A Pathway to Excellence

Bruce R. Smoller

Published by University of Rochester Press

Smoller, Bruce R.
A Pathway to Excellence: The First 100 Years of Pathology and Laboratory Medicine at the University of Rochester School of Medicine and Dentistry, 1921-2020.
Project MUSE. muse.jhu.edu/book/78629.

For additional information about this book
https://muse.jhu.edu/book/78629

For content related to this chapter
https://muse.jhu.edu/related_content?type=book&id=2737163
Medical economics continued to evolve at a fast pace and, with it, URMC leadership under the direction of Dr. Mark Taubman (dean of the medical school and chief executive officer) and Mr. Steve Goldstein (chief executive officer of Strong Memorial Hospital) developed an aggressive growth strategy. The university developed formal affiliation relationships with many small regional hospitals in order to coordinate healthcare, create efficiencies, and standardize care for patients throughout the region. The Department of Pathology and Laboratory Medicine transformed itself into a fully centralized regional laboratory, as well as maintaining its place as a tertiary care, academically oriented department. By the end of the decade, there were sixty-eight members of the full-time faculty and 985 employees, making the department the biggest one in the University of Rochester School of Medicine and Dentistry (and second only to the School of Nursing in the entire University of Rochester system). The departmental budget now exceeds $500 million annually, a far cry from the department with four faculty members who performed autopsies, taught medical students, and performed basic science investigation.

Cost of a loaf of bread: $2.78
President of the USA: Barack Obama
World series winner: St. Louis Cardinals
Cost of a gallon of gas: $3.52
2012: p53 tumor suppressor gene discovered

Chair

The decade began under the continued leadership of Dr. Dan Ryan. He announced his retirement in 2011. Dr. John Krolewski (see figure 35) from UC Irvine was recruited to lead
a transformation into a more scientific and molecular era for the department. Dr. Krolewski joined the faculty with great fanfare based upon a strong and highly productive research career. Unfortunately, he was not a good match for the department and for URMC and, after less than a year, Dr. Ryan was asked to return as an interim chair, a position he held for approximately two years. Dr. Ryan named Dr. Neil Blumberg to serve as the vice chair for clinical pathology in 2013. Dr. Brendan Boyce continued in his role as vice chair for anatomic pathology. They held these positions through 2016.

In 2014, Dr. Bruce Smoller was hired to serve as the seventh chair of the department (see figure 36). Dr. Smoller had recently stepped down as the executive vice president of the United States and Canadian Academy of Pathology (an organization that once boasted the department’s own Dr. Orbison as its president). He had previously spent almost nine years as the chair of the Department of Pathology at the University of Arkansas for Medical Sciences. Dr. Smoller is a pathologist with subspecialty
expertise in dermatopathology. He did his training at Harvard’s Beth Israel Hospital (anatomic and clinical pathology), followed by Cornell New York Hospital (dermatopathology fellowship). He came to Rochester with experience in building large outreach programs at several academic institutions, including the University of Arkansas and Stanford University, and these efforts, along with his administrative work overseeing an international organization, were deemed to be a good match for the rapidly evolving institutional initiatives. Dr. Smoller’s academic contributions center around diagnostic and immunologic features of mycosis fungoides, a type of cutaneous lymphoma. He was a past president of the American Society of Dermatopathology and a former editor-in-chief of the Journal of Cutaneous Pathology. His background as primarily an anatomic pathologist served as a nice switch in orientation from the primarily clinical pathology–trained chairs of the previous twenty years.

Faculty

By the end of the decade, the department proudly listed sixty-eight full-time faculty members (see figure 37). One of the exciting developments was the marked increase in diversity
amongst the faculty, and especially its leadership within the department. Vice chairs included Drs. Christa Whitney-Miller overseeing anatomic pathology; Richard Burack overseeing clinical operations at Strong Memorial Hospital; Victoria Zhang, who oversees the clinical enterprise that includes all of the affiliated hospitals; and Jennifer Findeis-Hosey, who oversees the educational programs. The vice chair for administration is Ms. Kelley Suskie, who was recruited from the University of Arkansas for Medical Sciences to oversee the enormous administrative aspects of the clinical enterprise. She had worked in a similar role with Dr. Smoller when he served as chair of that department.

The huge growth in faculty numbers during this era was in keeping with the move to completely sub-specialize services in both anatomic and clinical pathology. Paralleling clinical medicine in which sub-specialization became the norm for academic medical centers, there was a pressing desire on the part of the medical center’s clinicians for the department to have pathologists with subspecialty training and expertise in all areas of pathology. This change resulted in a large influx of subspecialty-trained faculty members in both anatomic and clinical pathology disciplines and in the creation of sections within the larger divisions such as surgical pathology. With this sub-specialization, each organ-specific faculty group was headed by a section head. By the end of the decade, the department boasted nine gastrointestinal pathologists as part of its surgical pathology faculty, which numbered more than thirty (see appendix). Sections within surgical pathology included dermatopathology (Dr. Glynis Scott, director), neuropathology (Dr. Mahlon Johnson, director), renal pathology (Dr. Bruce Goldman, director), thoracic pathology (Dr. Moises Velez, director), genitourinary pathology (Dr. Hiroshi Miyamoto, director), breast pathology (Dr. David Hicks, director), bone and soft tissue pathology (Dr. Xi Wang, director), gynecologic pathology (Sharlin Varghese, director), pediatric pathology (Dr. Phil Katzman, director), and head and neck pathology (Dr. Ellen Giampoli, director).

The clinical laboratories continued with the theme of sub-specialization that began prior to the parallel evolution of surgical pathology. Microbiology continued to be led by
Dr. Dwight Hardy, with the addition of Nicole Pecora as the associate director. (Dr. Marilyn Menegus, who had served in this role for many years, died suddenly in 2017). The automated laboratories, including clinical chemistry and hematology, once again came under the direction of Dr. Kwong late in the decade, though as he moved to part-time status in 2020, Dr. Victoria Zhang took over this role. Dr. Li Liu was recruited to serve as an associate director. Molecular pathology, run by Dr. Paul Rothberg for many years, transitioned to the leadership of Dr. Zoltan Oltvai in 2019. Dr. Oltvai was recruited from the University of Pittsburgh, where he had overseen a very successful research laboratory. He immediately set out to build a next-generation sequencing program for the solid tissue pathology work-ups. Drs. Anwar Iqbal and Bin Zhang served as the section directors for microarray and cytogenetics, respectively, within the rapidly expanding division. Transfusion medicine continued to be run by Dr. Neil Blumberg with the able assistance of Drs. Scott Kirkley and Majed Refaai. Myra Coppage continued in her role as the director of the tissue typing laboratory, but recruited and trained Dr. Helene McMurray to serve as the associate director and her successor. Dr. McMurray is also serving as the director of the graduate studies program within the department.

While “retired,” Dan Ryan continued to oversee the clinical trials unit through the decade. His vision from more than ten years earlier had begun to pay huge dividends to the department and the institution. The unit currently has more than thirty employees. The department successfully recruited Dr. Ryan’s successor, Dr. Erin Marner, from the clinical trials division at Roche, with the hope that this unit will continue to grow and to provide a steady source of revenue to help support its research and teaching missions.

Dr. Charles Sparks announced his retirement in 2011 and was named professor emeritus. Dr. Robert Mooney, another member of the chemistry division who also served as the director of the graduate student PhD program for many years, retired in 2017. Dr. Nancy Wang retired as the director
of cytogenetics in 2015. Dr. Bin Zhang was recruited from Washington University in St. Louis to take her place. Dr. Paul Rothberg retired in 2019 and Dr. Jim Corsetti, yet another long-standing member of the chemistry division, retired in 2020. After many years of a highly successful and stable clinical pathology division largely assembled by Dr. Arvan in the 1970s and 1980s, it was time to rebuild the division.

Space

This decade saw an enormous growth in the medical center footprint and an even greater growth in patient services. Space shortage on the Strong Memorial Hospital campus resulted in the move of several departments, including diagnostic imaging, orthopedics, and dermatology, to off-site facilities. The emergency medicine department established urgent care centers throughout the region. The Department of Pathology and Laboratory Medicine was an active participant in this process. The concept of a centralized laboratory had been discussed by the hospital administration as early as fifteen to twenty years before. There was clearly a need for more acute care space within the hospital, and the administration believed that the laboratories were occupying space that could be better used for this purpose. Additionally, the physical plant at Strong Memorial Hospital was not capable of absorbing the increase in numbers of specimens that were flowing into the system as a result of the expansion of the clinical enterprise throughout the state. After decades of discussion and planning, the concept became a reality in 2019.

The first phase of a new 130,000-square-foot laboratory building was built at 211 Bailey Road in Henrietta in 2019, with flexible laboratory space designed to allow for a regional, centralized laboratory (see figures 38 and 39). All outpatient, non-urgent laboratory testing from Strong Memorial Hospital and from the affiliated hospital network was directed to the new facility, which also houses the clinical trials unit. The new building has office space (with windows!) for the
Figure 38. University of Rochester Central Laboratories at Bailey Road (2019)

Figure 39. Microbiology at Bailey Road (2019)
medical directors of the faculty who oversee the laboratories that are based there. Laboratories such as microbiology, much of automated chemistry and hematology, toxicology, the protein laboratory, and molecular pathology relocated from Strong Memorial Hospital into the new building. FF Thompson Hospital, Highland Hospital, Jones Memorial Hospital, St. James Mercy Hospital, and Nicholas Noyes Hospital redirected the majority of their outpatient testing to the new centralized laboratory.

The transfusion medicine unit and the portions of the automated chemistry and hematology laboratories that remained on-site at Strong Memorial Hospital were relocated to the ground and first floors of the 2100 wing of the hospital, enabling the department to occupy three consecutive floors. The researchers who had previously occupied this space moved into renovated space on the fifth floor of the S-wing. Faculty offices were consolidated to occupy the majority of the second floor of the 2100 wing, and a new suite was constructed in the same area for residents and fellows. The department’s footprint within Strong Memorial Hospital was becoming both smaller and more localized.

The surgical pathology suite, which saw a massive renovation and expansion at the turn of the century, remained intact but with plans to move portions of it into the next phase of the Bailey Road laboratory, allowing for further growth. At the time of this writing, the surgical pathology unit is developing plans to move various functions such as histology, immunohistochemistry, fluorescent in situ hybridization (FISH), and some specimen processing to the Bailey Road facility. In addition, various parts of the cytopathology laboratory, including specimen preparation and Pap smear evaluation, will be moved to the off-site location. Decisions regarding other parts of the operation remain unsettled at the time of this writing.

As the clinical trials laboratory expanded and became a source of pride, as well as providing a steady flow of revenue used to support departmental teaching and research activities, the unit relocated into the newly built University of Rochester Central Laboratories on Bailey Road.
Clinical

This was a period of enormous expansion and transformation for the University of Rochester School of Medicine and Dentistry. Leadership sought to actively build a stable population of “covered lives” throughout the western portion of New York state by forging relationships with several surrounding hospitals. As the institution’s mission transformed, so did that of the department.

A huge initiative for the department during this decade was one that paralleled the direction of the institution, namely expansion and consolidation. The department was charged with centralizing non-urgent anatomic and laboratory testing into a single laboratory that was built for this purpose. Dr. Victoria Zhang, a clinical chemist with additional MBA training, was called upon to oversee the process of developing a single enterprise that provides standardized, efficient laboratory testing to the network of affiliated hospitals. By 2019, the process was approximately 80 percent completed, with routine laboratory specimens arriving daily from FF Thompson Hospital, Highland Hospital, Jones Memorial Hospital, St. James Mercy Hospital, and Nicholas Noyes Hospital. Similar testing originating from Strong Memorial Hospital was also shifted to the new central laboratory, as was all of the testing from the approximately fifty regional patient service centers (off-campus sites at which outpatients can go to have blood drawn).

Surgical pathology followed suit with the trend in medicine by developing a completely sub-specialized model for diagnostic work, establishing a wide range of organ-based sections. The surgical case volume in 2014 was 55,156 cases. The volume had exceeded 75,000 accessions (and over 125,000 specimens) by 2019. Additional surgical pathology specimens were received in large numbers from affiliated hospitals. Dr. David Hicks began the decade as the director of surgical pathology and, in 2018, ceded the position to Dr. Christa Whitney-Miller. He maintains his role as the director of the immunohistochemistry laboratory. Within the division of surgical pathology, distinct sections were established for each
organ system. Each small group of faculty members assumed responsibility for diagnostic work and participation in tumor boards for their respective clinical services. Clinical colleagues throughout the institution expressed their delight at the departmental reorganization and the evident new level of sophistication with diagnostic and treatment plans. Several of the various sections have been quite successful in attracting large volumes of consultation cases, contributing to the regional reputation and the quality of the educational programs for the department. Nearly twenty histotechnologists prepare over one million microscope slides per year (see figure 40).

Ms. Laurie Baxter heads a group of eleven pathologists’ assistants who are an invaluable part of the team, providing not only grossing assistance but also teaching and expertise to the residents during their surgical pathology and autopsy rotations.

The cytopathology laboratory continues to review approximately 50,000–60,000 Pap smears per year, but the majority of time and effort is now spent on fine needle aspiration cytopathology procedures. The cytopathology slides are reviewed by

Figure 40. Histology laboratory (2018)
approximately twelve cytotechnologists. Cytopathology faculty are annually performing more than 1,200 fine needle aspiration procedures. As the decade came to an end, ultrasound-guided fine needle aspiration biopsies became an increasingly important part of the practice.

In order to provide diagnostic services for the plethora of affiliated hospitals, a division of affiliated hospital pathologists was created. To varying degrees, the department administered pathology services to FF Thompson Hospital, St. James Mercy Hospital, Jones Memorial Hospital, and Nicholas Noyes Hospital, in addition to its continued strong ties with Highland Hospital. There was a short-lived relationship with Wyoming County Hospital. The division is overseen by Dr. Tamera Paczos, a pathologist who had previously trained as an obstetrician/gynecologist. Her clinical acumen allows her to work as an ideal liaison with the community physicians in the smaller, affiliated hospitals. This group oversees frozen section diagnoses, as required at the smaller hospitals, as well as providing medical oversight for the various clinical laboratories. Routine surgical cases from all hospitals throughout the network are transported to the central laboratory for processing and signed out by the surgical pathologists within the department. Over the century, the department had provided such services to varying degrees to many smaller hospitals. However, by the end of the 2010s, the department had complete control and responsibility for laboratory services for all of the hospitals in the network. All laboratory services were now fully rolled up into the departmental operations.

Less formal relationships were established with Basset Hospital in Cooperstown and Arnot-Ogden Hospital in Elmira as the institution and the department extended services throughout the state. For many remote and smaller hospitals, the department has taken on the role of a reference laboratory. At the time of this writing, additional institutional affiliations were being entertained by upper levels of the administration. The influx of patient specimens necessitated an expansion of clinical faculty and the complete rethinking of clinical laboratory space as has been described. However,
the organizational structure of the department now allows it to more readily accommodate any further affiliations or other relationships.

By 2014, autopsy volume had diminished to 193 cases. The addition of a strong advocate for autopsies, Dr. Caroline Dignan, resulted in increased numbers of cases thereafter, with numbers rising back to almost 250 by 2019. Dr. Dignan had served for many years as the medical examiner for Monroe County before she was recruited to join the department in 2016. Her expertise in forensic pathology further enhanced the educational component of the department, though residents continue to rotate through the county facility for their primary training in forensics. Her passionate advocacy for postmortem examinations has resonated with several clinical services and resulted in renewed interest throughout the medical center.

The large and complex clinical operation could not survive without an effective administrative organization, overseen by the vice chair for administration, Ms. Kelley Suskie. Ms. Melissa Allen serves as the administrative director of operations; Ms. Rosemary Ziemba-Ball, the administrative director of finance, monitors the departmental finances; and Mr. Bill Andrews is the administrative director of the enormous information technology program. Ms. Fran Gersonia is the administrative director of the quality assurance program that ensures regulatory compliance in hospital laboratories throughout the enterprise. As the enterprise continues to evolve, Ms. Gersonia is developing a portfolio of shared operating procedures to be followed across the group of hospital laboratories. Ms. Vicki Vandewalle is the director of performance improvement and projects and played a central role in the construction and consolidation projects of the decade (for which she was recognized with the University of Rochester Meliora Award in 2019). Ms. Judy Sterry just completed her long-standing tenure as the administrative director for strategic planning and retired in early 2020 after many years of service in the department. Ms. Kim Evans-Dame serves
as the department’s human resources business partner. Ms. Kathleen Leibenguth oversees the clinical trials unit.

Research

The Department of Pathology boasted several extramurally funded scientists throughout the decade. Dr. Brendan Boyce continued with his work in osteoclast biology and remained a mainstay of the musculoskeletal research unit. Dr. Lianping Xing, whose career started under the tutelage of Dr. Boyce, continued with her own successful NIH-funded program, working in a similar scientific arena. Dr. Archibald Perkins, a hematopathologist, made some breakthrough discoveries with his extramurally funded leukemia research. Dr. Chang continued with his work in prostate carcinogenesis. Dr. Zhenqiang Yao became an independently funded investigator, working in the field of cancer metastasis. Dr. Richard Burack also garnered some extramural funding for his studies on tumor microenvironment. Dr. Andrew Evans, also a member of the hematopathology unit, was awarded a Wilmot Cancer Institute training grant. Hiroshi Miyamoto derived grant support from the US Department of Defense, as well as garnering industry support.

Dr. Benjamin Frisch was recruited to join the basic science team, working in hematologic malignancies and tumor microenvironment. The department was also successful in recruiting several young physician scientists. Drs. Nicole Pecora, Bin Zhang, and Rajnish Bharadwaj began to develop exciting programs in microbiology, cytogenetics, and neurobiology, respectively. Dr. Michael Drage is also pursuing an investigative career in gastrointestinal disease, along with his work on the GI pathology service.

Dr. Peter Sims retired and became a professor emeritus in 2012. Dr. Janet Sparks retired in 2014. Dr. Brendan Boyce moved to a part-time status toward the end of the decade. He continues to have NIH funding.

The end of the decade saw the initiation of a huge campaign to recruit a vice chair for experimental pathology to
oversee a formal new division in hopes of expansion and to provide institutional support to the Wilmot Cancer Institute initiative to attain National Cancer Institute designation as a cancer center.

Education

Dr. Jennifer Findeis-Hosey assumed the position of medical student education director in 2014. Beginning in the years before, and accelerating during her tenure as director, the medical school curriculum underwent a complete transformation. The year-long pathology course was replaced with a curriculum that was organ-based, into which pathology education was interspersed with physiology, histology, pharmacology, and clinical diagnosis for each organ system. This followed the national trend that occurred in virtually all medical schools. As the directorship for each of the organ-based courses progressively came under the control of clinicians, the role for pathologists in the medical school curriculum continued to diminish. Nonetheless, Dr. Findeis-Hosey was able to build a large and enthusiastic student organization, the Pathology Interest Group, designed to stimulate interest in pathology as a field. Nonetheless, interest in residency training in pathology continued to wane amongst URMC medical students.

Dr. Findeis-Hosey initiated the department’s participation in a program for exceptional high school students known as Explorations in Pathology, further expanding the department’s commitment to education at all levels. High school students spend several weeks in the department learning about the specialty and rotating in the laboratories.

In 2019, Dr. Linda Schiffhauer replaced Dr. Kirkley, who had served as the residency director for eighteen years. Dr. Majed Refaai moved into the role as the associate director and this initiated a new era of changes in the residency educational program. Dr. Kirkley’s tenure was characterized by stability and the consolidation of a solid program that annually excelled in ACGME reviews. The department consistently
graduated from three to five residents each year. Virtually all of the graduates pursued subspecialty fellowships, though largely in other sites due to the paucity of fellowship offerings at URMC. Our resident graduates routinely were placed in elite fellowship programs. About half of these trainees went on to community hospital–based jobs, while the other half remained within academia.

The residency program was capped at sixteen residents for many years, despite the fact that the service workload for the department had increased manifold (see figure 41). It remained at this level until 2020, at which time the department was granted permission to increase by one additional resident per year, up to a total of twenty residents. The dearth of American-trained medical students pursuing residency training in pathology became a serious national issue, with many programs
failing to fill all of their available training slots. Despite this, the department continued to do well, recruiting fine residents to fill all of the spots for the latter half of the decade. This is a testament to the excellent job Dr. Kirkley did in overseeing the screening and recruiting of our trainees.

During this period, subspecialty pathology fellowship training programs at URMC also greatly increased. The medical school administration realized that the department’s postgraduate educational offerings were disproportionately small compared with the clinical enterprise and the department’s training program was suffering as a result. The department added ACGME-accredited programs in transfusion medicine, dermatopathology, forensic pathology, and pediatric pathology. The Milton J. Finegold Pediatric Pathology Fellowship program was made possible by a generous philanthropic gift from Dr. Milton Finegold. Dr. Finegold was a graduate of the University of Rochester School of Medicine and had done a year-out medical student fellowship in the pathology department in 1958–59 (see figure 42). Inspired by his mentors, Drs. Terry and Hawkins, Dr. Finegold was moved to give back to his old alma mater. The dermatopathology fellowship was created in partnership with the Department of Dermatology and the forensic pathology program in conjunction with the Monroe County Medical Examiner, overseen by Dr. Nadia Granger, an alumna of our residency training program. These new fellowships were added to the extant ones in hematopathology, cytopathology, microbiology, and transfusion medicine, as well as three in surgical pathology. At the
time of this writing, an additional fellowship training program in molecular pathology is under consideration.

The graduate student program remained under the direction of Dr. Robert Mooney until 2016. Upon Dr. Mooney’s retirement, Dr. Rick Libby, a member of the Department of Ophthalmology, briefly stepped in to oversee the program. Shortly thereafter, he was promoted to the rank of senior associate dean of graduate education and relinquished this position. Dr. Helene McMurray was appointed to the position in 2018. Dr. McMurray has a PhD in microbiology and has spent many years working in the fields of genomics, bioinformatics, and biostatistics. The program continues to thrive and, under Dr. McMurray’s leadership, is undergoing some significant modifications. She has worked with Drs. Schiffhauer and Findeis-Hosey to integrate the graduate students and research faculty with the clinical residency and educational missions. Over the decades, the basic science and service components of the department had drifted apart, reflecting the increased pressures in both arenas. The change in leadership within both educational components began a concerted effort to meld the goals and educational opportunities in hopes of creating synergies.

In 2017, the department admitted its first class of medical technology students (see figure 43). Faced with a crisis that existed nationally, but to a larger extent within the state due to New York’s restrictive licensing criteria, the department decided to begin its own program. Ms. Vicki Roberts was able to escort the program through its ultimate National Accrediting Agency for Clinical Laboratory Sciences (NAACLS) accreditation and to serve as its inaugural program coordinator. Initially admitting twelve students per year, the program rapidly expanded to fifteen annually. Many of the graduates immediately joined the workforce at URMC, which was the proximal goal of the program. The department is currently initiating the work to expand the program to include a phlebotomy training program.

Ms. Donna Russell serves as the program director for a joint cytotechnology training program in conjunction with
Roswell Park Cancer Center’s cytopathology unit and Daemon College. They train two cytotechnology students per year and there are thoughts about expanding this program. Members of the cytopathology faculty and other cytotechnologists also participate in this program.

The medical student year-out program continues to be a very popular and successful program, despite the marked reduction in available funding sources. Each year, one or two superb medical students opt to spend a year serving in a position similar to that of a first year resident in the department. These students continue to be amongst the brightest and most motivated of the URMC medical students. Dr. Whipple’s initial concept persists a century later.

New Developments/Achievements

The new University of Rochester Central Laboratories building was erected at Bailey Road. Using the old Cardiovascular
Research Institute (CVRI) laboratory building as a foundation, the department constructed a 130,000-square-foot building to house many of its laboratories. In the first phase of the project, microbiology, much of the automated hematology and chemistry laboratories, molecular pathology including microarray and cytogenetics, toxicology, specimen management, phlebotomy, and the information technology units relocated to the new building. When the project is complete, parts of cytopathology and surgical pathology will also move into the modern, flexible open laboratory building. The second phase of the building project with additional clinical laboratory space is currently in the planning stages.

The department implemented many advances in technology as part of the regional expansion of laboratory services. The bacteriology section within microbiology became largely automated by the end of the decade. The automated chemistry operations became more streamlined with automation of the pre-analytical aspects of the system. The new central laboratory implemented a LEAN design in order to maximize efficiencies in the newly erected building. Next-generation sequencing became part of the basic work-up for hematologic malignancies, with solid tumor panels following close behind.

Anatomic pathology began to experiment with telepathology as a means to provide frozen section coverage at the outlying affiliated hospitals, but without necessitating a full-time pathologist’s presence at these smaller settings. Voice recognition software transformed the way surgical pathologists worked through cases, largely obviating the need for transcription. Fluorescent in situ hybridization (FISH) technology became part of the standard work-up for breast cancers. Bar-coded slides and other automated cassette printers have been implemented in order to reduce labeling errors.

As the decade comes to an end, department leadership spends a great deal of time debating the transition into whole-slide imaging technology and the potential benefits of introducing image analysis software into the clinical services.