

# The Gallbladder and Vermiform Appendix as Quality Assurance Indicators in Autopsy Pathology

## A 10-Year Community Teaching Hospital Experience

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### ABSTRACT

**Objectives:** We investigate the number of autopsy reports that did or did not document the presence or absence of the gallbladder or appendix or document abdominal scars in patients following cholecystectomy or appendectomy. We also report gallbladder and appendix pathology at autopsy.

**Methods:** Autopsy reports from patients 18 years or older autopsied at a community teaching hospital between January 1, 2009, and December 31, 2018 were reviewed. Nonabdominal autopsies were excluded. Histopathologic examination of the gallbladder and appendix was only performed if gross pathology was seen.

**Results:** Of the 385 autopsies studied, 48 (12.5%) had cholecystectomies, of which 6 (12.5%) did not document abdominal scars. Sixty-two (16.1%) had appendectomies, of which 12 (19.4%) did not document abdominal scars. The presence or absence of the gallbladder and appendix was not documented in 6 (1.6%) and 16 (4.2%) of reports, respectively. Pathology was seen in 87 (25.8%) gallbladders and 4 (1.2%) appendixes.

**Conclusions:** Absence of the gallbladder or appendix is a relatively common autopsy finding. Auditing autopsy reports for documentation of their presence or absence, along with associated abdominal scars, are potential quality assurance indicators of autopsy reports. Documentation of these elements could be improved by changing the autopsy template or using synoptic reporting.

### INTRODUCTION

Autopsies serve an important role in the medical field. An autopsy report should be an objective description of observations of the deceased presented in an appropriate format. The ordering of the description is less important than the need for consistency and completeness. Most often, the protocol follows a sequence of external examination, internal examination of the body cavities, and descriptions of the individual organs and tissues, including weights and measurements as appropriate.<sup>1</sup> Attention of pathologists to details of reporting is essential to the utility and veracity of the autopsy report.<sup>2</sup> The autopsy report is the outcome to which most efforts should be directed.<sup>3</sup>

### KEY POINTS

- Poor-quality autopsy reports can cause medical liability issues.
- Auditing autopsy reports for documentation of the presence or absence of the gallbladder, appendix, and abdominal scars may be used for quality assurance.
- Autopsy reports can be improved by using templates or synoptic reporting.

### KEY WORDS

Autopsy; Report; Gallbladder; Appendix; Scars; Postmortem; Cholecystectomy; Appendectomy

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The autopsy plays an important role in the curriculum of all disciplines and improves clinical practice. Autopsies can be used to teach anatomy, gross pathology, skills in clinicopathologic correlation, a holistic approach to medicine, medical ethics, medical law, and the importance of health and safety at work.<sup>4</sup> Despite these facts, autopsy rates at community and teaching hospitals in the United States have dropped substantially and are currently below 5%.<sup>5</sup> While there are several reasons for this decline, one possible reason is potential medicolegal ramifications of autopsy findings.<sup>6,7</sup>

Poor-quality autopsy reports can cause medical liability issues. In the review of 99 appeals court decisions by Bove et al,<sup>7</sup> 18 cases reviewed by the appeals courts, mostly reversals, involved questions about autopsy performance or reporting, or admissibility of autopsy information or death certification. The authors found that outcome of a malpractice case may depend on the quality of the autopsy and that internal inconsistencies or flagrant omissions in autopsy reports cause concern and fuel conspiracy theories.<sup>2</sup> Failure to document appropriate findings in an autopsy report, such as the absence of an appendix in a patient following appendectomy, may allow plaintiff attorneys to discredit the report and question the accuracy of other elements in the report. Patients who have undergone cholecystectomy or appendectomy should have corresponding abdominal surgical scars documented in their autopsy reports. One must carefully look for these scars while performing external examination as surgical operations have evolved over the decades from open approaches to increasingly minimally invasive procedures.<sup>8</sup> Due to this shift, surgical scars have become smaller and may not always be found despite a careful search. The quality of autopsy reports is important; however, most of the autopsy quality assurance literature addresses turnaround time and discrepancies between clinical diagnoses and autopsy findings.<sup>9-13</sup>

The primary objective of this study is to investigate the proportion of autopsy reports that did not report the presence or absence of the gallbladder or appendix and did not document the presence of abdominal scars in patients following cholecystectomy or appendectomy. The secondary objective is to propose ways to improve documentation of abdominal scars and the presence or absence of the gallbladder and appendix in autopsy reports. We also report the pathologic findings in the gallbladder and appendix to provide an update to the autopsy literature.

## MATERIALS AND METHODS

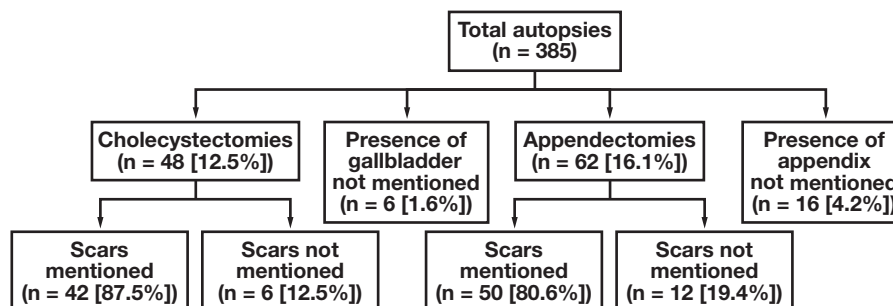
This study was reviewed by our institutional review board and received exempt determination. In this cross-sectional study, we retrospectively searched the laboratory information system (Cerner Millennium) for autopsies performed at Danbury Hospital, a community teaching hospital, between January 1, 2009, and December 31, 2018. Inclusion criteria included patients 18 years or older and autopsies that examined the abdomen. Consecutive autopsy reports that met criteria were reviewed. The primary outcome variables collected for this study included documentation of the presence or absence status of the gallbladder and appendix, as well as documentation of abdominal scars in patients whose autopsy reports stated that the gallbladder or appendix was absent. We also collected qualitative descriptions of gallbladder pathology and appendix pathology. Routine histopathologic examination of the gallbladder and appendix was not performed unless gross pathology was seen. The electronic medical records of patients who had appendix pathology were reviewed to determine if they had been diagnosed prior to death.

## RESULTS

Between January 1, 2009, and December 31, 2018, 385 autopsy reports met inclusion criteria and were included in our analyses. Out of 385 autopsy reports reviewed, 250 were male and 135 were female. Forty-eight (12.5%) had cholecystectomies (21 males and 27 females) and 62 (16.1%) had appendectomies (32 males and 30 females). Of the 48 patients who had cholecystectomies, 6 (12.5%) autopsy reports did not document abdominal scars. The presence or absence of the gallbladder was not mentioned in six (1.6%) autopsy reports.

Out of the 62 patients who had appendectomies, 12 (19.4%) autopsy reports did not document abdominal scars. The presence or absence of the appendix was not reported in 16 (4.2%) autopsy reports **FIGURE 1** and **TABLE 1**.

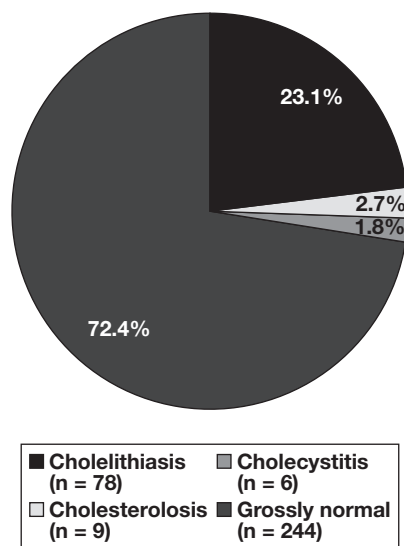
In total, 337 patients had gallbladders present at the time of autopsy. Eighty-seven (25.8%) had gallbladder pathology, with 6 patients having more than one pathologic finding. The most common pathologic findings were cholelithiasis (78 cases, 23.1%), cholesterosis (9 cases, 2.7%), and cholecystitis (6 cases, 1.8%) **FIGURE 2**.



**FIGURE 1** Flow diagram of the study.

**TABLE 1** Quality Assurance Indicators and Data for Autopsy External and Internal Gross Examinations

Quality Assurance Indicator	Danbury Hospital, %
Autopsy reports documenting presence or absence of gallbladder	98.4
Autopsy reports documenting presence or absence of appendix	95.8
Autopsy reports documenting abdominal scar(s) in patients without a gallbladder	87.5
Autopsy reports documenting abdominal scar(s) in patients without an appendix	80.6

**FIGURE 2** Gallbladder pathology (n = 337).

Four (1.2%) appendixes showed pathologic findings, including primary carcinoid tumor, metastatic carcinoid tumor from the ileum, mucinous cystadenoma, and plasmablastic myeloma/lymphoma. Only the patient with the metastatic carcinoid tumor (25%) had been diagnosed prior to death.

## DISCUSSION

The importance of the autopsy lies in medical education, counseling, and performing research to gain better understanding of disease. Despite its value, the number of autopsies has been declining significantly in both community and teaching hospitals.<sup>10</sup> The reasons for the global decline in the role of autopsies are multifactorial and include increased emphasis on reducing education and health care costs, advances in imaging and other diagnostic modalities, cultural aversion, and modern pathology training and practice structure.<sup>14</sup> Another reason for this decline is the fear that damaging information from autopsies will be introduced as evidence in lawsuits in which malpractice is alleged to have occurred.<sup>7</sup>

The autopsy report can be a legal document that may be relied on in medical malpractice cases. An autopsy report usually includes clinical history, external examination, microscopic examination, key of sections, final diagnosis, and a comment regarding the cause

of death. Autopsy reports are lengthy, and some details can be missed, which can raise concern regarding a report's accuracy. Failure to document appropriate findings in an autopsy report, such as the absence of an appendix or a gallbladder in a patient following appendectomy or cholecystectomy, may cause plaintiff attorneys to discredit the report, hindering the usefulness of the report for the defense attorneys. In the study by Bove et al,<sup>2</sup> the courts raised issues related to the manner in which autopsies were performed and the manner in which information derived from autopsies was reported in around 15% of the cases studied. The authors recommend that before verification of the final report, discrepancies between the preliminary and final diagnosis lists and between the gross and microscopic findings and the final diagnosis should be addressed.<sup>2</sup>

Bove et al<sup>7</sup> found that autopsy reports used in medical malpractice cases can be helpful to either the plaintiff or defendant, or they can be neutral. In 30 (61%) of 49 cases, the defendant physicians were acquitted of medical negligence even though the information provided by the autopsy favored the plaintiff. The study confirmed that a finding of medical negligence is based on standard-of-care issues rather than accuracy of clinical diagnosis. The authors concluded that fear of autopsy findings has no rational basis and is an important obstacle to uninhibited outcomes analysis.<sup>7</sup> Another study found that autopsy aided the defense of anesthesiologists in 55% of claims and harmed the defense in 27% of claims with evaluable autopsy information.<sup>15</sup>

More recently, Gartland et al<sup>14</sup> studied 293 malpractice claims related to an inpatient death that could be linked to patient electronic health records. Eighty-nine (30%) claims had an autopsy performed by either the hospital or medical examiner. There was no difference in percentage of claims paid whether an autopsy was performed or not and no difference in median indemnity of paid claims after adjusting for number of defendants. Thirty-one percent of claims with hospital autopsies performed demonstrated major discordance between autopsy and clinical findings. Claims with major clinicopathologic discordance also did not have a statistically significant difference in percentage or amount paid compared with claims with minor or no discordance. The authors conclude that liability fear should not be seen as a barrier to obtaining autopsies.

Much of the autopsy quality assurance literature focuses on turnaround time and discrepancies between clinical and autopsy diagnoses rather than the quality of autopsy reports.<sup>9-12,16</sup> Given the decrease in autopsy rates and the decrease in the number of autopsies required for American Board of Pathology eligibility (30 as of August 2020), there is a concern about the competency of pathology residents, pathologists' assistants, and pathologists.<sup>5,17-20</sup> In this study, we explore new quality assurance indicators for autopsy external and internal gross examinations (analytic phase) and autopsy reports (postanalytic phase) and provide our data **TABLE 1**. To our knowledge, there are no published data with which to compare our results. We found that 1.6% and 4.2% of our autopsy reports did not document the presence or absence of the gallbladder and appendix, respectively. Our autopsy reports did not mention abdominal scars in 12.5% and 19.4% of patients who had cholecystectomies and appendectomies, respectively. Possible causes of these errors

<p><b>CURRENT TEMPLATE</b>  <b>GASTROINTESTINAL TRACT:</b>          The gallbladder has a smooth serosa. The wall is thin and lined by a velvety green mucosa. It contains approximately __cc of green viscid bile. The extrahepatic biliary ducts are patent. The ileocecal valve is competent. The appendix is normal. The cecum is not remarkable. The colon and rectum contain formed stool and are not remarkable. The mucosa is intact throughout.</p> <p><b>PROPOSED TEMPLATE</b>  <b>GASTROINTESTINAL TRACT:</b>          The gallbladder is present/surgically absent. The gallbladder has a smooth serosa. The wall is thin and lined by a velvety green mucosa. It contains approximately __mL of green viscid bile. Gallstones are present/absent. The extrahepatic biliary ducts are patent. The ileocecal valve is competent. The appendix is present/surgically absent. The cecum is not remarkable. The colon and rectum contain formed stool and are not remarkable. The mucosa is intact throughout.</p>	
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**FIGURE 3** Example of current and proposed autopsy gross description templates for gallbladder and appendix.

include lengthy autopsy reports and use of a template that lacked prompts for the presence or absence of the gallbladder, appendix, and scars.

Ways to improve documentation include changing the autopsy template **FIGURE 3** or switching to synoptic reporting. A reporting protocol for the gross examination of adult decedents is posted on the College of American Pathologists' website.<sup>21</sup>

These new quality assurance indicators should not be the sole assessment of autopsy reports because, although an indicator of quality, they are not evaluative of the primary diagnostic value of the autopsy. They are intended to supplement existing quality management (QM) plans. Components of autopsy QM plans may include monitoring turnaround time of autopsy preliminary and final reports, ensuring that clinicians are notified about significant and unexpected autopsy findings, peer review of autopsy slides and reports, and presentation of autopsy findings at intradepartmental quality assurance conferences and interdepartmental conferences.<sup>16,22</sup>

The most common indication is cholelithiasis for performing cholecystectomy and acute appendicitis for performing appendectomy. Approximately 750,000 cholecystectomies are performed each year in the United States.<sup>23</sup> The lifetime risk of appendicitis is 1 in 15 in the United States.<sup>24</sup> Surgical operations have evolved over the decades from open procedures to laparoscopic procedures, resulting in smaller abdominal scars.<sup>8</sup> Laparoscopic cholecystectomies are usually performed by making 5- to 10-mm incisions in the epigastrium, right midclavicular, and right flank areas.<sup>23</sup> For laparoscopic appendectomies, 5-mm ports are usually placed in the suprapubic and left lower quadrant areas. It is also technically feasible to place the third port in the right upper quadrant.<sup>23</sup> Possible ways to avoid missing abdominal scars include educating pathology residents, pathologists' assistants, and pathologists to perform a thorough review of the patient's medical record prior to autopsy, with attention to the surgical history, and emphasizing thorough external gross examinations, including photography.

In one study of 1,960 cholecystectomy specimens, 99.5% showed histopathology, with 85.3% showing cholecystitis (acute, chronic, follicular, and xanthogranulomatous cholecystitis combined) as the most common histopathologic finding, followed by cholesterosis (13%).<sup>25</sup> In our study of 337 autopsy gallbladders, the most common finding was cholelithiasis (23.1%), followed by cholesterosis (2.7%) and cholecystitis (1.8%). The lower incidence of gallbladder pathology in our study (25.8%) was most likely due to the patient

population (deceased patients vs patients following cholecystectomy) and the lack of routine histopathologic examination of the gallbladder unless gross pathology was seen.

In one study of 4,670 appendectomy specimens, the incidence of appendiceal tumors was 1.6%.<sup>26</sup> Our study found appendiceal tumors in 1.2% of autopsy cases. A limitation in our study was that routine histopathologic examination of the appendix was not performed unless gross pathology was seen.

In conclusion, the gallbladder, appendix, and abdominal scars may be used as quality assurance indicators for autopsy reports. If audits of autopsy reports show high error rates (eg, failure to document the presence or absence of the gallbladder or appendix or failure to document abdominal scars in patients lacking a gallbladder or appendix), the autopsy template may need to be revised, synoptic reporting may need to be implemented, and more thorough clinical history review and gross examinations may need to be performed.

## REFERENCES

- Hutchins GM. Practice guidelines for autopsy pathology: autopsy performance. Autopsy Committee of the College of American Pathologists. *Arch Pathol Lab Med*. 1994;118:19-25.
- Bove KE, Iery C; Autopsy Committee, College of American Pathologists. The role of the autopsy in medical malpractice cases, II: controversy related to autopsy performance and reporting. *Arch Pathol Lab Med*. 2002;126:1032-1035.
- Travers H. Quality assurance indicators in anatomic pathology. *Arch Pathol Lab Med*. 1990;114:1149-1156.
- Burton JL, Underwood J. Clinical, educational, and epidemiological value of autopsy. *Lancet*. 2007;369:1471-1480.
- Geller SA. Who will do my autopsy? *Arch Pathol Lab Med*. 2015;139:578-580.
- Hull MJ, Nazarian RM, Wheeler AE, et al. Resident physician opinions on autopsy importance and procurement. *Hum Pathol*. 2007;38:342-350.
- Bove KE, Iery C; Autopsy Committee, College of American Pathologists. The role of the autopsy in medical malpractice cases, I: a review of 99 appeals court decisions. *Arch Pathol Lab Med*. 2002;126:1023-1031.
- Switzer NJ, Gill RS, Karmali S. The evolution of the appendectomy: from open to laparoscopic to single incision. *Scientifica (Cairo)*. 2012;2012:895469.
- Marshall HS, Milikowski C. Comparison of clinical diagnoses and autopsy findings: six-year retrospective study. *Arch Pathol Lab Med*. 2017;141:1262-1266.
- Goldman L. Autopsy 2018: still necessary, even if occasionally not sufficient. *Circulation*. 2018;137:2686-2688.

11. Siebert JR. Increasing the efficiency of autopsy reporting. *Arch Pathol Lab Med*. 2009;133:1932-1937.
12. van den Tweel JG, Wittekind C. The medical autopsy as quality assurance tool in clinical medicine: dreams and realities. *Virchows Arch*. 2016;468:75-81.
13. Association of Directors of Anatomic and Surgical Pathology. Recommendations for quality assurance and improvement in surgical and autopsy pathology. *Hum Pathol*. 2006;37:985-988.
14. Gartland RM, Myers LC, Iorgulescu JB, et al. Body of evidence: do autopsy findings impact medical malpractice claim outcomes? *J Patient Saf*. 2020. doi:10.1097/PTS.0000000000000686.
15. Lee LA, Stephens LS, Fligner CL, et al. Autopsy utilization in medicolegal defense of anesthesiologists. *Anesthesiology*. 2011;115:713-717.
16. Young NA, Naryshkin S. An implementation plan for autopsy quality control and quality assurance. *Arch Pathol Lab Med*. 1993;117:531-534.
17. American Board of Pathology. Booklet of information. [https://www.abpath.org/images/booklets/ABP\\_BOI.pdf](https://www.abpath.org/images/booklets/ABP_BOI.pdf). Accessed August 24, 2021.
18. Shojania KG, Burton EC. The vanishing nonforensic autopsy. *N Engl J Med*. 2008;358:873-875.
19. Hoffman RD, Kragel PJ, Kaul KL. Position paper from the Association of Pathology Chairs: assessing autopsy competency in pathology residency training. *Acad Pathol*. 2019;6:2374289518824057.
20. Davis GG, Winters GL, Fyfe BS, et al. Report and recommendations of the Association of Pathology Chairs' autopsy working group. *Acad Pathol*. 2018;5:2374289518793988.
21. Hooper JE, Flickinger K. Reporting protocol for the examination of gross autopsy of adult decedents, autopsy-adult-20.02. February 2020. <https://documents.cap.org/protocols/ap-autopsy-adult-20-02.pdf>. Accessed August 24, 2021.
22. Collins KA. *Autopsy Performance and Reporting*. 3rd ed. Northfield, IL: CAP Press; 2017.
23. Brunnicardi F, Anderson DK, Billiar TR, et al. *Schwartz's Principles of Surgery*. 11th ed. New York, NY: McGraw-Hill; 2019.
24. Ferris M, Quan S, Kaplan BS, et al. The global incidence of appendicitis: a systematic review of population-based studies. *Ann Surg*. 2017;266:237-241.
25. Limaïem F, Sassi A, Talbi G, et al. Routine histopathological study of cholecystectomy specimens: useful? A retrospective study of 1960 cases. *Acta Gastroenterol Belg*. 2017;80:365-370.
26. Chandrasegaram MD, Rothwell LA, An EI, et al. Pathologies of the appendix: a 10-year review of 4670 appendicectomy specimens. *ANZ J Surg*. 2012;82:844-847.