

Innocent Prattle

IN this issue of ANESTHESIOLOGY, Dr. Li *et al.*¹ from the Department of Anesthesiology at the Columbia University College of Physicians and Surgeons in New York introduce new methodology to examine the epidemiologic patterns of anesthesia-related deaths at the national level. Specifically, they used *International Classification of Diseases*, 10th Revision (ICD-10) codes to identify anesthesia-related deaths from the multiple-cause-of-death data files maintained by the National Center for Health Statistics for the years 1999–2005. Death rates from anesthesia complications were then calculated based on population data and hospital surgical discharge data. The authors found that the number of anesthesia-related deaths averaged 316 per year and the number of deaths with an anesthesia complication as the underlying cause averaged 34 per year. They then concluded that the results of their study suggest that the United States has experienced a 97% decrease in the anesthesia-related death rate since the late 1940s and that 46.6% of anesthesia-related deaths are attributable to overdose of anesthetics and 42.5% are attributable to adverse effects of anesthetics in therapeutic use.

The authors' discussion focuses on the limitations of their methodology, including the sensitivity and specificity of the ICD-10 codes, validity and reliability of the multiple-cause-of-death data, and potential bias in both the denominator and numerator data. In terms of sensitivity, the authors state that "the anesthesia safety indicators developed in this study are based on a limited number of ICD-10 codes," which are likely to capture only the tip of the iceberg of all relevant complications and adverse events. So let us take a look at what might lie below the surface. Lagasse² has reported anesthesia-related mortality rates, defined as a death within 48 h of a procedure in which human error by the anesthetist contributed to the death, of 1:12,641 (0.79 per 10,000 anesthetics) and 1:13,322 (0.75 per 10,000 anesthetics) in two hospital networks from 1992 to 1994 and from 1995 to 1999, respectively. Because many investigators of anesthesia-related mortality want to say that there has been a steady decline in the rate since 1940, I will add that the anesthesia-related mortality rate, as previously defined, was 1:14,282 between 1999 and 2005 at the latter hospital network where 199,961 anesthetics were

performed. So, either my hospital network produced almost 6% of the anesthesia-related deaths in this country between 1999 and 2005 or there is a problem with the sensitivity of ICD-10 codes.

In all fairness, it is inappropriate for me to draw conclusions by comparing my hospital data to the current study by Dr. Li *et al.* to suggest that their data are in error. We used different methodologies to measure different rates. Similarly, it is inappropriate for Dr. Li *et al.* to compare their data with those from previous investigations that used different methodologies and draw conclusions about trends in anesthesia-related mortality rates. For example, Dr. Li *et al.* compare their current work with the 1954 study by Beecher and Todd,³ who reviewed 599,548 anesthetics administered at 10 institutions and reported a perioperative mortality rate of 1 in 75. Beecher and Todd reported that anesthesia was the primary cause of mortality in 1 in 2,680 cases and was contributory in 1 in 1,560 cases. The Beecher and Todd methodology involved chart review and manually recording the name of the anesthetists, techniques and agents used, and whether the trachea was intubated. Interestingly, Beecher and Todd concluded that muscle relaxants made up a portion of the anesthesia contribution to perioperative mortality. Comparison with this study is the basis for the current claim that there has been a 97% reduction in anesthesia-related mortality compared with the years 1948–1952. Dr. Li *et al.* have introduced an innovative approach to estimate the number and characteristics of anesthesia-related deaths in the United States. Their methodology is relatively less labor intensive and can be applied on a large scale, but it bears no resemblance to the methodology of Beecher and Todd. Like Lienhart and his colleagues, who introduced similar methodology to determine the number and characteristics of anesthesia-related deaths in France, this newer methodology represents both the strength and weakness of these authors' work.⁴

By Dr. Li *et al.*'s own admission, the validity and reliability of the multiple-cause-of-death data are a concern. Although previous research has shown a high reliability of the multiple-cause-of-death data for diseases such as cancer, their sensitivity and specificity for detecting anesthesia-related deaths have not been rigorously examined. Even if the multiple-cause-of-death data were highly reliable, I believe that the current ICD-10 coding methodology lacks both face validity and content validity. Simply spoken, the idea that 46.6% of anesthesia-related deaths were attributable to an overdose of anesthetics and 42.5% were due to adverse effects of anesthetics in therapeutic use seems to be an oversimplification that does not get to the heart of the issue, and

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ICD-10 codes do not identify all factors that contribute to anesthesia-related deaths.

Still, Dr. Li *et al.* are to be congratulated for moving in the right direction. I agree that “the lack of a comprehensive data system monitoring anesthesia exposure is a problem that has hindered research efforts in the United States and other countries for many years” and that “considering methods for ongoing national surveillance for anesthesia exposure and outcomes is imperative.” As I have stated before in *ANESTHESIOLOGY*, we must begin to standardize our methodology of data collection and analysis so that we can share data worldwide. Large international data pools will allow us to develop risk adjustment models and identify best practices, and only then will we be able to identify trends in anesthesia safety across time and venues.³ Until then, innovative investigators like Dr. Li *et al.* will continue to publish new methods to identify anesthesia-related mortality, while the anesthesia community proudly accepts claims about improvements in anesthesia safety, so that we can hold our safety mechanisms high for others to see.

“Did you ever hear such innocent prattle?” said its father. And one person whispered to another what the child had said, “He hasn’t anything on. A child says he hasn’t anything on.”

“But he hasn’t got anything on!” the whole town cried out at last. The Emperor shivered, for he suspected they were right. But he thought, “This procession has got to go on.” So he walked more proudly than ever, as his noblemen held high the train that wasn’t there at all.⁵

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