Evaluating publication trends in clinical research:
How reliable are medical databases?

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The aim of this study was to draw attention to the possible existence of “quirks” in bibliographic databases and to discuss their implications. We analysed the time-trends of “publication types” (PTs) relating to clinical medicine in the most frequently searched medical database, MEDLINE. We counted the number of entries corresponding to 10 PTs indexed in MEDLINE (1963-1998) and drew up a matrix of [10 PTs x 36 years] which we analysed by correspondence factor analysis (CFA). The analysis showed that, although the “internal clock” of the database was broadly consistent, there were periods of erratic activity. Thus, observed trends might not always reflect true publication trends in clinical medicine but quirks in MEDLINE indexing of PTs. There may be, for instance, different limits for retrospective tagging of entries relating to different PTs. The time-trend for Reviews of Reported Cases differed substantially from that of other publication types.

Despite the quirks, quite rational explanations could be provided for the strongest correlations among PTs. The main factorial map revealed how the advent of the Randomized Controlled Trial (RCT) and the accumulation of a critical mass of literature may have increased the rate of publication of research syntheses (meta-analyses, practice guidelines, …). The RCT is now the “gold standard” in clinical investigation and is often a key component of formal “systematic reviews” of the literature. Medical journal editors have largely contributed to this situation and thus helped to foster the birth and development of a new paradigm “evidence based medicine” which assumes that expert opinion is biased and therefore relies heavily – virtually exclusively – on critical analysis of the peer-reviewed literature. Our exploratory factor analysis, however, leads us to question the consistency of MEDLINE’s indexing procedures and also the rationale for MEDLINE’s choice of descriptors. Databases have biases of their own, some of which are not independent of expert opinion. User-friendliness should not make us forget that outputs depend on how the databases are constructed and structured.

Introduction

Evaluation and measurement of scientific achievements rely increasingly heavily on access to systematic, structured information as supplied by electronic databases. Databases compiled by well-known bodies with substantial resources (funds, staff,
competence ... tend to be the most attractive, especially if their use is free. Many are devoted entirely to the compilation of published literature. However, complaints are common especially from those who research a topic in depth. Information is fragmentary. There may be, for instance, incomplete coverage of all articles in a journal, or the paths of access to existing information may not be found even when using appropriate thesaurus terms.

It is one thing, however, to detect inadequacies in a database through sporadic use on selected topics and quite another to study the overall structure of a database. A bird's eye view can tell us how a database has been set up and how it is run. It raises fundamental questions on the strategies of database construction: (i) how accurate, consistent and timely is the indexing, (ii) how and when are new key-words selected, (iii) what are the selection rules for inclusion of journals, and so on. Relying solely on information provided by database compilers is unwise; we should be developing tools for database evaluation and labelling with quality assurance in mind.

This article investigates part of the structure of the MEDLINE database. MEDLINE is run by the National Library of Medicine (USA) and covers over 9 million articles, some dating back to 1960, from nearly 4,000 scientific and medical journals. It is reputed to be the most frequently used medical database. We focussed on an area that has gained increasing importance over the years, namely, clinical methodology and research synthesis. We highlight “quirks” in indexing which we attempt to explain and show how the development of the randomised controlled trial has prepared the ground for a new paradigm known as evidence based medicine.

The dataset: Publication types in MEDLINE

We used the PubMed MEDLINE database (1966-present). In March 1999, we recorded the number of articles indexed each year from 1963 onwards (three years prior to the official start of MEDLINE) for 10 major “publication types” (PT) relating to clinical investigations (N = 491,135). The PT search option (formerly “citation types”) was introduced in 1991. The 10 PTs, as defined by MEDLINE, were in decreasing order of number of counts:

*Clinical Trial* (CT) (N = 248,238)

Pre-planned clinical study of the safety, efficacy, or optimum dosage schedule of one or more diagnostic, therapeutic, or prophylactic drugs, devices, or techniques in humans.

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* Access is now via http://www.ncbi.nlm.nih.gov/PubMedCld/medline.html