formation resources are static. Just as health educators experiment with curricula, librarians must continue to seek ways to bring the most advanced—and sometimes the most familiar—information resources and technologies to faculty and students practicing and learning in these communities.

CONCLUSION

Establishing a multidisciplinary program is an intricate task. Challenges range from the smallest concerns, such as differences in the academic calendars of various programs, to the largest, such as how to teach the same material to both allied health students just out of high school and medical students with doctorates in engineering. Adding to this complex mix are the challenges particular to distance education. With cooperation and flexibility, two distinct library systems came together to meet the information needs of ETSU's unique Kellogg program. This support has helped the university, health care students, and two rural communities reap the benefits of a bold experiment.

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First-year medical students' information needs and resource selection: responses to a clinical scenario

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INTRODUCTION

The clinical encounter is an increasingly significant component of the first years of the undergraduate medical curriculum. A student's clinical experience has traditionally begun in the third year of the curriculum. Recently, however, a number of medical schools have initiated programs that provide students with clinical experience in each of their four years. Among the initiatives aimed at increasing the number of graduates intending to pursue primary care careers, for example, has been the placement of students in primary care practices at regular intervals beginning in the first year of the curriculum. While the clinical encounter is understood to be a significant educational experience, little is known about the information needs and information seeking behaviors of students in response to clinical problems.

Recent studies have investigated the nature of physicians' information needs and how these needs are managed. Covell, Uman, and Manning [1] developed a methodology that placed the researchers in ambulatory care practices for half-day site visits during which physicians indicated any information need relative to each patient encounter. Results of this study suggest that clinicians articulate an average of two information needs for every three patients seen, but that only 30% of questions are resolved at the time of the patient visit.

Gorman and Helfand [2] extended the findings of Covell, Uman, and Manning by investigating physicians' motivations for the pursuit of each information need. Two to five days after the formulation of questions, follow-up interviews found that approximately 30% of questions had been pursued, corroborating the findings of Covell, Uman, and Manning. When consideration was given to the motivating factors behind each question, however, Gorman and Helfand found much higher rates of information seeking among certain categories of questions. Physicians pursued 56% of questions they perceived as most likely to have a definitive answer and 50% of questions they rated as most urgent for the care of a patient. It is interesting

that two factors, the potential benefit to one's general medical knowledge and the possibility of applying an answer to the care of other patients, were significant negative predictors of information seeking.

Wildemuth et al. [3] have studied the information needs of first-year medical students by investigating questions posed to a hypothetical librarian and physician. Students were presented with clinical scenarios describing a patient affected by a toxin. After answering a set of questions about the case, students were asked to articulate questions to a hypothetical librarian and internist specializing in toxicology. The students' questions were categorized by their form (e.g., identification, explanation, description). Results of this study suggest that students were more likely to ask the hypothetical librarian for help in identifying the toxin and finding references in the medical literature. The questions posed to the hypothetical toxicologist were more likely to involve an explanation of symptoms and descriptions of treatment.

Investigations of information needs, such as those just described, commonly use an explicit question as a surrogate for the information need. The distinction between information needs and articulated questions emerges from the early work of Taylor [4], who proposed that information needs can be understood as having a variety of possible states ranging from a vague awareness of need to the articulation of a specific question. As in past studies, the present study aims at analyzing the information needs experienced by medical students and recorded as articulated questions. The present study differs from most of the past studies by focusing on the information needs of students, rather than those of clinicians.

This study seeks to provide a better understanding of students' information needs and their perceptions of information resources. It analyzes the content of questions articulated by medical students in response to a clinical scenario. In addition, it investigates the types of information resources students identified as desirable for each question.

METHODS

This study called for first-year medical students to review a clinical scenario [5] and record the information they would need to manage the patient's problem. In addition, students were asked to identify the resources they would use to pursue each information need. The data collection was conducted in the context of a training session on information resources in medicine. Analysis of the data was conducted by using two coding schemes that emerged from the data sets, one for questions and one for resources identified. Chi-square tests were conducted to investigate associations among types of questions and information resources.
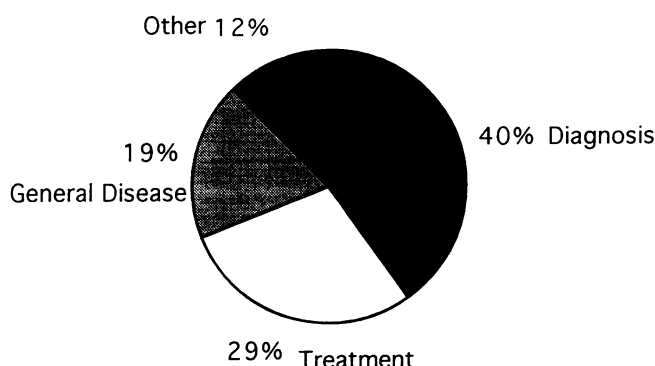
Data collection

Participants in this study were first-year medical students at the University of North Carolina at Chapel Hill. Recent changes in the curriculum have provided these students with clinical experience at community-based primary care practice sites during the first year of the curriculum. Offering first-year medical students experience in a clinical setting has created interest in how, as novices, first-year students manage the information needs they experience in response to a clinical problem. Therefore all students entering in the fall of 1995 attended a set of small-group discussions on managing information in medicine and received training by health sciences librarians on a variety of computer-based information resources. During the training sessions students were invited to participate in the study. In the context of the training session on information resources, students were presented with a clinical scenario developed by a member of the microbiology faculty. The case presentation followed a small-group discussion of managing information in medicine. Small-group discussion leaders followed a single agenda developed in advance of the training sessions. After these small-group discussions and at the end of the case presentation, students were asked to record the information they would need to manage the patient. Students were also asked to identify the information resources they would use for each of their information needs.

Data analysis

Two sets of categories were developed to classify (1) the content of the information needs recorded as questions and (2) the resources identified. Both category sets emerged from a review of the data. The categorization of students' questions was based on the content of each question, such as general disease information, diagnosis, therapy, general management, patient-specific information, procedures, or psychosocial issues. The categorization of information resources was based on the type of resource, such as diagnostic tests, general medical literature, medical textbooks, reference material, a bibliographic retrieval resource, journal articles, human experts, the patient's chart or interview, and educational software. Both coding schemes were developed after the data had been collected. Inter-rater reliability for the categories was assessed by having two judges independently categorize fifty-nine randomly selected questions, with a resulting *kappa* coefficient of $+0.85$. Because the coding scheme for the content of the questions was found to be highly reliable, the first author coded the remainder of the questions. Little ambiguity was found among the types of resources identified, and high reliability of the resource classification scheme was assumed. Statistical analysis software (SAS Institute, Cary, North

Figure 1
Types of question

Other 12%

19%
General Disease

40% Diagnosis

29% Treatment

Table 1
Resources identified

Information resource	Frequency of identification*†
Textbooks	45.4%
MEDLINE	16.7%
Reference source	12.5%
Software	12.1%
Human	9.2%
Journal articles	7.9%
Other	7.1%

* Percent of questions associated with each resource.
† The combined frequency of identification exceeds 100%, as more than one information resource was identified for 27% of questions.

Carolina) was used to identify the frequencies for each of the types of questions and resources, and the Chi-square statistic was used to test for significant associations among the data.

RESULTS

Data were collected from 88 of the 166 first-year medical students. The students recorded a total of 240 questions. The majority of questions generated in response to the case presentation pertained to diagnosis, treatment, and general information about a disease (Figure 1). Forty percent of questions pertained to diagnosing the patient's problem, and 29% to treatment issues, such as optimal drug therapy. Requests for general information about a disease accounted for 19% of questions, while the remaining 12% dealt with procedures used in the case, patient-specific information retrievable from the patient's chart or interview, general management issues, and psychosocial issues stemming from the case.

Students did not identify an information resource for 52 of the 240 questions. For the remaining 188 questions, students identified 266 information resources. For 124 questions students identified a single information resource. Two resources were associated with fifty-one of the questions, and three or four resources were identified for thirteen of the questions.

Resources identified by students included diagnostic tests; general medical literature; medical textbooks; reference resources, such as a drug information resource; bibliographic retrieval resources (MEDLINE); journal literature; human experts; software, such as a microbiology database; and the patient's chart or interview with the patient (Table 1). The most frequently identified information resources included medical textbooks (for 45% of questions), and MEDLINE (for 17% of questions).

Chi-square tests revealed significant associations be-

tween the most frequently identified resources, MEDLINE and textbooks, and the types of questions asked. Of particular interest was the observed frequency of MEDLINE identifications being significantly greater than expected for questions pertaining to treatment. Among questions for which students identified MEDLINE as a resource, 43% pertained to treatment. In contrast, among those questions for which medical textbooks were identified as a resource, 23% pertained to treatment (Figure 2). While the overall frequency of textbook identifications was more than twice the frequency of identifications of MEDLINE, questions pertaining to treatment accounted for more MEDLINE identifications than any other question category.

DISCUSSION

The results of this study provide a better understanding of first-year medical students' information needs and their perceptions of appropriate resources. Like those of experienced clinicians, students' information needs most often pertain to diagnosing a problem or choosing a treatment. Unlike experienced clinicians, however, first-year medical students can be expected to request general disease information frequently in

Figure 2
Resources identified and question types

■ Textbooks
□ MEDLINE

Diagnosis General Disease Treatment Other
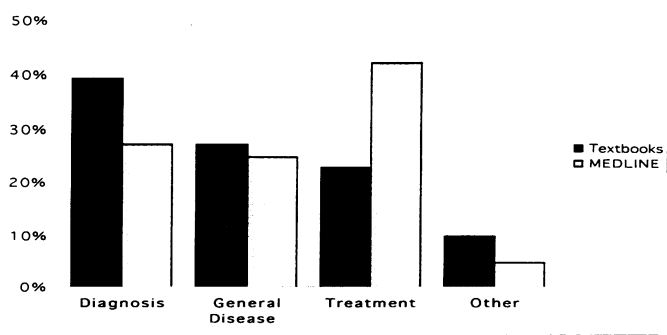
support of their management of a problem (19% of questions). While colleagues are an important resource for experienced clinicians, students in this study seldom reported a preference for human sources of information (for fewer than 10% of questions). This low preference for human sources of information should be interpreted with caution, however, since it may have been a result of the data collection methods, as students reported their preferences for information resources in the context of having participated in small-group discussions about information management in medicine led by librarians.

Textbooks were the information resource most frequently suggested by students. Among questions pertaining to treatment, however, MEDLINE was identified substantially more frequently than medical textbooks as an appropriate information resource. This finding suggests that students perceive questions about treatment as needing a frequently updated information resource, such as MEDLINE. It is important to note that the classification of information needs used in this analysis was developed after the data had been collected. Students had not been introduced to a classification of their information needs prior to the data collection.

CONCLUSION

This study's findings underscore the importance of textbooks within the collections of academic health sciences libraries. It is now common for libraries to provide remote access to the journal literature through MEDLINE and other indexes as well as full-text databases. Results of this study suggest that librarians serving the information needs of medical students cannot overlook the importance of textbooks, increasingly available in both print and electronic formats.

Implications of this study also extend to reference service and educational programs for medical students. In both reference service and educational programs, an important role of the library is to provide a bridge between information needs and appropriate information resources either at the time of need or in anticipation of future needs. This study's findings describe the information needs students are likely to have in response to a clinical encounter as well as their perceptions of which resources are appropriate for specific types of needs. A thorough understanding of these factors is increasingly important, as many medical schools develop curricula that rely on problem-centered learning.

Finally, it may be concluded that at an early stage in their medical training, students perceive specific information resources as appropriate for particular types of information needs. While textbooks are the most commonly preferred general resource, MEDLINE emerges as the preferred resource for questions pertaining to treatment.

Future studies that include multiple clinical scenarios are needed. Wildemuth et al. [6] have observed that when subjects are presented with multiple clinical scenarios the types of questions stemming from each scenario vary substantially. While the types of questions expressed for different clinical scenarios can be expected to be at least partially dependent on the content of the scenario, consistent associations of types of resources with types of questions may again emerge.

ACKNOWLEDGMENTS

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