handwriting of non-doctors. The mean score in our study was 7.1 out of a possible 13 points, indicating that handwriting among the average subject, whether a doctor or not, lies somewhere between the two middle samples in fig 1. In medical circumstances, where the stakes are high, writing of this mediocre quality may be unacceptable.

If average handwriting is not acceptably safe or clear in medical care then we must seek ways either to "error proof" written communication or to reduce reliance on it. In the short run increasing individual's awareness and motivation may produce some minor gains. In the longer run, however, it may be more helpful to regard legibility as a systemic problem, not a personal one. Better physical designs, for example, might make it easier to write legibly. However, when the stakes are highest, safety may require not improving writing, but replacing it.

We have shown, in a study with an artificial task and high inter-rater reliability, that doctors have handwriting no worse than that of a comparison group of other healthcare personnel, and much better than that of healthcare executives. These findings in no way contradict lore and literature about the costs and hazards of

poor writing in prescriptions and medical records, but they do refocus the problem. Illegibility in medical care may have less to do with "bad" (that is, exceptionally bad) handwriting among doctors than with handwriting in general as a form of communication. More help may be found in computerisation⁸ and other systemic innovations than in pointing the finger at a profession whose members, on the whole, write with an average hand.

Funding: None.

Conflict of interest: None.

- 1 White KB, Beary JF. Illegible handwritten medical records. *New Engl J Med* 1986; 314:390-1.
- 2 A study of physicians' handwriting as a time-waster. *JAMA* 1979;242:2429-30.
- 3 Halper NA, Colucci RD, Alicea M, Greenstein R. Intensive care order writing practices in the USA: results in a nationwide study. *Crit Care Med* 1991;19:433-5.
- 4 Brahm D. Uninsured pharmacists and illegible prescriptions. *Lancet* 1989;i:510.
- 5 Sanders S, Shaw AB. Drug name confusion. *Lancet* 1991;i: 56-7.
- 6 Mullan K. Importance of legible prescriptions. *J Royal Coll Gen Pract* 1989;39:347-8.
- 7 Fenelly WA. Can you read your own handwriting? *N York J Dentistry* 1975;45:73-4.
- 8 Institute of Medicine. *The computer-based medical record: an essential technology for health care*. Washington, DC: National Academy Press, 1991.

Mizspellin and Medline

Joel G Ray, Marian J Vermeulen

Literature searches, whether conducted for patient care or for construction of a systematic overview, depend on at least two factors to be comprehensive. These are, firstly, use of an inclusive set of search strategies,¹ and, secondly, correct entry and referencing of published material within the database.² There is limited evidence on the accuracy of information within electronic databases. We assessed the accuracy of entries in Medline by searching for misspelt textwords.

Methods and results

We conducted a literature search of 10 commonly used medical terms selected from the subject index of the *ACP Journal Club* (May/June 1996 issue).³ We intentionally misspelt each term by altering one or two letters within the word (for example, myocardial infarction became myocardiial infraction). We searched for the terms as textwords in Medline from 1966 to November 1996 but did not use medical subject headings (MeSH). We analysed the number of times a misspelt term occurred within an article's title, abstract, or both and

the proportion of misspelt citations that might be missed if a search was conducted using only a textword search with the correctly spelt term.

Results

Table 1 summarises the results of our misspelt searches. A total of 200 citations were retrieved from the 10 selected search terms. Most misspelt textwords occurred within the abstract only (141/200; 71%). Surprisingly, 98 of the 200 articles (49%) with misspelt textwords might be missed if you conducted a Medline search using the correctly spelt word alone without the MeSH heading.

Comment

Although we did not evaluate the impact of adding proper MeSH headings to the above searches (assignment of MeSH headings is automated and thus they are never misspelt), we feel that a substantial proportion of minor articles on these subjects would be missed in a detailed systematic literature search.

Table 1—Results of Medline search using 10 misspelt textwords

Misspelt term (correct spelling)	No of misspelt citations retrieved	No (%) with misspelling in title alone	No (%) with misspelling in abstract alone	No (%) of potentially missed citations using textword search alone
Angima (angina)	3	2 (67)	1 (33)	1 (33)
Antibotics (antibiotics)	15	6 (40)	9 (60)	8 (53)
Asprin (aspirin)	13	5 (38)	8 (62)	7 (54)
Canzer (cancer)	0	0	0	0
Dopler (Doppler)	8	3 (38)	5 (63)	5 (63)
Cholestrol (cholesterol)	47	9 (19)	38 (81)	25 (53)
Hamorrhage (haemorrhage)	4	1 (25)	3 (75)	2 (50)
Myocardiial infraction (myocardial infarction)	96	22 (23)	71 (74)*	41 (43)
Spetic (septic)	10	5 (50)	5 (50)	7 (70)
Thrombolism (thromboembolism)	4	3 (75)	1 (25)	2 (50)
Total	200	56 (28)	141 (71)	98 (49)

*Three articles contained misspelling within both the title and abstract.

Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario L8L 4L8
Joel G Ray, graduate student

Department of Community Health, University of Toronto, Toronto, Ontario
Marian J Vermeulen, graduate student

Indeed, given the number of ways that words can be misspelt our findings clearly underestimate the magnitude of the problem. The topics that we chose for our misspelt searches are common to clinical practice and have been used within systematic literature reviews for various medical specialties, thereby making our findings relevant to such uses of Medline.

Researchers need to beware of misspelt textwords within Medline and to realise the importance of using both MeSH headings and textwords in any systematic literature search.¹⁻⁴

Special thanks to Dr R B Haynes for his help with the preparation of this manuscript.

- 1 Haynes RB, Wilczynski N, McKibbon KA, Walker CJ, Sinclair JC. Developing optimal search strategies for detecting clinically sound studies in MEDLINE. *Journal of the American Medical Informatics Association* 1994;1:447-58.
- 2 Funk ME, Reid CA, McGoogan LS. Indexing consistency in MEDLINE. *Bulletin of the Medical Library Association* 1983;71:176-83.
- 3 Index. *ACP Journal Club* 1996;124:88-96.
- 4 Lowe HJ, Barnett GO. Understanding and using the medical subject headings (MeSH) vocabulary to perform literature searches. *JAMA* 1994;271:1103-8.

Introducing Selfcite 2.0—career enhancing software

Nick Craddock, Michael C O'Donovan, Michael J Owen

Fig 1—Total potential number of self citations as a function of the number of publications

Citation rate is becoming increasingly important as an index of success within medical academia.¹ Self citation (referencing one's own earlier publications in a new publication) is a useful method for increasing citation rate.² Although some academics are undoubtedly masters of this approach, maximising the benefit from self citation can be tedious, so we have developed a user friendly software package, Selfcite, to help in this task. In this paper we introduce the theory of self citation and give a short description of the Selfcite program.

The benefits of self citation: theoretical considerations

To achieve maximum benefit from self citation, each new publication should cite all earlier works.³ Thus, in one's second paper, the first is cited. In one's third, the first and second are cited, making a total of three citations. In the fourth, the first, second, and third are cited, making a total of six citations. The mathematically inclined reader will immediately recognise that the number of possible citations is the sum of a series of triangular numbers, and that the total number of citations possible on publication of the *n*th paper is given by $n(n-1)/2$.⁴ Thus, the tenth paper produces 45 references and the 100th produces 4950. The expected accumulated reward is shown graphically in fig 1.

Clearly this is the ideal situation and it will rarely be possible to realise this goal: despite a commitment to the principle of self citation, the content of manuscripts may prevent later citation. In this regard it is worth remembering that early publications should be kept very general with a view to later citation in progressively more specialised works.⁵

Recognising the burden on time and ingenuity of incorporating citations of one's earlier work into new manuscripts we were motivated to develop Selfcite.

The Selfcite 2.0 package

Selfcite 2.0 is an integrated suite of programs that runs on IBM compatible personal computers under Windows and is compatible with the major word processing packages, reference managers, and online reference databases. A database within Selfcite stores details (including title, key words, and abstract) of each of the user's publications. The program can be used in interactive mode or non-interactive mode. In interactive mode the user composes the text of a new manuscript and Selfcite makes context sensitive suggestions for citations of one's own work. The user can then select or reject suggestions. In the non-interactive mode Selfcite can be used to scan the final text of a manuscript and automatically insert self citations. The algorithm used

to decide on inclusion of a citation involves assigning a score to each of the user's previous publications based on the similarity between words and phrases in the nascent manuscript and those used in the database record for previous publications. The user sets a threshold score that determines whether or not a citation will be inserted automatically in scan mode.

The package has several important features:

- **Maxcite**—this option maximises the number of self citations and can usually incorporate over 80% of the user's earlier work.
- **Megacite**—this option ensures inclusion of all one's previous papers and if necessary inserts them randomly into the text. We recommend that this option should be used only sparingly as reviewers and editors may notice that references do not have a crucial bearing on the text.
- **Minicite**—This option allows the user to choose the desired number of self citations for a given manuscript and the program selects those most appropriate.
- **Modesty**—This overrides the program and prevents self citations (not recommended for general use).
- **Multicite**—This allows multiple users to maximise the number of joint self citations. This is particularly useful for research groups.
- **Shaft**—A popular option introduced in version 2.0. It allows the user to specify one or more other researchers who should not be cited. A warning message flashes on the screen if one of the researchers in the shaft list is coauthor of a paper that the user is inadvertently trying to cite. The closest self citation is suggested as an alternative.
- **Paracite**—An extremely useful feature. The program deliberately miscites one's own earlier publication in the hope that another worker will write a letter to the journal pointing this out, thus allowing the user to publish a letter in reply, thereby providing further self citation opportunities. (The default setting is paracite on but only once per manuscript.)
- **Citers-block**—The user decides on the references to be cited and the program offers suggestions for plausible passages of text to support their citation.
- **Stats**—This set of options provides statistics about the overall efficiency of the self citation process (total number of self citations divided by total number possible) and will present the data in graphical form. The algorithms monitor potential self citation classics and automatically increase their citation priority in the main part of the program.

Department of
Psychological Medicine,
University of Wales
College of Medicine,
Cardiff CF4 4XN
Nick Craddock, Wellcome
Trust senior research fellow in
clinical sciences
Michael C O'Donovan,
senior lecturer in psychiatry
Michael J Owen, professor of
neuropsychiatric genetics

Correspondence to:
Dr Craddock.
craddock@cardiff.ac.uk

BMJ 1996;313:1659-60