

## Editorial

# Autopsy Data to Refine Healthcare Quality: A Fresh Perspective

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The medical autopsy is an established quality assurance tool that has laid the foundation for modern quality assurance and improvement strategies.<sup>1</sup> Previous studies have predominantly utilized autopsy data to determine discordance rates among pre- and post-mortem diagnoses and to identify pathologies at highest risk of misdiagnosis. Examples of such work that has provided valuable data to guide healthcare policy from around the world include pre- and post-mortem discordance rates of 9.3% in India,<sup>2</sup> 12.3% in Canada,<sup>3</sup> 17.2% in the USA,<sup>4</sup> 18.1% in the Netherlands,<sup>5</sup> 19.0% in Greece,<sup>6</sup> 25.6% in Spain,<sup>7</sup> 28% in Brazil,<sup>8</sup> and 48.4% in Jamaica.<sup>9</sup> Although this area of work has contributed considerably to the practice of diagnostic medicine, it is only beginning to scratch the surface of the potential applications of autopsy data. New and innovative strategies to apply autopsy data represent timely opportunities to strengthen modern diagnostic processes. The purpose of expanded applications of autopsy data is to inform targeted strategies to recalibrate diagnostic methods and to mitigate factors that contribute to diagnostic error in the evolving landscape of modern healthcare.<sup>10</sup>

The medical autopsy plays an important role in medical research.<sup>1</sup> Advances in science and technology continue to expand the available resources that can be leveraged to inform diagnostic decision-making processes. However, an abundance of diagnostic resources available has added complexity to the interpretation of test results. Unwarranted utilization of laboratory tests results in data pollution, over-diagnosis, and harm to patients.<sup>11</sup> By providing a gold standard of diagnostic accuracy, autopsy data has guided research in the development and utilization of diagnostic technologies including imaging modalities. In this way, autopsy data provides insights into the contributions of various diagnostic technologies and allows us to optimize indications for future implementation. Our previous results have shown that 54.8% of computerized to-

mography (CT) scans and 57.9% of magnetic resonance imaging (MRI) studies yielded a previously unsuspected diagnosis.<sup>3</sup> This is in keeping with previous reports that between 20-50% of CT scans and MRI studies do not contribute to patient care.<sup>12</sup> Examples such as these highlight the importance of autopsy data in guiding research and optimizing the use of diagnostic testing.

Previous efforts to understand diagnostic error have focused on overall rates of concordance and discordance between pre- and post-mortem diagnoses. It has been proposed that specificity and sensitivity would serve as more appropriate measures of current clinical diagnostic accuracy.<sup>13</sup> Traditionally, studies of diagnostic sensitivity and specificity have been conducted on a disease-specific basis.<sup>14-17</sup> While this approach provides insights into the identification of particular pathologies, it does not allow for the assessment of common underlying factors that are shared in diagnostic processes across different organ systems and disease pathologies. In order to quantify the overall accuracy of clinical diagnostic methods, sensitivity analyses should be done on a per-case rather than on a per-disease basis. Obtaining measures of overall diagnostic specificity presents additional challenges as it not possible to accurately determine the number of conditions not diagnosed and not present in a patient.<sup>18</sup> Applying this approach to autopsy data collected over a 5-year period, our preliminary results suggest that the overall sensitivity of clinical diagnoses, calculated across all available pathologies and organ systems involved, is 53.5%. This is in keeping with previous studies that have reported sensitivities ranging from 47% to 74%.<sup>14,18</sup> This approach is unique in that it approaches clinical diagnostic accuracy as a parameter that can be quantified across various clinical situations, thereby providing an objective measure of overall diagnostic accuracy. The advantages of such an approach include the capacity to assess systematic factors that contribute to medical error.

As an educational tool autopsy findings play a critical role in refining diagnostic skills at all levels of clinical training.<sup>19</sup> It has long been recognized that approximately 80% of physicians do not believe that probabilities of diagnostic error apply to their patients.<sup>19</sup> Clinician certainty in a diagnosis and perceived need for autopsy have shown minimal influence on the rate of discrepancies between clinical and autopsy diagnoses.<sup>20</sup> This has led to a nearly 50% decrease in autopsy rates in the past six decades.<sup>3</sup> It has been reported that for every 10% increase in autopsy rates, there is a 12.4% decrease in major medical errors.<sup>9</sup> Some experts have suggested that if medical autopsy rates were performed on every patient that died in hospital, the rate of major medical errors could be decreased to as low as 4%,<sup>21</sup> illustrating the importance of autopsy in medical education.

We advocate for increased autopsy rates and expanded utilization of autopsy data to optimize healthcare delivery systems. In-depth analyses of the clinical context in which medical errors occur allow for the recognition of systemic factors that contribute to medical error. By examining the circumstances surrounding cases of diagnostic error, key systemic factors can be recognized and addressed before such misdiagnoses result in a loss of life. Factors including patient demographics, clinical scenarios, workplace circumstances, and healthcare utilization can be assessed to identify clinical scenarios at highest risk of medical error. Subsequently, autopsy data can inform the implementation of additional quality checks in a specific and targeted manner.

Acknowledging shortcomings in our healthcare systems is the first step in mitigating their consequences. The autopsy has been established as a feedback mechanism to measure diagnostic error and improve diagnostic accuracy. The current state of healthcare presents timely opportunities to apply autopsy data to strengthen diagnostic processes. Critical reflection of the accuracy and relevance of lab results, imaging studies, and healthcare policy is a vital component of healthcare quality assurance and improvement. New and innovative ways to implement autopsy data will inform targeted strategies to mitigate systemic factors that contribute to diagnostic error. These represent the first of many steps in realizing the vast potential applications of autopsy data in creating actionable strategies to recalibrate diagnostic methods. The harnessing of autopsy data in innovative ways represents a critical next frontier in strengthening modern diagnostic processes.

## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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