

Traditional physical autopsies -- not high-tech 'virtopsies' -- still 'gold standard'

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TV crime shows like *Bones* and *CSI* are quick to explain each death by showing highly detailed scans and video images of victims' insides. Traditional autopsies, if shown at all, are at best in supporting roles to the high-tech equipment, and usually gloss over the sometimes physically grueling tasks of sawing through skin and bone.

But according to two [autopsy](#) and body imaging experts at The Johns Hopkins Hospital, the notion that "virtopsy" could replace traditional autopsy-- made popular by such TV dramas -- is simply not ready for scientifically vigorous prime time. The latest virtual [imaging technologies](#) -- including full-body computed tomography (CT) scans, [magnetic resonance imaging](#) (MRI), ultrasound, X-ray and [angiography](#) -- are helpful, they say, but cannot yet replace a direct physical inspection of the body's main organs.

"The traditional autopsy, though less and less frequently performed, is still the gold standard for determining why and how people really died," says pathologist Elizabeth Burton, M.D., deputy director of the autopsy service at Johns Hopkins.

Burton and Johns Hopkins clinical fellow Mahmud Mossa-Basha, M.D., in an editorial set to appear in the [Annals of Internal Medicine](#) online Jan. 17, offer their own assessment of why the numbers of conventional autopsies have steadily declined over the past decade and why, despite this drop, the virtopsy is unlikely to properly replace it anytime soon.

Burton, who has performed well over a thousand autopsies, says current imaging technologies can help tremendously when used in combination with autopsies. "It's not a question of either traditional autopsy or virtopsy," she says. "It's a question of what methods work best in determining cause of death."

The Johns Hopkins experts base their claims on evidence, some of which will also be published in the same edition of *Annals*, that some common diagnoses are routinely missed when imaging results are compared to autopsy findings. There is no proof, they say, that virtopsy is a more reliable alternative to conventional autopsy, at least for now.

According to Burton, a visiting associate professor at the Johns Hopkins University School of Medicine, hospital autopsy rates in the United States -- for patients who die of natural causes in hospitals, whose bodies do not have to be examined by the local medical examiner or coroner-- have fallen from a high of about 50 percent in the 1960s to about 10 percent today. At The Johns Hopkins Hospital, she says, the rate remains close to a once-required standard for hospital accreditation of 25 percent, set as an appropriate goal for teaching medical residents and fellows, and auditing clinical practice.

Burton says many reasons are behind the drop in conventional autopsy rates. Medical overconfidence in diagnostic imaging results partly explains the decline, but is also to blame for the high number of diagnostic errors.

"If we chose the right test at the right time in the right people, and followed clinical guidelines to the letter, then modern diagnostic tests would produce optimal results. But we don't," says Burton.

Burton says such misinterpretations of images, lab results, and physical signs and symptoms, help explain the roughly 23 percent of new

diagnoses that are detected by autopsy.

She acknowledges that it also is easier for physicians to rely on existing diagnostic techniques to determine the cause of death than to go through the often uncomfortable task of asking grieving family members for permission to perform a conventional autopsy to confirm the cause of death. Making the process more difficult is that many physicians simply don't know what steps to take, including the paperwork and approvals, to get an autopsy performed.

For many families, dissuading factors include the prospect of delaying funeral arrangements, possible disfigurement to a loved one's body as well as the stress in coping with their loss, and the cost of an autopsy, which can run upwards of \$3,000, unless the hospital offers to do it at no charge for teaching or its own auditing purposes.

While diagnostic overconfidence, changing cultural norms and cost may depress autopsy rates, Burton says, overreliance on technology underscores an inherent flaw in switching to virtopsy.

In a German study that accompanies the Johns Hopkins editorial, conventional autopsy and imaging results, as would be seen in virtopsy, were compared for accuracy in 162 people who died in a hospital. Some had just virtopsy, while the others had both virtopsy and conventional autopsy. In the 47 who underwent both procedures, 102 new diagnoses were found; while in comparison, 47 new diagnoses were found among the 115 who underwent virtopsy alone. Study results also showed that virtual autopsy by CT scan failed to pick up 20.8 percent of the new diagnoses, while conventional autopsy missed only 13.4 percent.

Medical problems most commonly missed or not seen by autopsy included air pockets in collapsed lungs (which could have impeded breathing) and bone fractures, and the most common diagnoses missed

by imaging were heart attack, pulmonary emboli and cancer.

Burton says the study findings are not surprising because, for example, a tumor nodule in the lung could appear on any scan or X-ray image as a small, dense, white spot or so-called coin lesion that could easily be interpreted as a fungal infection, tuberculosis-related granuloma or benign tissue mass. But until the tissue is physically examined in a lab, after biopsy or during traditional autopsy, "there's no way to know the diagnosis with 100 percent certainty," she says.

In addition to diagnostic weaknesses, Mossa-Basha says that perhaps the biggest hurdle for proponents of the virtopsy alternative is the high cost of imaging. Modern ultrasounds and MRI scanners cost hundreds of thousands of dollars, with the most advanced CT scanners needed for the most detailed imaging priced well in excess of a million dollars. Full-body CT scans, he says, run about \$1,500 each, which, when added to device purchasing and maintenance fees, make virtopsy an expensive option.

Mossa-Basha says major advances in scanning devices make some forensic aspects of autopsy easier when keeping the body closed protects physical evidence from being destroyed, such as tracking bullet trajectories in gun victims.

"Steady progress in imaging technology is refining conventional autopsy, making it better and more accurate," says Mossa-Basha, a clinical fellow in neuroradiology at Johns Hopkins. "Physicians really need to be selective and proactive -- even before a critically injured patient in hospital dies -- in deciding whether an autopsy is likely to be needed and, if so, whether to approach the family in advance. Only in this way do we ensure that we are using the latest scanning devices appropriately during autopsy and when it is most effective in producing the most accurate-as-possible death certificates."

More information: www.annals.org/content/current

Provided by Johns Hopkins Medical Institutions

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