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# Editorial

## The Autopsy in Clinical Medicine

The autopsy has contributed substantially to clinical medicine in at least five distinct areas—pathophysiologic understanding of disease, medical education, epidemiology, organ transplantation, and quality assurance.

By correlating premortem and postmortem findings, autopsies have long furthered our understanding of disease and the effects of treatment. In the 19th century, for example, postmortem examinations conducted by Virchow and Osler provided the basis for our current understanding of diseases such as pulmonary embolism and endocarditis.<sup>1</sup> In the 1980s, autopsies continue to advance knowledge of diseases such as acquired immunodeficiency syndrome (AIDS).<sup>2</sup> Autopsies have also played an important part in the education of medical students and postgraduate physicians. Although the requirement that medical students participate in large numbers of autopsies has lapsed since the 1940s, postmortem examinations remain a central part of training in the field of pathology and have considerable potential for improving the training of all clinicians.<sup>3</sup> In the epidemiologic study of disease, autopsies provide a measure of the accuracy of death certificates;<sup>4</sup> in addition, they are the basis for a rigorous epidemiologic method for estimating the prevalence of specific diseases in a population.<sup>5</sup> In recent times, routine postmortem examination has also provided some tissues for transplantation, such as corneas.

Finally, autopsies are essential to quality assurance because they establish a standard for diagnostic accuracy and therapeutic effective-

ness. This point is especially important in the current debate over the value of autopsies. Although modern medical technology is commonly thought to have reduced diagnostic errors and, therefore, the need for postmortem examination, a review that encompassed more than 50,000 autopsies found that the accuracy of clinical diagnosis of 11 specific diseases did not improve from 1930 to 1977.<sup>6</sup> Several recent studies have found that the yield from autopsies remains high. Autopsies consistently detect major unexpected findings whose premortem diagnosis would probably have improved survival in 5 to 10% of cases; other major unexpected findings are identified in an additional 10% of cases.<sup>1,7-10</sup>

Despite these contributions, autopsy rates have plummeted from 50% in the 1940s to 14% in 1985.<sup>11,12</sup> The decrease in autopsy rates might be considered inconsequential because many of the contributions of autopsies could be sustained by high rates at selected institutions that focus on research and education. This view is shortsighted, however. The autopsy has universal value in monitoring the quality of medical care. Recognition of this worth has led to a strong national consensus that high rates are needed at all institutions.<sup>1,13,14</sup> In their two articles in this issue of the *Proceedings* (pages 1055 and 1065), Nemetz and colleagues support this view.

Several factors have been blamed for the decline in autopsy rates. Among these factors are the common but mistaken belief that the diagnostic yield of autopsies has decreased, the fear of malpractice litigation arising from autopsy findings, the lack of financial and professional incentives to perform autopsies, the elimination in 1970 of the recommendation from the Joint Commission for Accreditation of Hospitals for a 20% autopsy rate in hospitals, the decreased emphasis on the autopsy in formal undergraduate and postgraduate medical education, the general trend of research away from pathologic anatomy, and the difficulty in obtaining consent for autopsy.<sup>3,15</sup>

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Nevertheless, few actual data are available to account for the decline in autopsy rates. A few facts have been documented previously: physicians sometimes fail to request permission for autopsy, and families may object to autopsy;<sup>16</sup> in addition, autopsy rates are consistently higher for men, young persons, and medical examiner cases.<sup>17,18</sup> These factors alone, however, probably do not explain the decrease in autopsy rates.

In this issue of the *Proceedings*, Nemetz and colleagues advance our understanding of factors related to the change in autopsy rates from 1935 to 1985. Their population-based study from Olmsted County provides the first data about autopsy rates in one geographic area over time. Several findings in this study deserve comment.

First, autopsy rates for residents of Olmsted County are atypical. Nationally, autopsy rates steadily declined from 50% in the 1940s to 14% at present; in contrast, autopsy rates in Olmsted County increased from 33% in 1940 to 63% in 1970—and declined sharply thereafter. The generally high autopsy rates in Olmsted County probably reflect the influence of the Mayo Clinic, which has a written policy that complete post-mortem examination is to be requested in all cases. Despite this difference in autopsy rates, most of the other findings reported by Nemetz and associates are probably representative of the national experience.

Second, throughout the study period, autopsies in patients 65 years of age or older were performed approximately half as often as in younger patients. This finding extends the observations of other studies that were conducted for shorter periods and found similar declines in autopsy rates in patients older than 30 years of age.<sup>17,18</sup> Of note, the recent decline in Olmsted County autopsy rates was limited to adult patients. In patients younger than 20 years of age, autopsy rates remained at more than 50%; this difference may reflect a greater proportion of medical examiner cases or a greater interest in postmortem examination among pediatricians and parents of young children.

Third, as others have found,<sup>17,18</sup> autopsy rates were generally higher among male than among female patients. Interestingly, in Olm-

sted County, the difference was limited to certain age groups. Autopsies were performed significantly more frequently in male than in female patients only for those 35 to 64 years of age and those 85 years of age or older. If these age-related differences in autopsy rates for male and female patients persist over time and are confirmed in other settings, they deserve further exploration.

Finally and most interestingly, Nemetz and colleagues show that the change in Olmsted County autopsy rates from 1940 to 1984 was associated with an increase in the proportion of deaths that occurred in nursing homes, which had lower autopsy rates than did hospitals. In 1940, less than 1% of deaths of Olmsted County residents occurred in nursing homes (autopsy rate, 0%), 34% of deaths occurred in hospitals (autopsy rate, 63%), and 66% of deaths occurred at home or elsewhere (autopsy rate, 18%). In contrast, in 1984, 29% of deaths occurred in nursing homes (autopsy rate, 14%), 45% of deaths occurred in hospitals (autopsy rate, 46%), and 25% of deaths occurred at home or elsewhere (autopsy rate, 54%). Thus, between 1940 and 1984, the proportion of deaths occurring in nursing homes increased greatly, the proportion of deaths in hospitals increased moderately, and the proportion of deaths at home decreased considerably. During this period, autopsy rates remained low in nursing homes and high in hospitals; autopsy rates for deaths at home increased, probably because an increasing number of deaths from chronic diseases occurred in nursing homes.

These findings extend those of earlier population-based studies<sup>17,18</sup> by providing evidence that the age- and sex-related differences in autopsy rates have persisted for 50 years; they also substantiate the increasing proportion of deaths occurring in nursing homes, with their attendant low autopsy rates. From 1940 to 1984, however, Olmsted County autopsy rates changed relatively little—in distinct contrast to the rest of the United States. Furthermore, the low autopsy rate in nursing homes was counterbalanced by an increasing autopsy rate for deaths at home.

What is the explanation for the temporal and demographic variations in autopsy rates found by Nemetz and colleagues? We are unaware of data that explain differences in autopsy rates on the basis of age, gender, or place of death. Information from Nemetz and co-workers and from another study group<sup>17</sup> show that the lower autopsy rates for women are not explained solely by the fact that women die at an older age. Some of the variations in autopsy rates related to age, sex, and place of death are attributable to the fact that medical examiner cases (for which autopsy rates are high) often involve young male patients who die outside of hospitals. Nonetheless, the number of medical examiner cases is too small to explain the differences fully, and even among medical examiner cases, the autopsy rate decreases with advancing age.<sup>17</sup>

The behavioral and attitudinal factors that have been blamed for the decrease in autopsy rates probably also explain other variations in autopsy rates among different patient groups. If autopsy rates are to be increased, this possibility should be studied, the relative importance of these factors determined, and methods to counter their effects developed. For example, inaccurate beliefs about the value of autopsy on the part of both physicians and families may be especially important and readily influenced by education.

Should autopsy rates be increased uniformly across the United States? We agree with Nemetz and associates and others<sup>13,14</sup> that they should. It must be recognized, however, that much more research is needed to substantiate—or disprove—this belief.

Several studies have shown that autopsies identify an unexpected cause of death in approximately 20% of cases; in half these cases, correct premortem diagnosis would probably have prolonged survival.<sup>1,8-10</sup> These findings have been consistent over time and in hospitals with widely varying autopsy rates. Furthermore, neither physicians nor clinical findings are able to identify reliably those autopsies that are likely to have high yields. Thus, the case that autopsy rates should be higher than 10%—preferably in the 25 to 50% range—can be made most strongly for patients dying in the hospital, but

insufficient data are available to prescribe the most cost-effective autopsy rate.

The diagnostic yield of autopsy has not been established in other rapidly growing groups, such as the very old and those dying in nursing homes. Prospective studies of the yield of autopsy in these groups are needed.

Surprisingly, no available data have substantiated the widespread belief that autopsies lead to improvements in patient care. Although the yield of autopsies in hospital deaths is impressive, we agree with King<sup>19</sup> that, "It is a grave disservice to confuse the performance of autopsies with the spark of insight which the autopsy may trigger." It is critical to determine whether autopsies can be used systematically both to measure and to improve the quality of medical care.<sup>1</sup> Furthermore, the cost-effectiveness of autopsies should be scrutinized with the same scientific rigor as is needed in using the autopsy itself to monitor the quality of medical practice. Promising areas for current research include assessment of limited goal-directed autopsies and attempts to evaluate circumstances in which the autopsy may have an especially high or low yield for new information.

We believe that six steps are especially important for improving the clinical contributions of autopsies (Table 1). Bias in the selection of cases for autopsy would be decreased by higher autopsy rates and could be eliminated by including a random sample of cases in which autopsies would not be routinely performed. Because physicians often have difficulties in requesting and obtaining consent for autopsy,<sup>16</sup> concerted institutional efforts and the use of "autopsy advocates" with special training in obtaining permission in a sensitive manner might be effective.<sup>1</sup> Fair reimbursement for the professional and institutional costs of performing autopsies is needed. The cost-effectiveness of autopsies should be evaluated, and national standards for reimbursement should be established. We believe that third-party payers should recognize the cost of autopsies as a necessary investment for measuring and maintaining quality, not just an expense for research or education.<sup>1</sup> For improving the comparability of autopsy findings

among institutions, a standard method for classifying unexpected findings should be developed. We have defined four classes of unexpected autopsy findings that provide a sound, clinically relevant, easily adapted basis for reports.<sup>1,8-10</sup> Systematic use of this or another reasonable classification method would be especially useful in assessment of quality. Finally, systems to provide feedback and act on autopsy information should be developed and evaluated. Clinicians should be informed of autopsy findings within a few days after death, and major unexpected findings should be discussed at regular departmental meetings. Interventions should focus on strategies to reduce rates of treatable major unexpected findings, with an emphasis on improving the performance of physician groups.

The contributions of the autopsy to clinical medicine are threatened by the decline in autopsy rates noted by Nemetz and others. While steps are taken to increase autopsy rates, further studies are needed to determine the cost-effectiveness of the autopsy and its yield in growing demographic groups, such as the very old and those dying in nursing homes. Most importantly, methods for integrating autopsy findings into quality-assurance programs and using them to improve the quality of care must be developed and rigorously evaluated.

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Table 1.—Proposed Steps To Enhance the Contributions of Autopsy to Clinical Medicine

1. Develop methods to minimize bias in the selection of cases for autopsy
2. Improve the process of obtaining consent for autopsy
3. Pay the cost of performing autopsies
4. Standardize the method for classifying unexpected autopsy findings
5. Integrate autopsy findings into educational feedback systems
6. Institute research to determine the yield and cost-effectiveness of the autopsy in specific clinical situations

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