Papers

Have declining clinical necropsy rates reduced the contribution of necropsy to medical research?

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Abstract

Aims—To examine trends in necropsy based research output for a period of 27 years during which there has been a progressive decline in clinical necropsy rates.

Methods—The numbers of necropsy based research papers published between 1966 and 1993 were determined using the CD-Plus Medline computed literature database.

Results—The number of necropsy based research papers containing necropsy or a synonym in the title increased by 220% between 1966 and 1993. When papers including necropsy or a synonym in the abstract, but not in the title, were included, the proportion of all indexed papers increased from 0.35% in 1975, when abstracts were first included, to 0.53% in 1993. Analysis of the subject material indicated that necropsy based research has constantly reflected trends and advances in clinical medicine. Neuroscience related research represented the largest subject category which may reflect the difficulties in obtaining human tissue from sources other than necropsy.

Conclusions—The modern necropsy continues to provide valuable information for all clinical and laboratory based disciplines. The decline in clinical necropsy rates would not yet appear to have undermined the contribution of the necropsy to research.

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Keywords: Necropsy, necropsy rates, research.

The numbers of clinical necropsies performed after obtaining a relative's permission have been in decline for several decades despite the accepted benefits of necropsies to medicine and society.¹⁻³ The clinical necropsy rate in England and Wales has fallen from 8.9% of all deaths in 1966 to just 1.7% in 1991.^{4,5} These figures represent a reduction in the actual numbers of clinical necropsies by 80%, from 50 045 in 1966 to 10 099 in 1991.

The effects of this established trend on necropsy based research output and the possible implications for the provision of material for future research applications have not been investigated in any detail. No formal measurements of the use of necropsy derived

material in research programmes are available to support suggestions that research activities can and will be compromised by declining clinical necropsy rates.^{3,6}

The present complacency may be a consequence of the vast increase in the amount of published scientific data, known as the information explosion, which has occurred in all areas of science.⁷ In an earlier study we demonstrated this phenomenon in histopathology using a computed literature database which facilitates faster and more objective searches than manual searches of printed listings of published papers.⁸ This study uses a similar computed literature database to examine the trends in necropsy based research output within an established background of declining clinical necropsy rates.

Methods

Multiple searches were performed on the CD-Plus system (CD Plus Inc., New York, USA) which utilises information coded on compact discs in a read-only form (CD-ROM). The Medline literature database was used which includes papers listed in *Index Medicus*, the *Index to Dental Literature* and the *International Nursing Index*.

The search strategy used in the study was designed to select all papers in which the title or abstract included one of the terms autopsy, necropsy or postmortem in either single or plural form. The searches were limited to papers published in English and those dealing with human material. Other non-pathological uses of necropsy synonyms—for example, the psychological autopsy, were excluded by the search strategy. All years between 1966 and 1993 were included in the study. No information was available before 1966. The trends in the annual numbers of published papers containing necropsy or a synonym in the title were examined in the context of the total number of papers published in each year between 1966 and 1993. This method was used in order to take account of the known increase in the number of indexed journals in the Medline literature database between 1966 and 1993. A similar method was used to examine the trends in the annual numbers of published papers containing necropsy or a synonym in the title or abstract, or both, after 1975 when abstracts were first included in the Medline literature database.

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Figure 1 The proportion of all indexed papers in the Medline literature database which contain necropsy or a synonym in the title 1966–1993.

Figure 2 The proportion of all indexed papers in the Medline literature database which contain necropsy or a synonym in the title or abstract, or both, 1975–1993.

Table 1 The five largest subject categories within the total number of papers published between 1966 and 1993 containing necropsy or a synonym in the title

Subject category	Papers with necropsy or a synonym in title (%)
Neuroscience (including ophthalmology)	18.3
Cardiovascular system	16.6
The necropsy	13.9
Oncology (all sites)	11.7
Haematology	8.8
Respiratory system	6.9

All papers which included necropsy or a synonym in the title were read in the form available within the Medline literature database and assigned to one or more individual subject categories based on systematic pathology. No attempt was made to determine the value or the quality of the research work undertaken. Those papers which included necropsy or a synonym in the abstract only were excluded from this analysis for two reasons: (1) no abstracts were included in the database until 1975

and therefore measurements of research output which contained those published papers including necropsy or a synonym in the abstract only would not have been comparable for the periods before and after this date; (2) nearly 17 000 papers were published after 1975 which included necropsy or a synonym in the abstract only. Such large numbers of papers prevented detailed analysis.

The trends in annual publication figures for these individual subject categories were studied and the proportion of these papers represented by case reports based on two or less cases was recorded separately.

Results

The numbers of necropsy based research papers containing necropsy or a synonym in the title increased by 220% between 1966 and 1993. Although the total number of indexed papers available on the database also increased by 170% over the same period, the proportion of all indexed papers in the database represented by necropsy based research papers showed no evident decline (fig 1). When papers including necropsy or a synonym in the abstract, but not in the title, were also included the proportion of all indexed papers increased from 0.35% in 1975, when abstracts were first included, to 0.53% in 1993 (fig 2). The number of necropsy based research papers increased by 186% over the same period when these papers were included.

The subject analysis of papers including a synonym for necropsy in the title included a total of 4899 papers which represented 23% of all necropsy based research papers published between 1966 and 1993. Only the main results will be discussed and these are presented in tables 1 and 2. The largest subject category was neuroscience which included ophthalmology and represented 18.3% of all published papers (table 1). Papers relating to the necropsy itself represented the third largest category (13.9% of all papers). The trends in publications relating to recently described conditions were examined in order to assess the continuing relevance of necropsy and the figures for HIV related diseases are given in table 2 as an example. The proportion of published papers represented by case reports based on just one or two cases decreased from 29% in 1966 to 14% in 1993 (table 2).

Discussion

The observed increase in the total numbers of indexed papers in the database between 1966

Table 2 Annual totals of published papers containing necropsy or a synonym in the title. Annual totals for case reports and selected subject categories within the latter group are also shown

Year	Total numbers of papers with necropsy or synonym in abstract only*	Total numbers of papers with necropsy or synonym in title	Total numbers of case reports with necropsy or synonym in title	Numbers of papers in neuroscience category	Numbers of papers in necropsy category	Numbers of papers in HIV related disease category
1966	NA	100	29	13	13	0
1970	NA	124	31	17	16	0
1975	721	131	24	24	21	0
1978	794	164	43	31	21	0
1982	924	146	26	26	22	0
1986	1295	249	48	61	34	2
1990	1569	296	50	73	41	11
1993	1363	220	30	64	39	15

* Figures not available on Medline literature database before 1975.

and 1993 provides further confirmation of the continuing information explosion which is occurring within world scientific literature. The numbers of research papers based on necropsy material also increased over the same period and the proportion of all papers represented by necropsy based research papers including necropsy or a synonym in the title increased between 1966 and 1993. These findings suggest that necropsy based research output, as measured by the numbers of published papers, has actually increased during the last 30 years despite the decline in clinical necropsy rates over the same period. The present assessment may represent a considerable underestimate of necropsy based research output because the Medline database is estimated to contain only 40% of the world medical literature.⁹

Our analysis of the subject material of necropsy based research output indicates that this research has continued to reflect the trends and advances in clinical practice. Many of the modern concepts of disease and health were developed from detailed observations collected from many necropsies. Although the rate at which new diseases and conditions have appeared has slowed in recent decades, the contribution of necropsies to the clarification, discovery and treatment of these conditions has been significant.¹⁰ Current examples would include HIV related diseases and organ transplantation.

The commonest groups of diagnoses at necropsy are cardiac, pulmonary and malignancy¹⁵ and yet the largest subject category of research papers based on necropsies was represented by neuroscience subjects. This observation may reflect the difficulties of obtaining appropriate human tissues from sources other than necropsies. The observation that a large proportion of papers relate to the necropsy examination itself provides confirmation of the critical evaluation of role of necropsy which has occurred in the face of the persistent decline in clinical necropsy rates. Many of these papers relate to technical aspects of the necropsy and reflect the continuing evolution of the necropsy which is essential if it is to meet the ever changing requirements of modern clinical and research practice.

Many participants in medical research, particularly those in clinical disciplines and non-medically qualified scientists, are often unaware of the potential for research material derived from necropsies.^{6,11} Whilst there are definite limitations to the application of certain modern techniques to necropsy material, many can be applied to fresh or archival necropsy derived tissues. This material can be collected in a cost-effective manner and could be linked to appropriate information stored in a necropsy data bank.¹²⁻¹⁴ The challenge for pathologists is to convince others engaged in medical research that necropsies can still provide valuable material and information. Many expensive clinical trials of therapeutic regimens used in the treatment of a variety of cancer types have been designed without reference to necropsies¹⁰ and large prospective studies of other conditions often do not include necropsy as an integral

part of outcome evaluation. The low necropsy rates in such research must surely change and the clinical interest in necropsies revived through clear demonstrations of the usefulness of the information provided by necropsy.

The reciprocal changes in clinical and medicolegal necropsy rates observed in recent years mean that the medicolegal necropsy is now the major component of necropsy practice in many teaching centres.² If this trend continues then the availability of reports and material from these necropsies could become critically important for research purposes, particularly when there is requirement for large series of cases. The complete loss of clinical necropsies is unlikely in the foreseeable future. A minimal level of activity will persist in larger teaching centres where many researchers remain unaware of the legal constraints which currently prevent the retention of tissues from medicolegal necropsies and therefore limit the scientific value of these necropsies.

How much further clinical necropsy rates can decline without compromising the ability of the necropsy to provide its invaluable services to medical research and clinical practice remains to be seen. The time for active promotion of the role of necropsy in research must be now while the level of necropsy based research activity remains high and the necropsy continues to make an important contribution to modern medicine. The sceptical conclusion from this study would be that declining necropsy rates have not yet affected research output or the contribution of necropsy to clinical practice and therefore do not matter. A more realistic conclusion would be to reflect on the amount of information and opportunity which have already been lost through the decline in clinical necropsy rates and to acknowledge that for many areas of research there is never likely to be a comparable source of material.

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