

MEDLINE Demand Profiles: An Analysis of Requests for Clinical and Research Information

BY BETTE GREENBERG, *Head Librarian, Reference Section*
ROBERT BREEDLOVE, *Senior Library Specialist**
WENDY BERGER, *Library Assistant*

*Yale Medical Library
Yale University
New Haven, Connecticut*

ABSTRACT

When a medical library serves both research scientists and practicing physicians, it may be predicted from the results of previous studies that computerized bibliographic search services will show more research and less clinical activity. The present paper reports the results of a statistical analysis of professional use of the National Library of Medicine's bibliographic retrieval system, MEDLINE (Medical Literature Analysis and Retrieval System on-Line), at a large medical school library.

Results indicate that (1) demand for MEDLINE service is primarily research oriented; (2) frequency of use bears a relationship to rank and departmental affiliation; (3) broad and comprehensive searches are requested more frequently than searches for specific information; (4) usage shows an interesting curvilinear relationship with age and status of the user; and (5) grant funds and support correlate with the number of searches requested.

Implications of these findings are that since clinicians' use of MEDLINE was found to be minimal, information services should be reevaluated in order to assist in meeting their information needs more effectively.

COMPUTERIZED bibliographic on-line retrieval systems have challenged traditional methods of obtaining information. With the advent of the seventies, a biomedical communications network came into existence, and MEDLINE (Medical Literature Analysis and Retrieval System on-Line) had become a reality. It seems fitting, therefore, that after more than four years of availability to the biomedical community, it be critically evaluated, not only by the population of users it serves, but also by the librarians who assist in providing this service. An information retrieval system which, theoretically, saves the professional from hours of manual

literature searching, and provides more comprehensive access to information than was formerly feasible, deserves this attention.

Previous studies on MEDLINE use have ranged from inquiries into the efficacy of systems design and input in retrieving desired information to evaluation studies of users' satisfaction or dissatisfaction with the output of the system. Foreman, Allen, and Johnson's user evaluation study [1] investigated the suitability of manual searches compared with MEDLINE searches in meeting the clinicians' needs within a hospital setting. Moll's evaluation study [2], which was based on returns to a questionnaire sent to MEDLINE users, indicated that the majority of respondents favored MEDLINE for both clinical and research activities. The McCarthy, Maccabee, and Feng survey [3], also based on the results of a questionnaire, indicated a high percentage of clinical use of MEDLINE, although the majority of the users were clearly research oriented.

Information-flow studies, on the other hand, have shown that use of libraries and dependence on the literature as a primary source of information is relatively minor when compared with reliance on informal, interpersonal sources of information. These studies further indicate that when a library and its resources are used, they are used primarily for research activities. Herner [4] interviewed 500 medical researchers in order to estimate a variety of information sources used by investigators. This study did not attempt to evaluate clinicians' use of these same information sources. Orr [5] also focused on the information needs of the biomedical research community exclusively. Menzel's [6, 7] study of both researchers' and clinicians' use of formal information services found that for purposes of securing answers to specific questions, clinicians use the literature much less frequently than do re-

*Presently employed by Dunlap & Associates, Darien, Connecticut.

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searchers. Menzel further indicated that the current state of the art did not provide sufficient data to evaluate information services in meeting needs of clinicians. "Practitioners do bring reference questions to their local medical libraries, but it is not known how often this is in connection with patient care . . . perhaps, local medical libraries serve a reference function primarily for the high-level specialist consultant." He concluded with the observation that "the practitioner relies more heavily on verbal sources than the researcher, who is more dependent on the literature." Recently, Friedlander [8] reported on the information needs of clinicians affiliated with Case Western Reserve University School of Medicine. Her findings indicate that "research leads to more information searches than teaching, administration or clinical work," even when the users of the library are primarily clinicians.

Because little attention has been given to analysis of data comparing the use of the literature by researchers and clinicians, we believe it is more useful to examine variables that relate to both types of information-seeking activities than to examine one type or the other exclusively.

The Yale Medical Library is representative of the larger university medical libraries and serves academicians and researchers as well as providing clinical support to a closely adjacent hospital community. It is the intent of this study to examine MEDLINE use by both researchers and clinicians within a large medical library setting serving *both* user populations. The analysis represents a comprehensive, inclusive, large set of data rather than attempting such a study based on sampling techniques using post-search evaluation questionnaires or personal interviewing methodology. This

study presents tabulated results of the first 2,500 MEDLINE request forms processed at the Yale Medical Library. How much demand has been placed on the information services of the library for clinical activities is one of the interesting observations of this study.

DESCRIPTION OF THE PROJECT

The Yale Medical Library provides service to a varied institutional complex. The medical center consists of the Yale University School of Medicine, the Yale University School of Nursing, and the Yale-New Haven Hospital. The hospital does not have separate central library facilities to serve the clinical needs of its staff, although most departments have small collections of library materials. Thus, the Yale Medical Library provides information services to a homogenous population of research and educational staff as well as to clinicians.

This study is based on 2,500 MEDLINE search requests submitted from April 1972 through May 1973. Of these 2,500 requests, 1,466 represented the Yale-New Haven Medical Center faculty and professional staff (Table 1). Request forms were analyzed for MEDLINE demand among subpopulations defined as (1) user population by rank; (2) user population by departmental affiliation; (3) purpose of request—research, patient care, or education; (4) type of request—broad versus narrow. In addition, information was obtained to determine the mean professional age of each requester. Another consideration was to determine the amount of grant support in dollars by departments within the medical center, with the expectation that there would be a significant cor-

TABLE 1
MEDLINE USER POPULATION

| Status of users | Number of users | Percentage of users |
|---|-----------------|---------------------|
| Yale Medical Center faculty and professional staff | 1,466 | 59.0 |
| Other Yale faculty | 13 | 1.0 |
| Medical students | 308 | 12.0 |
| Nursing students | 99 | 4.0 |
| Epidemiology and public health students | 70 | 3.0 |
| Yale graduate students | 161 | 6.0 |
| Yale undergraduates | 105 | 4.0 |
| Miscellaneous, including laboratory technicians, social workers, administrative personnel | 278 | 11.0 |
| Total | 2,500 | 100.0 |

relation between funding dollars and MEDLINE searches processed.

User Population

A gross breakdown by user category (Table 1) indicated that 59% of the user population was either medical center faculty or professional staff (1,466). All of the subsequent data analyses have been conducted on *only* these 1,466 requests. Other Yale faculty, students, and a miscellaneous category of users including laboratory technicians, social workers, and administrative personnel were excluded.

1. *User's rank* was categorized as academic, clinical, house staff, and research associate. The academic ranks include those of lecturer, instructor, assistant professor, associate professor, and professor. The clinical faculty include clinical instructor, assistant clinical professor, associate clinical professor, and clinical professor. Distinction was further made between intern, resident, postdoctoral fellow, and research associate. In cases where an individual cited two appointments of differing ranks, we assigned the rank that was reflected by the MEDLINE request. If the substance of the question did not give a basis for a decision, then we reported the higher academic rank.

2. *User's departmental affiliation* was provided by each requester or determined in follow-up. If a user was affiliated with two, or in a few cases, three departments, his primary affiliation was made on the basis of (1) his highest rank and (2) the substance of his search.

Frequency of Use

1. *Rank and departmental affiliation.* We were interested in obtaining an accurate estimate of the percentage of use by rank and by departmental affiliation where the count would not be influenced by multiple searches by a particular requester. Therefore, for this purpose, we eliminated duplicate searches by the same individual and were left with 455 individual requests. Overall percentage of broad, narrow, research, patient care, or education requests was based on the total number of requests submitted (1,466).

2. *Purpose of request.* The number of searches placed for research, patient care, or education was tabulated and further broken down by rank and departmental affiliation. In cases where an individual cited multiple purposes (such as research and patient care, or research and education), a

value judgment was made on the basis of the type of search requested.

3. *Type of request.* The number of requests placed for a broad or narrow search was tabulated. We defined a broad search as comprehensive when some peripheral information was retrieved; and a narrow search, one for specific information pertinent to the user's needs.

Mean Professional Age of User by Rank

We felt that there might be a correlation between the number of MEDLINE searches requested and the age of the requester. For our purposes, we defined *professional age* as the number of years elapsed since the receipt of the user's first major graduate degree, M.D. or Ph.D. Using the Pearson correlation coefficients, we calculated the correlations between age, rank, and use.

Grant Support by Departmental Affiliation

Grant support in dollars from federal and private funding sources received by departments was obtained for the period July 1972 through June 1973. To assess whether there was a correlation between grant dollars and the number of MEDLINE searches requested by a department, a factor was calculated for each department based on the number of searches requested. We again used the Pearson correlation coefficients to determine if a relationship existed between grant dollars and use by departments. In effect, we were looking for a figure that would cluster towards an average figure for all departments, thereby providing us with a factor upon which to predict future MEDLINE demand.

DATA ANALYSIS AND DISCUSSION

1. *More broad searches are requested than narrow searches.* Table 2 summarizes the number of requests placed for research, patient care, and education, and within these categories, whether the search was for comprehensive information (broad) or specific information (narrow). In general, broad searches (59.1%) are requested more often than narrow searches (40.9%). However, even though searches for research predominate over those for patient care or education (Table 3), there are several departments which, surprisingly, asked more for specific information than for comprehensive searches; for example, Anesthesiology (86.4%), Microbiology (68.0%),

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TABLE 2
SUMMARY OF SCOPE AND NATURE OF MEDLINE SEARCHES REQUESTED

| Type of request | Purpose of request | | | | | | Total | |
|-----------------|--------------------|------|--------------|------|-----------|-----|-------|-------|
| | Research | | Patient care | | Education | | | |
| | No. | % | No. | % | No. | % | No. | % |
| Broad | 644 | 43.9 | 158 | 10.8 | 64 | 4.4 | 866 | 59.1 |
| Narrow | 496 | 33.9 | 63 | 4.2 | 41 | 2.8 | 600 | 40.9 |
| Total | 1,140 | 77.8 | 221 | 15.0 | 105 | 7.2 | 1,466 | 100.0 |

Psychiatry (52.4%), Neurology (52.0%), and the School of Nursing (48.6%).

We could postulate that if more research oriented requests are placed, this number would reflect predominantly comprehensive searches. However, we have no assurance that research oriented requests always lead to broad and

comprehensive searches; this may simply be an artifact of the novelty of the system. We would expect that as the novelty wore off, there would be a greater demand for searches for specific information. Future studies may prove this to be true.

2. *Demand for MEDLINE service is primarily research oriented.* Table 2 shows a considerable

TABLE 3
NUMBER OF MEDLINE SEARCHES AND PERCENTAGES OF TOTAL REQUESTS (1,466) BY DEPARTMENT

| Department | Broad | | Narrow | | Research | | Patient care | | Education | |
|-------------------------------------|-------|-------|--------|------|----------|-------|--------------|------|-----------|------|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Anatomy | 16 | 61.5 | 10 | 38.5 | 23 | 88.5 | 0 | — | 3 | 11.5 |
| Anesthesiology | 9 | 13.6 | 57 | 86.4 | 65 | 98.5 | 0 | — | 1 | 1.5 |
| Child Study Center | 18 | 64.5 | 10 | 35.7 | 18 | 64.3 | 5 | 17.9 | 5 | 17.9 |
| Dermatology | 20 | 100.0 | 0 | — | 16 | 80.0 | 3 | 15.0 | 1 | 5.0 |
| Epidemiology & Public Health | 61 | 63.5 | 35 | 36.5 | 89 | 92.7 | 5 | 5.2 | 2 | 2.1 |
| Health Science Resources | 31 | 63.3 | 18 | 36.7 | 38 | 77.5 | 3 | 6.2 | 8 | 16.3 |
| History of Science & Medicine | 2 | 100.0 | 0 | — | 2 | 100.0 | 0 | — | 0 | — |
| Human Genetics | 10 | 83.3 | 2 | 16.7 | 9 | 75.0 | 3 | 25.0 | 0 | — |
| Internal Medicine | 173 | 63.1 | 101 | 36.9 | 184 | 67.1 | 72 | 26.3 | 18 | 6.6 |
| Laboratory Medicine | 20 | 69.0 | 9 | 31.0 | 22 | 75.9 | 3 | 10.3 | 4 | 13.8 |
| Microbiology | 15 | 32.0 | 32 | 68.0 | 43 | 91.6 | 2 | 4.2 | 2 | 4.2 |
| Molecular Biophysics & Biochemistry | 12 | 80.0 | 3 | 20.0 | 15 | 100.0 | 0 | — | 0 | — |
| Neurology | 24 | 48.0 | 26 | 52.0 | 37 | 74.0 | 10 | 20.0 | 3 | 6.0 |
| Obstetrics & Gynecology | 10 | 91.0 | 1 | 9.0 | 8 | 72.8 | 2 | 18.2 | 1 | 9.0 |
| Ophthalmology | 52 | 72.2 | 20 | 27.8 | 60 | 83.3 | 11 | 15.4 | 1 | 1.3 |
| Pathology | 26 | 68.4 | 12 | 31.6 | 32 | 84.2 | 3 | 7.9 | 3 | 7.9 |
| Pediatrics | 37 | 67.3 | 18 | 32.7 | 26 | 47.3 | 23 | 41.8 | 6 | 10.9 |
| Pharmacology | 80 | 68.4 | 37 | 31.6 | 89 | 76.1 | 21 | 17.9 | 7 | 6.0 |
| Physiology | 13 | 76.5 | 4 | 23.5 | 16 | 94.1 | 0 | — | 1 | 5.9 |
| Psychiatry | 129 | 47.6 | 142 | 52.4 | 209 | 77.2 | 34 | 12.5 | 28 | 10.3 |
| Radiology | 34 | 75.5 | 11 | 24.5 | 35 | 77.8 | 8 | 17.8 | 2 | 4.4 |
| Surgery | 56 | 61.5 | 35 | 38.5 | 75 | 82.4 | 9 | 9.9 | 7 | 7.7 |
| Yale School of Nursing | 18 | 51.4 | 17 | 48.6 | 29 | 82.8 | 4 | 11.4 | 2 | 5.8 |

demand for searches to support research activities (77.8%) as compared with the demand for patient care (15.0%) or education (7.2%). The nonclinical departments such as Pharmacology (64.7%) and Health Science Resources (51.7%) request searches more frequently than do clinical departments (Table 4), and of these searches, an overwhelming number are requested for research (Table 3). The clinical departments, on the other hand, request MEDLINE searches less frequently, and when they do, the searches show a high percentage being requested for research (Table 3). One notable exception is Pediatrics, which requested almost as many patient care searches (41.8%) as research searches (47.3%). In general, we estimate that clinical departments use MEDLINE less than one-third of the total use with few exceptions.

If more research oriented requests are placed than those for patient care, a nonclinical profile of

a MEDLINE user emerges. Even when there is a user population that is heavily clinically oriented, MEDLINE searches do not reflect patient care use. The respondents in McCarthy's evaluation study indicated that 53.5% were researchers as compared to 46.5% who were clinicians, an insignificant difference [3]. Moll found a 56% use in both clinical and research activities while 33% of his respondents used MEDLINE for research and 11% for patient care exclusively [2]. These results, however, which were based on questionnaires sent to users, should be considered as informative predictors rather than indicators of actual use.

3. *Associate and assistant professors are the heaviest individual users.* We hypothesized that rank or status within an academic institution has a relationship to the number of searches requested, and further, that research activities were reflected in that portion of the user population that had the most to gain in recognition (for example, tenure,

TABLE 4
NUMBER OF INDIVIDUALS REQUESTING
MEDLINE SEARCHES BY DEPARTMENT

| Department | Actual population | Individuals by department | | MEDLINE requests and library workload | | Average no. of searches requested per individual |
|-------------------------------------|-------------------|---------------------------|------|---------------------------------------|------|--|
| | | No. | % | No. | % | |
| Anatomy | 35 | 14 | 40.0 | 26 | 1.8 | 1.9 |
| Anesthesiology | 10 | 10 | 23.8 | 66 | 4.5 | 6.6 |
| Child Study Center | 75 | 10 | 13.3 | 28 | 1.9 | 2.8 |
| Dermatology | 38 | 8 | 21.0 | 20 | 1.4 | 2.5 |
| Epidemiology & Public Health | 168 | 27 | 16.0 | 96 | 6.6 | 3.6 |
| Health Science Resources | 29 | 15 | 51.7 | 49 | 3.3 | 3.3 |
| History of Science & Medicine | 3 | 1 | 33.3 | 2 | 0.1 | 2.0 |
| Human Genetics | 42 | 6 | 14.3 | 12 | 0.8 | 2.0 |
| Internal Medicine | 365 | 76 | 20.8 | 274 | 18.7 | 3.7 |
| Laboratory Medicine | 21 | 9 | 42.8 | 29 | 2.0 | 3.2 |
| Microbiology | 29 | 6 | 20.7 | 47 | 3.2 | 7.8 |
| Molecular Biophysics & Biochemistry | 22 | 3 | 13.6 | 15 | 1.0 | 5.0 |
| Neurology | 33 | 11 | 33.3 | 50 | 3.4 | 4.5 |
| Obstetrics & Gynecology | 74 | 4 | 5.4 | 11 | 0.8 | 2.8 |
| Ophthalmology | 42 | 18 | 42.8 | 72 | 5.0 | 4.0 |
| Pathology | 89 | 14 | 15.7 | 38 | 2.6 | 2.7 |
| Pediatrics | 151 | 27 | 17.9 | 55 | 3.8 | 2.0 |
| Pharmacology | 51 | 33 | 64.7 | 117 | 8.0 | 3.5 |
| Physiology | 37 | 9 | 24.3 | 17 | 1.2 | 1.9 |
| Psychiatry | 358 | 77 | 21.5 | 271 | 18.5 | 3.5 |
| Radiology | 103 | 28 | 27.1 | 45 | 3.1 | 1.6 |
| Surgery | 279 | 34 | 12.2 | 91 | 6.2 | 2.7 |
| Yale School of Nursing | 91 | 15 | 16.5 | 35 | 2.4 | 2.3 |
| Total | 2,145 | 455 | | 1,466 | | |

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TABLE 5
NUMBER OF INDIVIDUALS REQUESTING MEDLINE SEARCHES BY RANK

| Rank | Actual population | Individuals by rank | | MEDLINE requests and library workload | | Average no. of searches requested per individual |
|------------------------------|-------------------|---------------------|------|---------------------------------------|------|--|
| | | No. | % | No. | % | |
| Professor | 112 | 32 | 28.6 | 87 | 5.9 | 2.7 |
| Associate professor | 160 | 70 | 43.8 | 199 | 13.6 | 2.8 |
| Assistant professor | 215 | 81 | 37.7 | 263 | 17.9 | 3.2 |
| Instructor | 94 | 29 | 30.9 | 74 | 5.1 | 2.6 |
| Lecturer | 134 | 2 | 1.5 | 5 | 0.4 | 2.5 |
| Postdoctoral fellow | 319 | 102 | 32.0 | 344 | 23.5 | 3.4 |
| Resident | 257 | 79 | 30.7 | 214 | 14.6 | 2.7 |
| Intern | 25 | 7 | 28.0 | 14 | 1.0 | 2.0 |
| Clinical professor | 23 | 1 | 4.4 | 3 | 0.2 | 3.0 |
| Associate clinical professor | 105 | 8 | 7.6 | 20 | 1.4 | 2.5 |
| Assistant clinical professor | 291 | 11 | 3.8 | 58 | 4.0 | 5.3 |
| Clinical professor | 105 | 1 | 1.0 | 2 | 0.1 | 2.0 |
| Clinical instructor | 85 | 4 | 4.9 | 19 | 1.3 | 4.8 |
| Research associate | 192 | 28 | 14.9 | 164 | 11.2 | 5.9 |
| Total | 2,117 | 455 | | 1,466 | | |

promotion, and reputation among colleagues). Table 5 shows that associate professors (43.8%) and assistant professors (37.7%) request searches the most frequently. It should be remembered that these figures represent individual users and not the number of times searches were requested. This result indicates that information needs are greater the longer one is in the profession. That is, the higher the rank, the more inclined an individual is to use MEDLINE. However, the peak is reached at the level of associate professor, with a decline in use by professors (28.6%). We assumed that once an individual attains stature within the profession, his research activities are narrower, and consequently, more circumspect. However, the results do not bear out this assumption, since professors generally request searches that are comprehensive (75.9%), and, as would be expected, are heavily research oriented (88.5%) (Table 6). Lehman states that "in many major universities, the evaluation of the faculty member's job performance is based almost exclusively on publications. . ." [9]. Therefore, we can assume that publication activity within an academic environment peaks at the time of tenure, and, thereafter a gradual decline can be predicted.

4. *Highest percentage of use of MEDLINE is made by junior faculty.* However, when it comes to the number of searches processed (1,466) and

percentage of MEDLINE workload, an inverse ratio is apparent. Table 5 shows that postdoctoral fellows request searches the most frequently (23.5%), with assistant professors (17.9%), residents (14.6%), and associate professors (13.6%) following in that order.

There is a greater dependency on the literature in the junior ranks as regards frequency of searches requested. Whether this is because there are less well established channels of interpersonal communication, or whether a greater amount of literature searching is delegated to the junior faculty, or simply that inexperience leads to less well defined searches, is a matter for speculation. This area of inquiry needs to be investigated more fully.

5. *Frequency of use by rank correlates with professional age.* We hypothesized that users of low professional age would have less rigidly fixed patterns of information-seeking behavior, and would, therefore, be more likely to use MEDLINE, a new and unfamiliar tool. It would then have been desirable to check for a significant difference between the predictive value of low rank and the predictive value of low professional age. This hypothesis might again substantiate observations made by Lehman that scientists achieve a peak in research and publication activity just prior to achieving tenure.

Statistical analysis showed that professional

TABLE 6
NUMBER OF MEDLINE SEARCHES AND PERCENTAGES OF TOTAL REQUESTS (1,466) BY RANK

| Rank | Broad | | Narrow | | Research | | Patient care | | Education | |
|------------------------------|-------|-------|--------|------|----------|-------|--------------|------|-----------|------|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Professor | 66 | 75.9 | 21 | 24.1 | 77 | 88.5 | 3 | 3.4 | 7 | 8.0 |
| Associate professor | 85 | 42.7 | 114 | 57.3 | 173 | 86.9 | 16 | 8.1 | 10 | 5.0 |
| Assistant professor | 152 | 57.8 | 111 | 42.2 | 206 | 78.3 | 34 | 12.9 | 23 | 8.7 |
| Instructor | 31 | 41.9 | 43 | 58.1 | 56 | 75.7 | 10 | 13.5 | 8 | 10.8 |
| Lecturer | 4 | 80.0 | 1 | 20.0 | 5 | 100.0 | 0 | — | 0 | — |
| Postdoctoral fellow | 206 | 59.9 | 138 | 40.1 | 245 | 71.2 | 68 | 19.8 | 31 | 9.0 |
| Resident | 158 | 73.8 | 56 | 26.2 | 134 | 62.6 | 69 | 32.3 | 11 | 5.1 |
| Intern | 9 | 64.9 | 5 | 35.7 | 9 | 64.3 | 3 | 21.4 | 2 | 14.3 |
| Clinical professor | 3 | 100.0 | 0 | — | 2 | 66.6 | 1 | 33.4 | 0 | — |
| Associate clinical professor | 5 | 25.0 | 15 | 75.0 | 15 | 75.0 | 2 | 10.0 | 3 | 15.0 |
| Assistant clinical professor | 14 | 24.1 | 44 | 75.9 | 52 | 89.6 | 6 | 10.4 | 0 | — |
| Clinical associate | 2 | 100.0 | 0 | — | 2 | 100.0 | 0 | — | 0 | — |
| Clinical instructor | 13 | 68.4 | 6 | 31.6 | 12 | 63.1 | 4 | 21.1 | 3 | 15.8 |
| Research associate | 118 | 71.9 | 46 | 28.1 | 153 | 93.3 | 6 | 3.6 | 5 | 3.1 |

age correlated significantly with two variables. There was a negative correlation coefficient between professional age and percentage of use by rank ($r = -0.58^*$). There was also a negative correlation between professional age and the number of patient care requests by rank ($r = -0.57^*$). This is probably not of great importance, however, since the modest negative correlation between professional age and percentage of patient care requests (-0.23) was not statistically significant. Thus, a declining interest in patient care requests as opposed to either research or education was not conclusively demonstrated.

6. *Grant support is reflected in total number of MEDLINE searches processed.* Since MEDLINE searches were most frequently performed for research purposes (77.8%), we postulated a direct relationship between the amount of grant dollars received by a department and the number of searches processed (presupposing that if literature searches were required, the resources would be available). We found that grant dollars did not correlate with percentage of use. However, grant dollars did show a highly significant correlation with the total number of requests processed by departments (0.84*).

Interestingly, the grant dollar factor (Table 7) correlated with the number of comprehensive searches processed with $r = 0.44^*$ and negatively

with the number of narrow searches processed, $i = -0.44^*$. A high factor means fewer MEDLINE searches per dollar spent. So, although fewer searches were being run per dollar, users tried to cover all the literature in a few searches. We have no assurance that searches will continue to be comprehensive when funding sources are low. This, again, may be an artifact of the novelty of the system. That is, the factor will decrease for these departments, and confidence in the system (narrow searches) will rise.

We expect that there will always be a significant correlation between grant dollars and the number of searches requested by a department. Future studies are needed to investigate whether increase or decrease in grant dollars produces a corresponding increase or decrease in MEDLINE demand.

7. *Grant support in dollars ranges from \$5,000 to \$20,000 per MEDLINE search requested.* It seemed likely that if the total number of searches processed was divided by grant dollars, a factor could be obtained that would tend to cluster around an average figure for all departments. If this was not the case, that is, if department X's research activities were intrinsically more expensive to conduct than department Y's, this factor might still be a good predictor of MEDLINE demand.

A figure in grant dollars that could be used to estimate number of requests by department was not apparent (Table 8). However, the distribution

*Significant beyond the 0.05 level of confidence.

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TABLE 7
DISTRIBUTION TABLE OF GRANT DOLLARS PER MEDLINE SEARCH REQUESTED

| Range in thousands of dollars | Departments | Number of departments |
|-------------------------------------|---|--------------------------|
| 1,000-5,000 | Anatomy, Anesthesiology, Microbiology, Pediatrics | 4 |
| 5,000-10,000 | Internal Medicine, Laboratory Medicine, Neurology, Ophthalmology | 4 |
| 10,000-15,000 | Pharmacology, Psychiatry, Surgery | 3 |
| 15,000-20,000 | Dermatology, Epidemiology & Public Health, History of Science & Medicine, Obstetrics & Gynecology | 4 |
| 20,000-25,000 | Child Study Center, Pathology | 2 |
| 25,000-30,000 | Radiology, Yale School of Nursing | 2 |
| 30,000-35,000 | — | 0 |
| 35,000-40,000 | Molecular Biophysics & Biochemistry | 1 |
| 40,000-50,000 | Physiology | 1 |
| 50,000+ | Human Genetics | 1 |

table (Table 7) shows a strong clustering around the level of \$5,000 to \$20,000 of grant support per MEDLINE search processed. The lower-factor departments are presumed to be entities with lower overhead and research costs or departments with demonstrably high patient care interests.

Although the distribution table did not provide us with an accurate figure upon which to predict

future MEDLINE demand, the value of this factor as a predictor could become more apparent if a longitudinal analysis were conducted.

CONCLUSION

We believe that medical librarians must provide information services that are responsive to the user's needs. This analysis of MEDLINE demand

TABLE 8
DOLLARS IN GRANT FUNDS PER MEDLINE SEARCH REQUESTED (FY 1973)

| Department | Grants in thousands of dollars | MEDLINE Requests | Factor in thousands of dollars |
|-------------------------------------|--------------------------------------|---------------------|--------------------------------------|
| Anatomy | 149,721 | 26 | 5,470 |
| Anesthesiology | 88,327 | 66 | 1,521 |
| Child Study Center | 659,700 | 28 | 23,517 |
| Dermatology | 321,599 | 20 | 16,015 |
| Epidemiology & Public Health | 1,963,759 | 96 | 20,437 |
| Health Science Resources | 870,827 | 49 | 17,735 |
| History of Science & Medicine | 36,133 | 2 | 18,013 |
| Human Genetics | 945,475 | 12 | 78,711 |
| Internal Medicine | 2,681,234 | 274 | 9,723 |
| Laboratory Medicine | 224,037 | 29 | 7,774 |
| Microbiology | 157,944 | 47 | 3,328 |
| Molecular Biophysics & Biochemistry | 605,675 | 15 | 40,312 |
| Neurology | 457,310 | 50 | 9,123 |
| Obstetrics & Gynecology | 214,851 | 11 | 19,535 |
| Ophthalmology | 655,776 | 72 | 9,157 |
| Pathology | 849,335 | 38 | 22,319 |
| Pediatrics | 256,749 | 55 | 4,637 |
| Pharmacology | 1,696,151 | 117 | 14,411 |
| Physiology | 799,170 | 17 | 47,017 |
| Psychiatry | 2,493,675 | 271 | 9,247 |
| Radiology | 1,346,092 | 45 | 29,410 |
| Surgery | 1,080,355 | 91 | 11,793 |
| Yale School of Nursing | 900,439 | 35 | 25,794 |

indicates a need to reevaluate existing information services within the Yale Medical Library. It is obvious from this study that clinical demand for automated searches is low, and that MEDLINE is not being used primarily as a clinical tool. Whether libraries have an important role in providing users with information applicable directly to patient care has not been demonstrated.

It is essential to heighten the clinician's awareness of his need for case-relevant information. Early application of MEDLINE use reflects a certain amount of anxiety over information flow with the rate of its use for research purposes. We expect that within ten years these demands will gradually show a more equitable balance in MEDLINE use, in that automated searching will be used more for clinical purposes than the present study indicates. Designing information services to complement and promote existing systems seems to be, for the moment, of paramount importance if medical librarians are to fulfill their role in the delivery of information as part of the total effort to improve health care.

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