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Problems encountered by clinical end users of MEDLINE and GRATEFUL MED*†

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INTRODUCTION

End-user searching of MEDLINE has become increasingly popular with the growing prevalence of personal computers and user-friendly search programs. However, novice end users frequently encounter frustrations that may deter them from further searching.

A study was undertaken at McMaster University Medical Center to observe medical personnel search MEDLINE in the clinical setting. Through direct observation, search capture, interviews, and questionnaires, reasons for successful and unsuccessful searches were determined. These suggest solutions for dealing with end users' search problems.

The design [1] and other results [2] of this study have been reported previously. This paper reports new data analyzing the reasons why end-user searches were unproductive.

* MEDLINE and GRATEFUL MED are registered trademarks of the National Library of Medicine.

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Table 1
Unproductive searches (n = 172)

	n (%)	n (%)
Search formulation	82 (48%)	
Redundant/repetitive terms		5 (3%)
General term instead of subheading		12 (7%)
Too restrictive		10 (6%)
Nothing on topic		41 (24%)
Low-postings terms		14 (8%)
GRATEFUL MED software	71 (41%)	
Inappropriate use of author line		1 (0.5%)
Inappropriate use of title line		18 (10%)
Inappropriate use of title abbreviation line		5 (3%)
Split words ("ORs" inserted) on subject line		31 (18%)
Backspacing over compound terms		3 (2%)
Inappropriate use of (*)		3 (2%)
Inappropriate use of (/)		9 (5%)
Spelling error in subject word		1 (0.5%)
System failure	19 (11%)	
Telecommunications failure to connect		11 (6%)
Host computer down		6 (4%)
GRATEFUL MED setup problem		2 (1%)
Total number unsuccessful searches	172 (100%)	

BACKGROUND

Unfortunate end-user experiences are a common phenomenon in the process of learning to search online. Slingluff stated that users have the most trouble in their conceptual understanding of online searching, particularly the contents and structure of a database, the use of appropriate terms, and Boolean logic [3]. More specifically, remembering how and when to use 'explode' and subheadings is difficult for end users [4]. Kirby stated that inadequate search strategy accounts for most search failures, including failure to use alternate approaches to the question or failure to use MeSH‡ effectively [5].

End-user problems unique to GRATEFUL MED (such as confusion with the automatic insertions of "OR" and "AND," not remembering to leave the title line blank for a subject search, and having to start over for every search) have also been noted [6].

THE MCMASTER EXPERIENCE

The mishaps and misfortunes sustained by the participants in the present study are enumerated in Table 1. An unproductive search was defined as one that did not retrieve any citations. There were 172 unproductive searches of a total of 1,203 during the study, September 1987 to December 1988. Unproductive searches were classified by a librarian researcher

‡ MeSH is a registered trademark of the National Library of Medicine.

according to the reason most responsible for the failure within three broad categories: problems in search formulation, problems peculiar to using the GRATEFUL MED software program, and system failure.

Problems in search formulation

Difficulties associated with the logic of MEDLINE accounted for eighty-two unproductive searches (48%). Poor search strategy was a common source of error and included "ANDing" together redundant or repetitive terms "TUBERCULOSIS IN CHILDHOOD" "AND" "TUBERCULOSIS, MENINGEAL"; using a general term instead of a subheading, especially "DIAGNOSIS" and "SURGERY"; and making the search strategy too restrictive, for example, asking for cause "AND" treatment "AND" follow-up "AND" a disease. Many searches resulted in no retrieval because there was seemingly nothing in MEDLINE on the topic. This was occasionally due to combining low-posting terms such as "FRUCTOSE INTOLERANCE" (11 postings) "AND" "HYPOCALCEMIA" (195 postings). Often there was no apparent reason (especially to the searcher) as to why the search failed. An example of this was "PUBLIC OPINION" "AND" "PARAMEDICS."

Problems peculiar to GRATEFUL MED software

Seventy-one unproductive searches (41%) were attributable to the users' unfamiliarity with the GRATEFUL MED searching software. Failure to use the F10 key to choose subject terms caused the majority of software problems. In eighteen instances, searchers unwittingly typed a subject word on the title line, automatically limiting retrieval to that word being in the title. In thirty-one cases, searchers did not choose a MeSH term when it was necessary to do so. For example, if the term "inflammatory bowel diseases" is entered, "INFLAMMATORY" "OR" "BOWEL" "OR" "DISEASES" is searched.

A little knowledge could also be deleterious to a search. Some users were aware that the use of the asterisk (*) and the forward slash (/) had special functions in GRATEFUL MED, but inappropriate use of the symbols, such as placing the asterisk at the end of a word or the slash before a textword, negated their usefulness and resulted in unsuccessful searches.

A few participants had difficulty with the author and journal abbreviation lines of the form screen, forgetting the correct format for authors and journal titles and neglecting to press HOME for help.

Problems due to system failure

Actual system failures accounted for just nineteen (11%) unsuccessful searches. These included failure

of the telecommunications system to connect the searcher to the National Library of Medicine (NLM) (11), failure of the host computer to answer (6), and a setup problem within the GRATEFUL MED program (2). These searches miscarried through no fault of the searcher; though relatively few in number, system failures seemed to play a disproportionate role in disillusioning beginner end users.

Unsuccessful and successful searches

These findings for unproductive searches must be taken in the context of both other reasons for unsuccessful searches and an overall picture of considerable success for inexperienced end-user searches.

Searches not meeting the "unproductive search" definition (because they retrieved citations) were often flawed by being off the topic or incomplete due to failure to use the "explode" feature. As Poisson stressed, one of the greatest dangers is the end users' unawareness of the incompleteness of their searches or frustration with too many false drops [7].

The majority of end-user searches in this study retrieved useful citations. Although novice users had considerably lower recall and precision than librarians, more experienced end users had recall equivalent to that of librarians. Thus, the overall prospect for end-user searching appears to be positive.

KEYS TO SUCCESS

The problems encountered by end users in this study echo previously documented experiences and provide information that suggests solutions. Spurred by the popularity of end-user searching, improvements in GRATEFUL MED and MEDLINE may help. GRATEFUL MED is now in its fifth version and has improvements that may reduce the problems of inexperienced users. These include a mapping capability, more notes for MeSH terms, and a smoother re-dialing procedure.

Proper training is essential, but remedial action is required as well. Reviewing the initial searches of end users following introductory training and providing corrective feedback may be effective in improving the quality of new users' searches. The challenge is to ensure that the process of follow-up and feedback does not become an additional burden to

the user. According to Ginn, for busy health professionals, evaluation of their searching performance may defeat the primary purpose of end-user searching, which is to save time [8].

Further investigation is required to determine the optimal amount of training and follow-up necessary for clinicians to perfect their searching skills. A randomized controlled trial is currently being conducted involving introductory training, followed by audit of initial searches and feedback. The control subjects in this new study receive only introductory training. Interviews with participants and analysis of down-loaded searches will allow measurement of the effect of this intervention. It is predicted that most of the searching mistakes discussed in this paper can be eradicated through a more rigorous but streamlined training approach.

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