MEDICAL ETHICS: Research Themes and Intellectual Base

Bo Jarneving

Swedish School of Library and Information Science at Göteborg University and Högskolan i Borås
SE 501 90 Borås, Sweden
e-mail: bo.jarneving@hb.se

ABSTRACT

The objective of this paper is to reflect the intellectual structure of the research field in medical ethics. Central research themes of both citing and cited documents were found to focus on issues concerning autonomy, ethics education, principles of ethics, medical research and life-death decisions. An additional number of themes with delimited foci were also identified. On the basis of the findings it was concluded that the objective of describing the intellectual structure of medical ethics was not reached in terms of completeness. The data consisted of 477 bibliographic descriptions of publications of Journal of Medical Ethics from the period 1993-2001 and the bibliometric methods used were cocitation analysis and bibliographic coupling. Additional bibliometric applications identified and extracted documents in the sample with a citation relationship to the same and analysed the co-occurrence of descriptor terms. General statistical techniques applied were multidimensional scaling and cluster analysis.

Keywords: Bibliometrics; bibliographic coupling; citation analysis; cocitation analysis; medical ethics

ABSTRAK


Kata kunci: bibliometrika; bibliographic coupling; analisis sitasi; analisis kositasi; etika kedokteran
1. INTRODUCTION

The basic principle of science is to publicize its research results. An emphasis on a field's publications and patterns of formal communication has the potential ability to reflect the cognitive structures of a scientific field. Once a discovery or research result is made public and put on permanent record, it could be said to constitute an entity of primary scientific communication and together such entities constitute an archive of public knowledge. On a personal level, such a work put on record is seen as the scientist's intellectual property. When works are read by other scientists and cited in their own works, the cited authors are recognized for their contribution to knowledge. These citations made and received by authors/scientist constitute a formal linking mechanism between the research published by individuals and other members of the scientific community. These previous research results to which a new research publication is linked backward in time through its citations are thus formally cited as authoritative sources (Ziman, 1984). As the number of publications increase, so does the number of citations constructing an expanding citation network. Any scientist's publication is thus embedded in this network constructed by the citations to and from many other scientists and depending on their work. Analyzing this network might contribute to our understanding of a field's intellectual structure and content.

In this paper the network constituted by the formal communication of researchers from the field of medical ethics or bioethics is analyzed using bibliometric methods. The term bibliometric has been used since the beginning of the 1970s and refers to the mathematical and statistical analysis of patterns from publications and the use of publications. Medical ethics refers to the study of moral issues in the fields of medical treatment and research. The term is also sometimes used more generally to describe ethical issues in the life sciences and the distribution of scarce medical resources. The professional fields that deal with ethical issues in medicine include medicine, nursing, law, sociology, philosophy, and theology, though today medical ethics is also recognized as its own discipline. For this analysis the Journal of Medical Ethics was chosen as a good representative of this field. First published in 1975, it has become a leading international journal, reflecting the whole field of medical ethics. Thus, the objective of this paper is to focus on the intellectual structure of medical ethics by analyzing the citation network constituted by references in this journal, depicting discernable research themes and the structure of the intellectual base. The objective of this paper is purely descriptive.

2. METHOD

A bibliographic data file was downloaded from the Institute for Scientific Information's index Science Citation Index Expanded. This index, accessed by the interface of Web of Science, contains complete bibliographic data, including cited references, citations received and author abstracts for each bibliographic item. In all, 477 articles on Medical Ethics from the period 1993-2001 were downloaded, formatted and appended to one file. Most of the computing was accomplished using the software Bibexcel.

2.1 Citation analysis

Citation analysis encompasses a wide-ranging area of bibliometric research methods. The use of citation analysis may focus on the documents themselves, their
authors or the journals in which the documents appear. There is also a great variety as to how citation analysis is applied and for what purposes. To mention a few, citations can be considered as indicators of scientific communication patterns, where the assumption is that there is a certain amount of congruence between documental and social structures. The study of the historical, scientific process using citation analysis is based on a literary model of the scientific process where scientific work is represented by papers and citations can be used to trace the chronology of events, relationships between them and their importance (Smith, 1981). The study of the cognitive structure of science, where the linkages among key papers establishes a structure map for the specialty. Through the study of changing structures, the development of disciplines and their interrelationship could be monitored (Small, 1973).

The techniques applied for this citation analysis, bibliographic coupling and co-citation coupling, are well established. Kessler (1963) first presented bibliographic coupling as a new method for grouping technical and scientific papers on the basis of bibliographic coupling units. A coupling unit is a single reference used by two papers and the strength of the coupling is measured by the number of coupling units between them. When two citing items have a strong bibliographic coupling they are presumably dealing with the same subject matter. Vladutz and Cook (1984) performed a large-scale study of the concept of bibliographic coupling where it was found that the use of bibliographic coupling yielded valid results in terms of subject relatedness in a large-scale database.

The co-citation technique was initially presented by Small (ibid.) as a new form of document coupling defined as the frequency with which two documents are cited together. The number of identical citing items decides the strength of co-citation between two documents. Therefore, this relationship between documents is established by the citing authors and the way they choose to cite works pertinent to their own work. Like bibliographic coupling, co-citation is a measure of similarity as to subject area and co-citation patterns can be used to model scientific specialties.

Cocitation- and bibliographic coupling can be illustrated as follows:

![Diagram of co-citation and bibliographic coupling](image)

Document I is bibliographically coupled with document II, as they both cite document C and document F.

Documents A ; C ; F ; H are all cocited by document I

Documents B ; C ; F ; L are all cocited by document II

Documents C ; F are cocited by document I and II

Two complementary statistical techniques are applied in this paper, multidimensional scaling (MDS) and cluster analysis. Both techniques have their starting point in a matrix of proximity values. MDS refers to a class of techniques, which use the proximity values of objects as input. The chief output is a geometric configuration of points, each point representing an object. The display of this geometric configuration is the "map" of (co-occurring) objects. The geometric configuration could be said to reflect the "hidden structure" of the matrix and often makes the data easier to comprehend (Kruskal & Wish, 1978). The operations used to obtain the geometric configuration are highly mathematical and due to their complexity all calculations are performed with the aid of a computer, however, the principle of MDS can be explained:

Let A, B, C, and D be the representations of four objects in the matrix. Let X be the value of similarity for A and B, and Y for C and D. Ideally, the following conditions should be the rule:

1) If X = Y, then the distance, between both points in the configuration, representing A and B should be the same
as the distance between the points representing C and D.
and
(2) if \( X < Y \), then the distance between both points representing A and B in the configuration, should be greater than the distance between the points representing C and D.

Clustering is a kind of classification of objects into meaningful sets (clusters). This classification might discover systems of organizing observations, usually people, into groups where members share properties in common (Stockburger, 1998). In this paper, a cluster could be defined as a group or a set consisting of a number of documents sharing some sort of property. The clusters should also be mutually exclusive. That is, no document may exist in more than one cluster. The routine is explained by a metaphorical example taken from the help files of Bibexcel:

Imagine you have the following list of pairs:

| 10 | A  | B  |
|  9 | D  | F  |
|  8 | B  | C  |
|  7 | A  | C  |
|  6 | F  | G  |
|  5 | H  | I  |
|  4 | A  | H  |

Note that the pairs are sorted by a co-occurrence frequency in column 1, and that the pair-list also must have tabs separating the two units of a pair.

The clustering routine will have the following sequence of events:

(the pairs are invited to a party):
A-B comes first, have to wait in the hall
D-F comes next, have to wait in the hall.
B-C comes next, forms a cluster-table with A-B in the living room
A-C comes next, will be deleted since A-C is already in the living room
F-G comes next, will not find a friend in the room
   Goes to the hall and finds D-F and
   Then D-F-G will form a cluster in the room
H-I comes next, have to wait in the hall
A-H comes next, H will cluster with A-B-C
   then searches the hall and finds H-I
   I will cluster with A-B-C-H
Clustering will hold: A-B-C-H-I
Clustering will hold D-F-G

In order to estimate interrelations (based on cocitations) between clusters the average cocitation strengths between clusters were calculated. The average cocitation frequency for \( c_1 \) and \( c_2 \), \( \text{AvgCC}(c_1, c_2) \), is defined as

\[
\text{AvgCC}(c_1, c_2) = \frac{\sum \sum \text{CC}(d_i, d_j)}{n_1 n_2},
\]

where \( n_1 \) is the number of documents in \( c_1 \), \( n_2 \) is the number of documents in \( c_2 \) and \( \text{CC}(d_i, d_j) \) the cocitation frequency for \( d_i \) (\( \in c_1 \)) and \( d_j \) (\( \in c_2 \)).

Based on these normalized values (proximities) of co-citation strength, a MDS map was computed showing the relative similarity between clustered groups of documents.

2.2 The internal citation network

The network constituted by citations given and received exclusively by documents of a sample of selected articles from Medical Ethics will also be investigated. This approach demands a technique that enables the extraction of documents that cite or is being cited by other documents in the selected sample. This technique is implemented in Bibexcel where a search key is constructed that contains the surname of the first author, publication year, volume number and starting page for every record, which enables the identification and computing of all documents citing any other document of the sample or being cited by any of these. Next, the number of citations to each cited document is calculated and a threshold for the inclusion of items for further analysis is set. Thus, the resulting set of bibliographic descriptions only contains documents that are connected to other documents in the original set. When this approach is applied, the whole monographic literature referenced in Medical Ethics hereby is excluded and references published earlier than 1993 and in journals not
indexed by SSCI are also excluded, and of course, those articles of the set that do not receive citations from articles of the same set nor give references to articles of the same. Conclusively, this gives a more concentrated view of the literature of medical ethics excluding citations to documents outside the field of medical ethics, but with notable limitations that have to be accounted for when interpreting the results.

2.3 Word analysis

In order to investigate and comprehend the subject content of a set of source articles from a field of investigation, an additional method uses title words or key words as input data. The assumption is that the frequency and co-occurrence of terms can reflect the content and structure of research. In this paper descriptor terms are used and after computing a pair list of co-occurring index terms, MDS is used to create a spatial configuration in two dimensions showing how concepts of medical ethics relate to one another during the time period chosen for this investigation. On a more detailed level, the co-occurrence of descriptors are analyzed in order to apprehend the context of some descriptor terms selected on the basis of their frequency of use and of their share of articles’total number of descriptors.

3. EMPIRICAL RESULTS

3.1 Research themes through bibliographic coupling

The research themes derived from clusters constituted by bibliographically coupled, highly cited source documents reveal recent research themes from the Journal of Medical Ethics and are labeled according to the content indicated by titles and abstracts. The citation threshold of the citing documents was set to 4 citations and exactly 100 documents were cited at least 5 times. The distribution of citations over source documents shows that 35% of all source documents have not, as yet, been cited at all and that a few are heavily cited.

Eight documents were excluded in the clustering and in all, 49 documents of 100 had at least one common reference, constituting 6 clusters. The clusters are presented with the first author, title, publication year, volume, issue, times cited and, at the end, the number of times they appear as one of the parts of the links forming the clusters. Typically, the more connected documents appear at the beginning of each cluster and the less relevant (as to the common theme of the cluster) documents are usually located at the end. As for the relationships between clusters, cluster 2 and 3 were found to have 21 references in common, cluster 2 and 1 had one common reference and the remaining clusters no common references at all. This indicates that there probably is a greater resemblance in subject content between cluster 2 and 3 than between the other clusters. The probability that cluster 2 and 3 contain common references is of course enhanced by the fact that they also contain most documents. In all, the clusters have a clear emphasis on medical treatment and care.

Cluster 1, Nutrition at the End of Life, is concerned with issues about terminal care and medical-moral issues concerning the alimentation of the patient near the end of life. Cluster 2, Principles of Resuscitation, have the second most documents, which indicates that the ethical question of resuscitation is a central theme in medical ethics research. In this context questions concerning euthanasia, patient...
autonomy and the age of the patient are also debated. **Cluster 3, Ethics of Care and Education of Ethics**, is the largest cluster and has a more general content such as the basic issues of medical ethics and in focus are educational aspects of medical ethics in the context of medical care. A more specialized theme is visible in **cluster 4, Clinical Trials**, where the role of uncertainty and scientific evidence as well as issues of patient and public benefit are discussed. In **cluster 5, Medical research**, the emphasis is on genetic issues but questions about screening and prevention and obstetrics are also debated. Finally, **cluster 6, Patient Autonomy**, is focused on patient autonomy in the context of refusal of blood transfusion.

**Cluster 1**

**Nutrition at the End of Life (n=4)**

Dunlop RJ/ On withholding nutrition and hydration in the terminally ill - has palliative medicine gone too far - a reply/1995/21/8/2
Craig GM/ On withholding artificial hydration and nutrition from terminally ill sedated patients. The debate continues/1996/22/7/2
Ashby IW/ Artificial hydration and alimentation at the end of life - a reply to craig/1995/21/7/1
Larches VF/ Paediatrics at the cutting edge: Do we need clinical ethics committees?/1997/23/12/1

**Cluster 2**

**Principles of Resuscitation (n=15)**

Halliday R/ Medical futility and the social context/1997/23/8/4
Bruce Jones P/ Resuscitating the elderly: What do the patients want?/1996/22/12/3
Robertson GS/ Resuscitation and senility - a study of patients opinions/1993/19/14/3
Hilberman M/ Marginally effective medical care: Ethical analysis of issues in cardiopulmonary resuscitation (CPR)/1997/23/8/2
Orr RD/ Requests for "inappropriate" treatment based on religious beliefs/1997/23/10/2
van Delden J JM/ Deciding not to resuscitate in Dutch hospitals/1993/19/15/2
Mead GF/ Cardiopulmonary-resuscitation in the elderly - patients and relatives views/1995/21/32/2
Mitchell KR/ Medical futility treatment withdrawal and the persistent vegetative state/1993/19/15/2
Shaw AB/ In defense of ageism/1994/20/13/2
Holm S/ Not Just autonomy - the principles of American biomedical ethics/1995/21/14/1
Schostak RZ/ Jewish ethical guidelines for resuscitation and artificial nutrition and hydration of the dying elderly/1994/20/6/1
Hunt RW/ A critique of using age to ration health-care/1993/19/5/1
Staufh M/ Rationality and the refusal of medical treatment - a critique of the recent approach of the English courts/1995/21/5/1
Stevens CA/ Management of death dying and euthanasia - attitudes and practices of medical practitioners in South-Australia/1994/20/29/1
Jochemsen IH/ Euthanasia in Holland - an ethical critique of the new law/1994/20/13/1

**Cluster 3**

**Ethics of Care and Education of Ethics (n=16)**

Robertson DW/ Ethical theory ethnography, and differences between doctors and nurses in approaches to patient care/1996/22/6/4
Sulmasy DP/ Ethics education for medical house officers: Long term improvements in knowledge and confidence/1997/23/10/3
Allmark P/ Can there be an ethics of care/1995/21/15/3
Sulmasy DP/ A randomized trial of ethics education for medical house officers/1993/19/19/3
Smith LFP/ Ethical dilemmas for general-practitioners under the UK new contract/1994/20/7/3
Green B/ Teaching ethics in psychiatry - a one-day workshop for clinical students/1995/21/7/2
Mchaffie HE/ Withholding/withdrawing treatment from neonates: Legislation and official guidelines across europe/1999/25/10/2
Hope J/ The Oxford practice skills project - teaching ethics law and communication-skills to clinical medical-students/1994/20/7/2
Mitchell KR/ Assessing the clinical ethical competence of undergraduate medical-students/1993/19/16/1
single document not cited by or citing any other document of this sample. The clusters are presented with the first author, publication year, volume number, starting page and at the end, the number of times they appear as one of the parts of the links forming the clusters. Those documents that are cited at least 15 times appear with their first authors in italics, extra bold type. Clustering the top documents of the Journal of Medical Ethics and those documents that are related to them reflects how research themes are formed around the more recognized documents within the period of 1993-2001 and will give a current picture of the field as reflected by this particular journal. Basically, the same or related research themes show up as in the case of clusters based on bibliographically coupled documents in section 3.1: cluster 1, Resuscitating the Elderly, has a content similar to cluster 2 (3.1) and 2 identical documents. Cluster 2, Artificial Hydration and Alimentation at the End of Life, corresponds to cluster 1 (3.1) with 3 identical documents and cluster 3, Ethics of Care and Education of Ethics, to cluster 3 (3.1) with 4 identical documents. Cluster 4, Patient Autonomy, is similar to cluster 6 (3.1) with 3 identical documents. Cluster 5, Using the dead, and cluster 6, Prioritization in medicine, reflects more specialized aspects of medical ethics not present in section 3.1. Of the remaining 9 documents, 3 are found in cluster 2, section 3.1 and 6 of them are not found in section 3.1.

Cluster 1.

Resuscitating the Elderly (n=5)

<table>
<thead>
<tr>
<th>Citing year</th>
<th>Cited year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>1</td>
</tr>
<tr>
<td>1995</td>
<td>10 2 5 17</td>
</tr>
<tr>
<td>1996</td>
<td>4 1 20 6 31</td>
</tr>
<tr>
<td>1997</td>
<td>3 2 6 2 12</td>
</tr>
<tr>
<td>1998</td>
<td>2 3 4 10 7</td>
</tr>
<tr>
<td>1999</td>
<td>2 3 5 7 13 10 7</td>
</tr>
<tr>
<td>2000</td>
<td>4 1 4 5 9 12 5 2 46</td>
</tr>
<tr>
<td>2001</td>
<td>1 1 3 3 3 2 3 1 13</td>
</tr>
<tr>
<td>Total</td>
<td>26 13 47 24 36 30 15 2 168</td>
</tr>
</tbody>
</table>


Cluster 2.

Artificial Hydration and Alimentation at the End of Life (n=7)

Craig, 1994, V20, P139, On withholding nutrition and hydration in the terminally ill - has palliative medicine gone too far?/5; Craig, 1996, V22, P147, On withholding artificial hydration and nutrition from terminally ill sedated patients. The debate continues/3; Allmark, 1995, V21, P19, Can there be an ethics of care?/2; Ashby, 1995, V21, P135, Artificial hydration and alimentation at the end of life - a reply to Craig/1; Dickenson, 2000, V26, P254, Are medical ethicists out of touch? Practitioner attitudes in the US and

9 The "clustering" or grouping of these pairs is pursued differently compared to the clustering of bibliographically coupled or cocited pairs as each pair has the same value, that is, exactly one citation exists between any two documents in a pair. Thus, in the clustering process there is no distinguishing of different strengths between documents.
UK towards decisions at the end of life/1; Dunlop, 1995, V21, P141, On withholding nutrition and hydration in the terminally ill - has palliative medicine gone too far - a reply/1; Fenwick, 1998, V24, P86, Applying best interests to persistent vegetative state - a principled distortion/1

Cluster 3.

Ethics of Care and Education of Ethics (n=8)

Mitchell, 1993, V19, P230, Assessing the clinical ethical competence of undergraduate medical-students/5; Malek, 2000, V26, P131, Talking about cases in bioethics: the effect of an intensive course on health care professionals/2; Sulmasy, 1993, V19, P157, A randomized trial of ethics education for medical house officers/2; Robertson, 1996, V22, P292, Ethical theory ethnography, and differences between doctors and nurses in approaches to patient care/1; Savulescu, 1999, V25, P367, Evaluating ethics competence in medical education/1; Myser, 1995, V21, P97, Teaching clinical ethics as a professional skill - bridging the gap between knowledge about ethics and its use in clinical-practice/1; Sulmasy, 1997, V23, P88, Ethics education for medical house officers: Long term improvements in knowledge and confidence/1; Tysinger, 1997, V23, P315, Teaching ethics using small-group problem-based learning/1

Cluster 4

Patient Autonomy (n=5)


Cluster 5

Using the Dead (n=3)

Iserson, 1993, V19, P92, Postmortem procedures in the emergency department - using the recently dead to practice and teach/2; Ardagh, 1997, V23, P289, May we practice endotracheal intubation on the newly dead?/1; Nyren, 2000, V26, P54, Ethics in the laboratory examination of patients/1

Cluster 6

Prioritization in medicine (n=3)

Nord, 1993, V19, P37, The relevance of health state after treatment in prioritizing between different patients/2; Cohen, 1996, V22, P267, Preferences needs and QALYs/1; Ryynanen, 1996, V22, P238, Random paired scenarios - A method for investigating attitudes to prioritization in medicine/1

Single Pairs

Fulford, 1993, V19, P85; Ethics of research with psychiatric-patients - principles problems and the primary responsibilities of researchers; Bindless, 1998, V24, P314; The use of patients in health care education: the need for ethical justification

Mitchell, 1993, V19, P71, Medical futility treatment withdrawal and the persistent vegetative state; Borthwick, 1995, V21, P205, The proof of the vegetable - a commentary on medical futility

Redshaw, 1996, V22, P78, Research ethics committee audit: Differences between committees; Dal-Re, 1999, V25, P268, Performance of research ethics committees in Spain. A prospective study of 100 applications for clinical trial protocols on medicines


Not Connected

Van Delden, 1993, V19, P200, Deciding not to resuscitate in Dutch hospitals
3.3 Concepts of research

In order to make full use of the information contained in the bibliographic descriptions, the key words that are assigned the documents by the author(s) are analyzed. The fall out of documents was acceptable as 95% of the citing documents contained descriptors. Compared to the techniques used in 3.1 and 3.2 there is no discrimination of documents and all documents containing descriptors are included. In this way most of the articles of the Journal of Medical Ethics have initially the same chance to make a contribution. But, on the descriptor level there is a choice of which ones to include. In this case 1911 descriptors were gathered in one file and the total number of unique descriptors was 1126, which is a number too big to be able to reflect in a meaningful way. Some sort of selection has to be made. The distribution of occurrences of unique descriptors is very skewed (Figure 2) and excluding descriptors only on the basis of low occurrence might exclude important concepts. Instead, each descriptor term was assigned a fraction according to its share of all descriptors in a particular document and all fractions of this term were then summed up (Table 3). The reason for this approach is that if a document is assigned only a single or a few descriptors, each descriptor should have a greater weight compared to the case when many descriptors are used to describe the focus of a document. As to the number of descriptors per document, the mode, median and mean are all 4th, which is a rather symmetrical distribution and one could conclude that mostly 3-6 descriptors are needed to reflect the content of a document and more seldom one or two descriptors are enough to describe the focus of a document. In another few cases more than 4 descriptors are used (Figure 3). As a good part of all descriptors occur only once (46%) over the time period, one is tempted to assume that there is no straightforward way to conceptualize research foci, or that the research field might be fragmented. This could mean that there is a problem in reflecting the research structure by means of descriptor terms. Thus, this attempt is delimited to the analysis of those descriptors that have relative high scores and one should keep in mind that eventually a body of varying concepts is not visualized.

In order to appreciate eventual changes over time, the set of descriptors was divided into 3 periods (Table 3). Sorting the descriptors in descending order, a few descriptors remain over the median for all three periods: autonomy, ethics, euthanasia and medical ethics. Thus, a delimited number of descriptors with relatively high scores are in focus for the whole period. It could be of some interest to understand how these relatively stable terms are related to one another and to other less central descriptors in terms of co-occurrence. For the whole period of 1993-2001, all descriptors that have relative high scores and one should keep in mind that eventually a body of varying concepts is not visualized.

In order to appreciate eventual changes over time, the set of descriptors was divided into 3 periods (Table 3). Sorting the descriptors in descending order, a few descriptors remain over the median for all three periods: autonomy, ethics, euthanasia and medical ethics. Thus, a delimited number of descriptors with relatively high scores are in focus for the whole period. It could be of some interest to understand how these relatively stable terms are related to one another and to other less central descriptors in terms of co-occurrence. For the whole period of 1993-2001, all descriptors that have relative high scores and one should keep in mind that eventually a body of varying concepts is not visualized.

In order to appreciate eventual changes over time, the set of descriptors was divided into 3 periods (Table 3). Sorting the descriptors in descending order, a few descriptors remain over the median for all three periods: autonomy, ethics, euthanasia and medical ethics. Thus, a delimited number of descriptors with relatively high scores are in focus for the whole period. It could be of some interest to understand how these relatively stable terms are related to one another and to other less central descriptors in terms of co-occurrence. For the whole period of 1993-2001, all descriptors that have relative high scores and one should keep in mind that eventually a body of varying concepts is not visualized.

In order to appreciate eventual changes over time, the set of descriptors was divided into 3 periods (Table 3). Sorting the descriptors in descending order, a few descriptors remain over the median for all three periods: autonomy, ethics, euthanasia and medical ethics. Thus, a delimited number of descriptors with relatively high scores are in focus for the whole period. It could be of some interest to understand how these relatively stable terms are related to one another and to other less central descriptors in terms of co-occurrence. For the whole period of 1993-2001, all descriptors that have relative high scores and one should keep in mind that eventually a body of varying concepts is not visualized.
Table 3
Descriptors, 1993-2001

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sums</td>
<td>Descriptors</td>
<td>Sums</td>
</tr>
<tr>
<td>3.8</td>
<td>Ethics</td>
<td>6.0</td>
</tr>
<tr>
<td>3.2</td>
<td>Euthanasia</td>
<td>4.5</td>
</tr>
<tr>
<td>2.3</td>
<td>Medical Ethics</td>
<td>2.0</td>
</tr>
<tr>
<td>2.2</td>
<td>Autonomy</td>
<td>2.0</td>
</tr>
<tr>
<td>2.2</td>
<td>Teaching Medical Ethics</td>
<td>2.0</td>
</tr>
<tr>
<td>1.9</td>
<td>Research</td>
<td>1.8</td>
</tr>
<tr>
<td>1.7</td>
<td>Medical Education</td>
<td>1.8</td>
</tr>
<tr>
<td>1.5</td>
<td>Bioethics</td>
<td>1.7</td>
</tr>
<tr>
<td>1.2</td>
<td>Persistent Vegetative State</td>
<td>1.5</td>
</tr>
<tr>
<td>1.2</td>
<td>Resource Allocation</td>
<td>1.5</td>
</tr>
<tr>
<td>1.1</td>
<td>Clinical Trials</td>
<td>1.1</td>
</tr>
<tr>
<td>1.0</td>
<td>Rationing</td>
<td>1.1</td>
</tr>
<tr>
<td>1.0</td>
<td>Ethics Committees</td>
<td>1.1</td>
</tr>
<tr>
<td>1.0</td>
<td>Human Experimentation</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>Authority</td>
<td>1.0</td>
</tr>
<tr>
<td>1.0</td>
<td>Abortion</td>
<td>1.0</td>
</tr>
<tr>
<td>0.9</td>
<td>Children</td>
<td>1.0</td>
</tr>
<tr>
<td>0.8</td>
<td>QALY</td>
<td>1.0</td>
</tr>
<tr>
<td>0.8</td>
<td>Death And Dying</td>
<td>0.9</td>
</tr>
<tr>
<td>0.8</td>
<td>Rights</td>
<td>0.9</td>
</tr>
<tr>
<td>0.8</td>
<td>Prenatal Diagnosis</td>
<td>0.9</td>
</tr>
<tr>
<td>0.8</td>
<td>Munchausen's Syndrome By Proxy</td>
<td>0.9</td>
</tr>
<tr>
<td>0.8</td>
<td>Covert Video Surveillance</td>
<td>0.9</td>
</tr>
<tr>
<td>0.7</td>
<td>Informed Consent</td>
<td>0.9</td>
</tr>
<tr>
<td>0.7</td>
<td>Psychiatric Ethics</td>
<td>0.8</td>
</tr>
<tr>
<td>0.7</td>
<td>Cardiopulmonary Resuscitation</td>
<td>0.8</td>
</tr>
<tr>
<td>0.7</td>
<td>Medical Role</td>
<td>0.8</td>
</tr>
<tr>
<td>0.7</td>
<td>Torture</td>
<td>0.7</td>
</tr>
<tr>
<td>0.7</td>
<td>Practical Reason</td>
<td>0.7</td>
</tr>
<tr>
<td>0.7</td>
<td>Medical Skills</td>
<td>0.7</td>
</tr>
</tbody>
</table>

Figure 4
The context of 'autonomy'

Note: 32 unique descriptor terms co-occurring once with autonomy excluded.
Figure 5
The context of 'euthanasia'
Note: 15 unique descriptor terms co-occurring once with euthanasia excluded.

Figure 6
The context of 'ethics'
Note: 32 unique descriptor terms co-occurring once with 'ethics' excluded.
Medical ethics: research themes and intellectual base / Bo Jarneving

**Figure 7**
The context of 'medical ethics'
Note: 26 unique descriptor terms co-occurring once with 'medical ethics' excluded.

**Figure 8**
Co-occurring descriptors, 1993-2001
Note: n=44, selection based on the frequency of occurrence.
terms occurring together with one of these terms are
computed, showing the context of each central descriptor
term (Figure 4-7). This gives us a detailed view of concepts,
not obtained by the mere counting of frequencies or
fractions. The descriptor autonomy can be seen in the
context of relationships between the professional provider
and the patient and religious aspects that affect treatment
as well as aspects concerning consent. Euthanasia has its
strongest relation with ethics, which indicates a basic
connection to a related subject domain, but has also
cognitive relations to terminal care, which reflects aspects
on hydration and nutrition of the terminal patient and the
process of dying. Ethics is foremost related to medical
ethics, which is seen in the connection to medical (which
seems rather redundant), and to euthanasia. The
connections to religion, justice, philosophy and genetics
indicate the use of the descriptor ethics in contexts that is
of great common concern for society. The descriptor
medical ethics (as well as its synonym bioethics) is, of
course, very general in this context but seems to relate
foremost to aspects of education and the remaining links
are dispersed to a variety of descriptors. Looking at all
descriptors above the cut-off point over all 3 periods, the
descriptors abortion, bioethics and informed consent can
be added to a set of descriptors that seem to remain stable
for the whole period. Using MDS, an overall view of term
relations could be visualized (Figure 8), but as there has to
be a limitation as to how many objects that can be contained
in a 'map' only the more frequent terms are included, which
means that a more complete comprehension of term
relations on a more detailed level requires several graphs
that display a majority of the terms relating to a certain,
selected term. Still, the map of co-occurring terms is
relatively easy to interpret as to central vs. peripheral
locations: autonomy, euthanasia, ethics and medical ethics
all hold central positions on the map in terms of having
several connections to more peripheral terms.

One could also look at the specific character of each
period (Table 3). The period 1993-1996 includes a focus
on medical ethics as a subject and the teaching of medical
ethics. During 1996-1998 consent and informed consent
and the question of patient autonomy in the context of
blood-refusal is debated. The debate on blood-refusal as
well as the debate on consent and informed consent is
continued in 1999-2001 and a group of new concepts that
seemingly seem to cohere, at least intellectually, emerge:
cloning, eugenics, genetic testing and genetics. In the same
context there is an emphasis on ethics committees and
research ethics. On the whole, it is hard to decide on a
specific character for each period, but obviously there is a
difference between the periods as to the emphasis of subject
content in their articles. Conclusively, this analysis approach
gives insights into which major concepts, as reflected by
the use and combination of descriptor terms, that have a
central meaning to the field.

3.4 The intellectual base of Journal of Medical Ethics,
1993-2001

3.4.1 Document types and journals

The intellectual base of the Journal of Medical
Ethics is constituted of a total of 7412 unique references.
In order to reflect the distribution of citations to the more
cited items, citations to non-journal items as well as to
journal articles were counted and a rank ordered listing
was produced to show the top journals as well as the top
non-journal items cited (Table 4). Not surprisingly, most
of the journal articles cited at least 4 times are from the
Journal of Medical Ethics and 37% of the citations to
articles are self-citations at journal level. In all, 28 % of
the citations to items cited at least 4 times are directed to
non-journal items and 72% to journal articles. As for the
total number of citations, 2875 or 3970 are to non-journals.
This means that the intellectual base of the Journal of
Medical Ethics, to a greater extent, can be traced to journal
articles and, to a lesser extent, to books. In order to get a
general view of the citations to journals, the total
distribution of citations to journals was calculated (Table
5). Comparing Table 4 and Table 5 as to the 10 top positions
one can see that two new journals have entered in Table 5:
Hastings Center Report, which is a genuine medical ethics
journal, and Social Science and Medicine. The two journals
that lost their prominent more positions were the Journal
of Clinical Ethics and the Journal of the Royal College of
Physicians of London. In all, the dominance of journals
not exclusively focusing on medical ethics is obvious.
### Table 4
The rank order of journal articles & non-journal items

Note: The rank order is based on the distribution of citations to items cited at least 4 times by documents in the Journal of Medical Ethics, 1993-2001. Journal articles are merged to the journal in which they are published.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Journals</th>
<th>Rank</th>
<th>Non-journals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Journal of Medical Ethics</td>
<td>1</td>
<td>Beauchamp TL, 1994, Principles Biomedica</td>
</tr>
<tr>
<td>3</td>
<td>British Medical Journal</td>
<td>3</td>
<td>British Medical Association, 1999, Withholding and withdrawing life-prolonging medical treatment</td>
</tr>
<tr>
<td>4</td>
<td>Annals of Internal Medicine</td>
<td>4</td>
<td>Parfit D, 1984, Reasons and persons</td>
</tr>
<tr>
<td>6</td>
<td>Archives of Internal Medicine</td>
<td>6</td>
<td>Duster T, 1990, Backdoor eugenics</td>
</tr>
<tr>
<td>7</td>
<td>Academic Medicine</td>
<td>7</td>
<td>Gillon R, 1994, Principles of health care ethics</td>
</tr>
<tr>
<td>8</td>
<td>Journal of Clinical Ethics</td>
<td>8</td>
<td>Buchanan AE, 1999, Deciding for others</td>
</tr>
<tr>
<td>9</td>
<td>Journal of the Royal College of Physicians of London</td>
<td>9</td>
<td>Gilligan C, 1982, In a different voice</td>
</tr>
<tr>
<td>10</td>
<td>Lancet</td>
<td>10</td>
<td>The Royal College of Physicians, 1990, Guidelines on the practice of ethics committees in medical research involving human subjects</td>
</tr>
</tbody>
</table>

### Table 5
The distribution of citations to journals cited by documents published in Journal of Medical Ethics, 1993-2001

Note: Only journals cited at least 30 times shown.

<table>
<thead>
<tr>
<th># citations</th>
<th>Journal title</th>
</tr>
</thead>
<tbody>
<tr>
<td>465</td>
<td>Journal of Medical Ethics</td>
</tr>
<tr>
<td>334</td>
<td>British Medical Journal</td>
</tr>
<tr>
<td>222</td>
<td>New England Journal of Medicine</td>
</tr>
<tr>
<td>190</td>
<td>Journal of the American Medical Association</td>
</tr>
<tr>
<td>131</td>
<td>Lancet</td>
</tr>
<tr>
<td>128</td>
<td>Hastings Center Report</td>
</tr>
<tr>
<td>97</td>
<td>Archives of Internal Medicine</td>
</tr>
<tr>
<td>71</td>
<td>Annals of Internal Medicine</td>
</tr>
<tr>
<td>50</td>
<td>Social Science and Medicine</td>
</tr>
<tr>
<td>49</td>
<td>Academic Medicine</td>
</tr>
<tr>
<td>46</td>
<td>Medical Journal of Australia</td>
</tr>
<tr>
<td>45</td>
<td>Journal of The American Geriatrics Society</td>
</tr>
<tr>
<td>42</td>
<td>Bioethics</td>
</tr>
<tr>
<td>40</td>
<td>Journal of Medicine and Philosophy</td>
</tr>
<tr>
<td>39</td>
<td>Pediatrics</td>
</tr>
<tr>
<td>34</td>
<td>Journal of Clinical Ethics</td>
</tr>
<tr>
<td>33</td>
<td>Medical Education</td>
</tr>
<tr>
<td>31</td>
<td>Critical Care Medicine</td>
</tr>
<tr>
<td>30</td>
<td>Journal of the Royal College of Physicians of London</td>
</tr>
</tbody>
</table>
It can be of interest not only to know about the degree of visibility or use reflected by the number of citations received by journals, but also to reflect the structure of the intellectual base on journal level and appreciate the whole pattern of relations between journals cited by *Journal of Medical Ethics*. In order to accomplish this, a journal cocitation map, based on the number of times that journals in the reference lists of documents from the *Journal of Medical Ethics* co-occur, was produced by means of MDS (Figure 9). The relations between journals and the spatial configuration of the map could be viewed in a center-periphery manner: in the center, a core is constituted by the most cited journals and corresponds well with the listing of highly cited journals in Table 5, while less cited journals are located in the periphery. Peripheral journals in this context represent a wide spectrum of journals focused on different aspects of medical research: cardiovascular & respiratory diseases, critical care, emergency medicine, genetics, geriatrics, internal medicine, obstetrics and pediatrics. Other fields of research present in the periphery are nursing science and philosophy, medical education and law medicine. To conclude, it is obvious that a few, highly cited journals from the field of medical ethics as well as a few journals with a general medical focus construct the core. An additional number of journals on medical ethics like *Bulletin of Medical Ethics*, *Bioethics*, *Cambridge Quarterly Healthcare Ethics* and *Kennedy Institute of Ethics Journal* are quite distant from the core and thus more seldom co-cited with journals of the same. The circle size is proportional to the number of citations.
received by a journal and the width of connecting lines to the co-citation strength. Journal titles are abbreviated.

3.4.2 The cluster structure of the intellectual base

The distribution of citations by cited documents is extremely skewed and 93% of all references are cited only once (Figure 10). As all documents are not of the same importance, or at least, not used or made visible to the same extent, some citation threshold for inclusion in the analysis has to be decided on.

In this case all documents cited at least 4 times were included, constituting a set of 55 documents. The resulting clustering produced 6 clusters, containing 53 documents, which are represented with the number of objects per cluster, the median publication year and number of citing documents. The objects in the clusters are presented with author name, publication year, volume number, starting page, abbreviated journal title, number of citations and, at the end, the number of times they appear as one of the parts of the links forming the clusters. In order to interpret and label the clusters, all documents citing a particular cluster are collected and titles, abstracts, identifiers and descriptors are studied. Thus, the labeling of clusters is based on the content of the citing documents. However, it seems valid, to a certain extent, that there should be a resemblance between the subject content of the cited documents and the subject content of the citing documents.

Looking at the literature that authors in the *Journal of Medical Ethics* refer to, the publication period of the analyzed items has no limitation. Certainly, an author can refer to any document he or she sees as pertinent regardless of its age. Nevertheless, a publication seems to lose interest for readers the older they are and more recent publications are usually more visible through their use as reflected by citations received. In accordance with this notion, the mean *median publication year* is 1994, which means that relatively recent publications are among the more cited documents selected.

Scanning the labels of these clusters, it is obvious that the subject content of the intellectual base does not diverge radically from the content of clusters based on the citing documents in section 3.1 and 3.2. As far as the authors of the *Journal of Medical Ethics* base their articles on previous knowledge and results contained in their referenced publications, this should to some extent be reflected in the subject content of their own articles as well.

---

12 This is certainly the case for the literature of science whereas the social sciences and arts & humanities have a different aging scheme.
as in their titles and assigned key words. Nevertheless, new themes can be seen to emerge, where referenced items are seen in a new light and linked together in new combinations by the way they are cocited. The subject-content dimension is rather clear: clinical aspects of medical ethics are reflected by cluster 1, 2, 4 and 5, while a more general theme of ethics in connection with education is reflected by cluster 3, which also is the largest cluster.

Using MDS, it is possible to reflect the interrelations between clusters by counting the number of times that documents of clusters are cocited with documents of other clusters (Figure 11). As there are differences in the number of objects in each cluster, the mean cocitation strength between clusters is calculated as presented in section 2.1. The most related clusters are cluster 5 and cluster 6 and apparently, as indicated by similar labels, they focus on similar research topics and it is in fact not unlikely that they are part of the same 'speciality' of medical ethics research. Proportionally, they seem to be equally cited and the median publication year is about the same. Thus, the concept of autonomy is connected to the concept of life-death decisions and through cluster 3 connected to aspects of education and ethical principles. The latter cluster has the most central position indicating that aspects of ethics and education are connected to several themes of medical ethics. Cluster 1 - Clinical- and Research Ethics Committees - have weak connections to cluster 5 and 6 but is more related to cluster 3 - Ethical Principles in Health Care and Teaching Ethics. Cluster 2, Patient Autonomy - Transfusion-free Treatment- is the 'youngest' cluster and has its only connection with cluster 5, connecting the concept of autonomy in the context of transfusion-free treatment with autonomy in the context of life death decisions. Cluster 4 reflects a delimited aspect of medical ethics research and is not connected to any other cluster.

Obviously, the time factor has some importance as to how documents cohere in terms of being cocited and the connection of a certain aspect of research with another is to some extent due to this time factor and possibly both size and connections to other clusters will increase with time for a 'young' cluster reflecting a relatively new research theme.

Cluster 1
Clinical- and Research Ethics Committees
(N=9, median publication year=1995, number of citing documents=22)

Cluster 2
Patient Autonomy - Transfusion-free Treatment
(N=3, median publication year=1998, number of citing documents=6)

Cluster 3
Ethical Principles in Health Care and Teaching Ethics
(N=15, median publication year=1990, number of citing documents=49)
Sulmasy DP, 1990, V150, P2509, Arch Intern Med/4/1; Gillon R, 1994, Principles Hlth Care/4/1
Cluster 4
Covert Video Surveillance
(N=3, median publication year=1995, number of citing documents=6)

Cluster 5
Autonomy and Life-Death Decisions
(N=14, median publication year=1991, number of citing documents=51)

Cluster 6
Life-Death Decisions
(N=8, median publication year=1990, number of citing documents=25)

Figure 11
Interrelations between cocitation-clusters

Note: Circle sizes are proportional to the number of objects in clusters and width of lines to the average cocitation-strength between clusters.

Medical ethics: research themes and intellectual base / Bo Jarneving

CluA(1), Clinical- and Research Ethics Committees; (N=9, median publication year=1995, number of citing documents=22)

CluB(2), Patient Autonomy – Transfusion-free Treatment; (N=3, median publication year=1998, number of citing documents=6)

CluC(3), Ethical Principles in Health Care and Teaching Ethics; (N=15, median publication year=1990, number of citing documents=49)

[Cluster 4, Covert Video Surveillance; (N=3, median publication year=1995, number of citing documents=6). No documents of cluster 4 is cocited with any documents of the other clusters.]

CluE(5), Autonomy and Life-Death Decisions; (N=14, median publication year=1991, number of citing documents=51)

CluF(6), Life-Death Decisions; (N=8, median publication year=1990, number of citing documents=25)

4. DISCUSSION AND SUMMARY

Based on the assumption that the Journal of Medical Ethics is a prominent representative for the field of medical ethics, the object of this paper has been to examine if its content can reflect the intellectual structure of the field. It was found that core journals in the journal cocitation structure comprised several journals not explicitly focused on medical ethics. It is not clear to what extent cited publications in these journals focus on mere medical ethics issues or on medical-clinical issues. Furthermore, a number of journals with a clear emphasis on medical ethics were found to be cited to a lesser extent by the Journal of Medical Ethics. Therefore, the result is indicative and not an exhaustive reflection of all possible research foci in the field.

Concerning the description of subject content, a number of research foci or research themes have been identified. Educational aspects and ethical principles is a pronounced theme of the intellectual base, represented by the largest and most central cluster. Autonomy and ethical aspects of life-death decisions is another pronounced theme and so is medical research ethics in a clinical context. Other more peripheral and delimited foci concern blood transfusion in a religious context, and covert surveillance.

The analysis of documents linked by bibliographic coupling visualized clinical aspects of medical ethics through clusters dealing with ethical problems of resuscitation and nutrition at the terminal stage. The largest cluster is concerned with issues about the ethical principles of 'care and ethics education'. The ethics of medical research and patient autonomy were two additional themes.

Clustering documents that cite or are cited by other documents in the Journal of Medical Ethics during the period 1993-2001, the objective was to see how research themes are formed around the top-cited documents of this particular journal and thus reflect this journals’ internal, formal communication. The research themes were in large found to be similar to those found in clusters based on bibliographic coupling, though a few new research themes emerged.

The analysis of words gave insights into which major concepts that have a central meaning to the field, reflecting the use and combination of descriptor terms. Autonomy, ethics, euthanasia and medical ethics were found to be used frequently over 3 consecutive periods. The context of these terms was analyzed as to co-occurrence with other terms and provided a more detailed understanding of each term. A general view of term relations by means of MDS based on co-occurrences further ascertained the cognitive context of more frequent descriptor terms. Over the time period of this investigation a few terms have remained stable and a large share of low frequency descriptors indicate difficulties in describing the research structure on this basis.
REFERENCES


