evaluation Consultant (EC) generates brief essay questions which can be answered to evaluate independent learning. The nurse-user answers these questions after using the education consultant.
- Nursing Protocol Consultant (NPC) provides decision support guidelines to assist nurses with all steps of the nursing process: assessments, potential nursing diagnoses, interventions, desired outcomes, and discharge planning (Norris, Cuddigan & Ryan, 1987).
These nursing consultants were derived from the baccalaureate nursing curriculum and the expertise of the faculty members. The curriculum contains a broad generalist knowledge base. Content in the consultants is updated on a regular basis as the faculty regularly review their curriculum content and resources.

Statement of the Problem

An increasingly sophisticated level of knowledge is required by nurses today who care for clients with complex health problems. Nurse educators who prepare these nurses are required to be knowledgeable about an equally wide range of health problems. As student numbers declined, fewer but more versatile faculty members were required. An undergraduate instructor may be expected to teach didactic content and supervise clinical laboratories in areas other than his or her practice specialty. Nurse educators in many institutions have responsibilities besides teaching, such as conducting research, advising students, serving on committees, maintaining involvement in nursing practice, and performing community service. Nurse faculty must find innovative ways to provide quality education while simultaneously meeting their other obligations. This study explored the potential benefits derived by use of COMMES, an innovative form of decision support consultation, by faculty for developing new teaching content.

Methodology

This study was designed to explore the advantages/disadvantages of the use of COMMES NPC and MC in preparing lectures for undergraduate nursing students during the 1987 fall term. Significant course assignments presented faculty members with the task of preparing large segments of new lecture content. Five faculty members volunteered to participate in this COMMES Evaluation Project. Two junior level and three senior level instructors comprised the group. Each person used the COMMES NPC and MC to prepare one lecture. They used their customary preparation approaches for a second new lecture. Content of each of the two lectures chosen was of similar difficulty for student learning and the sequencing of method of preparation was varied between the five instructors. Faculty familiarity with the subject matter for each lecture was also of similar depth. An orientation meeting to familiarize faculty with protocols for the study was held within the first 2 weeks of the semester.
Each professor was directed to keep records and compare the amount of time spent in lecture preparation using the traditional and COMMES systems. Notes were kept by faculty comparing the COMMES and syllabus content considering comprehensiveness, level, and organi-
INTERVENTIONS FOR THE PATIENT WITH LARYNGEAL CANCER INCLUDING RADIATION THERAPY AND CHEMOTHERAPY
In intervention for laryngeal cancer, consider: cold fluid voice rest analgesia for pain heating pad to painful ear warm compress to painful ear monitor respiratory status monitor for airway occlusion no acid food or fluid fluid or soft food for sore throat provide alternate communication method analgesic throat lozenge frequent oral care emergency tracheostomy tray available suction equipment available semifowler's if difficulty breathing enteral feeding if dysphagia severe tracheostomy if airway compromise suction if unable to cough up secretions emotional support patient teaching related to diagnosis patient teaching related to treatment

Figure 2: Partial printout of the original nursing protocol consultant.

INTERVENTIONS FOR THE PATIENT WITH LARYNGEAL CANCER INCLUDING RADIATION THERAPY AND CHEMOTHERAPY
In intervention for impaired communication after laryngeal cancer, consider: assess pt's hearing & writing abilities provide alternate method of communication demonstrate use of magic slate preoperatively
In interventions for alteration in comfort in laryngeal cancer, consider: cold fluid voice rest analgesia analgesic throat lozenge no acid food or fluid frequent oral care heating pad to painful ear warm compress to painful ear
In interventions for airway maintenance in laryngeal cancer, consider: monitor respiratory status monitor for airway occlusion emergency tracheostomy tray available suction equipment available semifowler's if difficulty breathing tracheostomy if airway is compromised suction if unable to cough up secretions
In interventions for ineffective coping in laryngeal cancer, consider: emotional support patient teaching related to diagnosis patient teaching related to treatment patient teaching related to impending surgery arrange visit from laryngectomee initiate discussion of ideas discuss body image concerns
In interventions for swallowing impairment in laryngeal cancer, consider: fluid or soft food for sore throat enteral feeding if dysphagia is severe

Figure 3: Partial printout of the revised nursing protocol consultant.

zation. Perceived strengths versus limitations of each approach were documented for later discussion and analysis.

Junior level content areas explored were: malnutrition and bowel disorders; and Parkinson's Disease and Multiple sclerosis. Senior level content included: esophageal disorders and pancreatitis; open heart surgery and cardiac rehabilitation; and immunosuppressant principles and associated nursing care. The immunosuppressant content, which encompassed four hours of lecture, was divided into two equal segments for comparison.

At the end of the semester, faculty met to discuss their experiences with the COMMES Consultants. They identified commonalities and differences in the systems' usage in the educational setting. A beginning analysis of advantages and limitations of use of the system by faculty was prepared for suggested system revisions and future investigative use.

Results

Value as a Systematic Prompt
COMMES NPC was found valuable as a systematic prompt for lecture content inclusion. Condensed listings of concepts related to specific health care topics aided faculty members to quickly gain a broad perspective of a new content area. This cueing provided clear direction for follow-up literature review aimed at expanding faculty self-knowledge. Listings of suggested resources found in the MC correlated with information in the NPC and thereby prompted efficient location of valuable reference material. At Creighton, however, these resources duplicate the information available in the course syllabi and thus provided no additional information to these five faculty members.

Information presented in the NPC was found to be comprehensive yet organized around priority concepts. Designation of key concepts aided faculty in selecting content limited to vital information. This was especially important when time constraints did not permit detailed coverage of all aspects of given health care topics.

Variation, however, in depth of coverage for individual topics was identified as a drawback. In some cases, the amount of detail was unwieldy, especially when the user was relatively unfamiliar with the content area. Conversely, some topics lacked detailed coverage. Specific lack of coverage was cited in categories of physiologic background, definition of terminology, and discussion of ac-
tions, side effects and nursing implications of pharmacology. This lack of uniformity and selected deficiencies of information prevented a standard approach to COMMES use in lecture development. Another key point derived from the experiences of these instructors was the importance of selecting from the NPC protocol only that content appropriate to the level of learner and the specific teaching objectives.

In addition to using COMMES NPC in initial lecture preparation, a review of the COMMES protocol following completion of the lecture was uniformly described as beneficial in identifying specific content not originally included or not recalled from readings. This final check helped to ensure incorporation of important details into the lecture that might otherwise have been omitted.

Value in Organizing Content

The organizational framework for the COMMES NPC is the nursing process. Information is presented under the categories of assessment, nursing diagnosis, desired outcomes, interventions, discharge planning and teaching. This organizational strategy was helpful to some, although others utilized an individually preferred method of organization for lecture.

One faculty member directly followed the organizational structure of COMMES in lecture development and presentation. Hard copy printouts of the NPC were given to students prior to the lecture. This approach allowed for minimal note taking and more ongoing cognitive processing during the lecture. Additionally, the lecturer was able to highlight key points while still providing comprehensive coverage of the topic. Positive student feedback was reported.

A concern, unanimously expressed by the faculty, was the lack of consistency in organization of cues under each step of the nursing process. While some topics correlated assessment data, interventions, and outcomes with specific nursing diagnoses, other topics were covered more broadly by simply listing all information under the appropriate category of the nursing process. (Figure 2 provides an example of one way of organizing the content.) Recommendations by these faculty members that all problems be reorganized according to diagnosis and intervention specifically and clearly underscored the need for current reorganization of protocol content (Fig 3).

For other topics, general concepts common to several specific health care problems were presented prior to focus on specific, yet related, topics (i.e., white blood cell functions prior to autoimmune diseases and hypersensitivity reactions). This was reported as very helpful in organizing concepts for lecture development. However, a general concept category is not provided for all topics.

Value as a Time Saving Tool

Faculty reported variable time savings when using COMMES for lecture development versus their traditional approach. Reports of time saving varied from 0 (equal preparation time with or without COMMES) to 70 minutes.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>Useful as a prompt for lecture content</td>
<td>Inadequate coverage of some topics</td>
</tr>
<tr>
<td>Valuable for organizing</td>
<td>Unwielding amount of content on some topics</td>
</tr>
<tr>
<td>Helpful as a final check for comprehensiveness of lecture</td>
<td>Lack of uniform approach to all topics</td>
</tr>
<tr>
<td>Advantages for locating key references</td>
<td>Lack of consistency in use of the nursing process</td>
</tr>
<tr>
<td>Timesaving for some faculty members</td>
<td></td>
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<tr>
<td>Useful in providing printed student outline</td>
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Figure 4: Use of COMMES in preparing lectures.

saved in preparing a two hour lecture segment. Figure 4 outlines the advantages and disadvantages that were identified.

Discussion

In their present state of development, the MC and NPC offer a comprehensive initial overview of a topic for a nursing educator preparing a new lecture. These consultants also provide guidance in the selection of references/resources and furnish cues for the preparation of lecture content. Once the NPC is completely revised, it will also be valuable as a more specific guide for organizing the lecture content. The information these computerized consultants provide is most compatible with an organizational framework such as functional areas of assessment or Basic Human Needs but can be adapted to other frameworks. The NPC and the MC serve as adjuncts to the user’s own expertise, judgment, and personal style.

In consideration of the scope, practicality, currency, and availability of the COMMES Education Consultant and Nursing Protocol Consultant, there would appear to be a number of additional applications in various settings. The educator could use hard copies (printed forms, print outs) of a NPC health problem topic for students to follow and highlight lecture material, freeing them from the task of note taking. Self study and development could also be enhanced through use of printouts by the student. This is important in an R.N. completion program as the student prepares for challenge exams. Also the NPC provides direction to educators in satellite nursing programs, assuring quality and consistency in program presentation. NPC

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would also be helpful to nurses providing continuing education.

At the present time, the appropriate follow-up research appears to be another formative evaluation study of the MC and NPC used for preparation of new lecture. The repeat study would reflect changes following the content review and revision now in progress. Replication of this study by other faculty in other educational institutions with access to these consultants would certainly help to clarify consultant usefulness and assist to refine and strengthen COMMES.

Conclusion

In conclusion, variation in content and lecture preparation style yielded differences in the utilization of the NPC and MC. Since the MC lists resources already incorporated in School of Nursing course syllabi, it was not considered by participating Creighton faculty to be as useful as the NPC. However, the faculty did find the NPC beneficial as a systematic prompt, as a tool for organizing content, and as a means to verify completeness of lecture material.

The COMMES consultants were not intended to be a substitute for faculty lecture preparation. The NPC and MC functioned as a decision support system to facilitate the nurse educator’s development of teaching content and organization. The individual faculty member must exercise judgment in selecting the depth and coverage of content appropriate to the student level and the time constraints on lecture preparation.

With the current emphasis in education and practice on nursing diagnoses, the uses of the revised COMMES consultants for educators seem promising. Nurse educators faced with the demands of instruction, research, and practice might explore the application of this system as an adjunct to curriculum development.

References

