WHITE PAPER

From Hand-Sorting to Full Traceability: A Guide to Automated Block and Slide Archiving

Why the least glamorous step in the histology workflow may be the smartest place to invest, and what the evidence says about getting it right.

Most conversations about laboratory modernization gravitate toward the visible, high-status technologies: whole-slide imaging, AI-assisted diagnosis, molecular platforms. Yet ask any laboratory manager where the day quietly leaks hours and where a single misplaced sample can derail a case, and the answer often lies at the unglamorous end of the bench: the sorting, filing, and retrieval of glass slides and paraffin blocks into long-term storage.

This is not a trivial corner of the operation. The specimen's journey through surgical pathology involves a series of fragile hand-offs, from container to cassette to block to slide to report, and each transfer is an opportunity for a labeling or filing error that can compromise patient safety (Nakhleh, 2008). As laboratories absorb rising case volumes with flat or shrinking staff, the manual archive has become a structural liability hiding in plain sight. The encouraging news, supported by a growing evidence base on laboratory automation and specimen tracking, is that this is also one of the most tractable problems a lab manager can solve.

The Real Cost of Manual Filing

Manual block and slide archiving fails in two ways that matter to a lab manager: it consumes scarce labor, and it introduces error. On the labor side, the timing could not be more difficult. The histotechnology and broader laboratory workforce is in sustained shortage. A May 2021 consortium survey of academic laboratories found the average open-position rate had climbed to 12 percent, with laboratory leaders describing the histotechnician shortage as having gone “from simmer to rolling boil” (Titus, 2022). The pressures are demographic and durable, an aging workforce, thin training pipelines, and rising demand, and they are not expected to resolve quickly (Walsh & Orsi, 2024). In that context, every hour a credentialed histotechnologist spends hand-sorting slides into numeric order is an hour not spent on work only they can do. Laboratory leaders facing the shortage have explicitly reframed the problem this way, looking for ways to reduce histology staff time spent filing slides as a lever for coping with constrained staffing (Paxton, 2023).

On the error side, the literature is sobering and consistent. Specimen identification and labeling errors are among the most common and most dangerous defects in the total testing process (Ning et al., 2016; Vahabi et al., 2023). They are also addressable through technology. The landmark Henry Ford Production System work demonstrated that bar-code–specified work-process standardization significantly reduced in-process misidentification defects in surgical pathology, establishing, well over a decade ago, that engineered tracking beats human vigilance (Zarbo et al., 2009). More recent syntheses reinforce that barcoding and specimen tracking are now foundational to laboratory efficiency and patient safety, allowing labs to identify, locate, standardize, and audit specimens across the workflow (Hanna & Pantanowitz, 2015; Absar & Prichard, 2021).

epredia

What “Automated Archiving” Actually Changes

Automated block and slide archiving extends that same tracking logic to the final, physical resting place of the sample. Instead of a technologist sorting specimens into sequence by hand and committing a location to paper or memory, an instrument scans each block or slide, records its identity and physical position in a shared database, and files it into standardized storage.

A 2026 review of pathology automation “from specimen to report” placed archiving squarely within the automatable workflow, concluding that robotics and digital archiving enhance specimen tracking, environmental control, and time management, freeing staff and improving reliability when compared against traditional manual workflows (L'Imperio et al., 2026). The mechanism is straightforward and well documented elsewhere in the tracking literature: when each specimen carries a machine-readable identity and every handling step is a scan, the system can flag an unlogged or misplaced specimen automatically rather than discovering it missing days later (Hanna & Pantanowitz, 2015). One quality-improvement program integrated barcode tracking into the hospital information system specifically so that automated alerts flag unlogged specimens to prevent oversight, converting traceability from a retrospective audit into a real-time safeguard (Vahabi et al., 2023).

There is also a measurable efficiency dividend when visibility replaces manual coordination. Studies applying real-time, time-stamped tracking and structured process improvement to laboratory workflows have reported meaningful reductions in intra-laboratory turnaround time, precisely because process visibility exposes the bottlenecks that manual systems hide (L'Imperio et al., 2026; Zarbo et al., 2009). For the archive specifically, the throughput gain is less about diagnostic speed and more about reclaiming the technologist hours that sorting and retrieval silently consume.

A Brief, Illustrative Scenario

Consider a mid-volume hospital laboratory that retains hundreds of thousands of slides and blocks under medico-legal retention requirements. In the manual state, a request for a five-year-old case triggers a physical hunt through boxes, occasionally ending in a sample that cannot be found and a difficult conversation with a clinician. After moving to an automated, database-backed archive, the same request becomes a pick list generated from any networked workstation; the box and position are known with certainty, and the retrieval is logged.

What This Means for the People Who Live with the Archive Every Day

An automated archive does not just change a process on paper. It changes what a working day feels like for the people who depend on that archive, often in ways a lab manager only hears about secondhand, after the fact.

For the pathologist, the archive is invisible until it fails. A recut request for a case from three years ago, or a molecular add-on that depends on finding the original block, should not be a source of anxiety. When traceability is reliable, a pathologist can request material with confidence that it will be found, rather than bracing for the possibility that it won't. That confidence protects not just turnaround time but the pathologist's ability to stay focused on the case in front of them instead of the one that got lost (Nakhleh, 2008).

For the histotechnologist, manual filing is often one of the least satisfying parts of a demanding, skilled job. Time spent hand-sorting slides into numeric order is time not spent on the technical work that drew them into the field in the first place, and in a workforce already stretched thin, that mismatch compounds burnout rather than easing it (Paxton, 2023). Automating the archive is not about removing people from the workflow; it is about giving skilled staff back the hours that a shelf search currently takes from them.

For the laboratory's leadership and the institution it serves, a lost specimen is never just an inconvenience. It can mean a repeat procedure for a patient, a delayed diagnosis, or a difficult conversation with a family, consequences that fall hardest on the people least equipped to absorb them (Vahabi et al., 2023; Ning et al., 2016). Reliable, engineered tracking exists to make that outcome rare rather than routine.

For the people managing information systems and data integrity, an archive that already speaks the language of the LIS, with audit logging, role-based access, and clean interoperability, is simply less work to maintain and trust over time than one built on paper logs and institutional memory (Absar & Prichard, 2021).

None of this requires a lab manager to build a pitch. It requires recognizing that the archive touches every one of these people daily, and that the evidence for fixing it speaks to something each of them already feels.

What Actually Changes, and What Doesn't

Three concerns come up often when labs consider this shift, and each deserves a direct, honest answer.

Change is hard on the people doing the work. Quality-improvement teams have documented real staff concern about added workload during tracking rollouts, and that concern is legitimate, not something to be talked out of (Vahabi et al., 2023). The difference between a rollout that lands well and one that doesn't tends to come down to whether automation is introduced as removing tedious work, and whether the people who do that work day to day are involved early enough to shape how it happens, rather than told about it after the decision is made (Paxton, 2023).

Integration is no longer the frontier it once was. Barcoding and LIS-integrated tracking are now standard laboratory infrastructure, with established guidance on hardware, symbology, and interoperability, not an experimental add-on (Absar & Prichard, 2021; Hanna & Pantanowitz, 2015). The open question for most labs today is not whether integration is possible, but how well it fits their existing systems.

The cost question is really a staffing question. In a sustained workforce shortage, the scarce resource is skilled labor, not capital (Titus, 2022; Walsh & Orsi, 2024). Reclaimed technologist time and avoided adverse events are the return that matters here, and that return only grows as staffing stays tight.

A Forward-Looking Conclusion

The trajectory of pathology is unmistakably digital, and digitization rewards exactly what automated archiving provides: a clean, machine-readable, fully traceable chain of custody for every physical specimen. A lab that has already digitized the identity and location of its blocks and slides is far better positioned to layer on whole-slide imaging, AI, and remote collaboration than one still reconciling paper logs. In that sense, automating the archive is not a side project. It is foundational infrastructure for the digital laboratory, and one of the few modernization moves that pays for itself in reclaimed labor while the broader transformation matures. The least glamorous step in the workflow, it turns out, may be the most strategic place to start.

Key Takeaways for Laboratories

1	Treat the archive as a patient-safety control, not just storage. Specimen identification and filing errors are common and consequential; engineered tracking has been shown to reduce them (Zarbo et al., 2009; Ning et al., 2016).
2	Justify the investment in labor, not slides. With histotechnology vacancies elevated and persistent, reclaimed skilled-staff time is the most defensible return (Titus, 2022; Paxton, 2023).
3	Insist on LIS integration and audit logging. Interoperability with the system of record and automated exception alerts are now baseline expectations, not premium features (Absar & Prichard, 2021; Vahabi et al., 2023).
4	Manage change deliberately. Involve the people who do the work early, and frame automation as removing tedious tasks rather than adding oversight (Paxton, 2023).
5	Build for the digital future now. A traceable, database-backed physical archive is the on-ramp to whole-slide imaging and AI, not a competing priority (L'Imperio et al., 2026).

References

1. Absar, S. F., & Prichard, J. W. (2021). Barcoding and tracking. PathologyOutlines.com. https://www.pathologyoutlines.com/topic/informaticsbarcodingtracking.html
2. Hanna, M. G., & Pantanowitz, L. (2015). Bar coding and tracking in pathology. Surgical Pathology Clinics, 8(2), 123–135. https://doi.org/10.1016/j.path.2015.02.017
3. L'Imperio, V., Dei Tos, A. P., Carbone, M., Malapelle, U., Bellevicine, C., Troncone, G., Pisapia, P., Marletta, S., Brunelli, M., Scarpa, A., Grassi, S., Cazzaniga, G., Pagni, F., & Eccher, A. (2026). Pathology in motion: Automation from specimen to report. Critical Reviews in Oncology/Hematology, 222, 105263. https://doi.org/10.1016/j.critrevonc.2026.105263
4. Hanna, M. G., Reuter, V. E., Samboy, J., England, C., Corsale, L., Fine, S. W., Klimstra, D. S., & Travis, W. D. (2020). Implementation of digital pathology offers clinical and operational increase in efficiency and cost savings. Archives of Pathology & Laboratory Medicine, 143(12), 1545–1555. https://doi.org/10.5858/arpa.2018-0514-OA
5. Ning, H.-C., Lin, C.-N., Chiu, D. T.-Y., Chang, Y.-T., Wen, C.-N., Peng, S.-Y., Chu, T.-L., Yu, H.-M., & Wu, T.-L. (2016). Reduction in hospital-wide clinical laboratory specimen identification errors following process interventions: A 10-year retrospective observational study. PLOS ONE, 11(8), Article e0160821. https://doi.org/10.1371/journal.pone.0160821
6. Paxton, A. (2023, June). Reorganize, promote, shift, assess: Staying staffed amid a shortage. CAP TODAY. https://www.captodayonline.com/reorganize-promote-shift-assess-staying-staffed-amid-a-shortage/
7. Titus, K. (2022, April). Lab workforce crisis takes top spot. CAP TODAY. https://www.captodayonline.com/lab-workforce-crisis-takes-top-spot/
8. Vahabi, N., et al. (2023). Evaluation of errors related to surgical pathology specimens of different hospital departments with a patient safety approach: A case study in Iran. [Journal article]. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10114301/
9. Walsh, E., & Orsi, N. M. (2024). The current troubled state of the global pathology workforce: A concise review. Diagnostic Pathology, 19, Article 163. https://doi.org/10.1186/s13000-024-01590-2
10. Zarbo, R. J., Tuthill, J. M., D'Angelo, R., Varney, R., Mahar, M., Neuman, C., & Ormsby, A. (2009). The Henry Ford Production System: Reduction of surgical pathology in-process misidentification defects by bar code–specified work process standardization. American Journal of Clinical Pathology, 131(4), 468–477. https://doi.org/10.1309/AJCPPTJ3XJY6ZXDB

©2026 Epredia. All rights reserved. All trademarks are the property of Epredia unless otherwise specified. **M2600094 R092026**

epredia
A Member of PHC Group