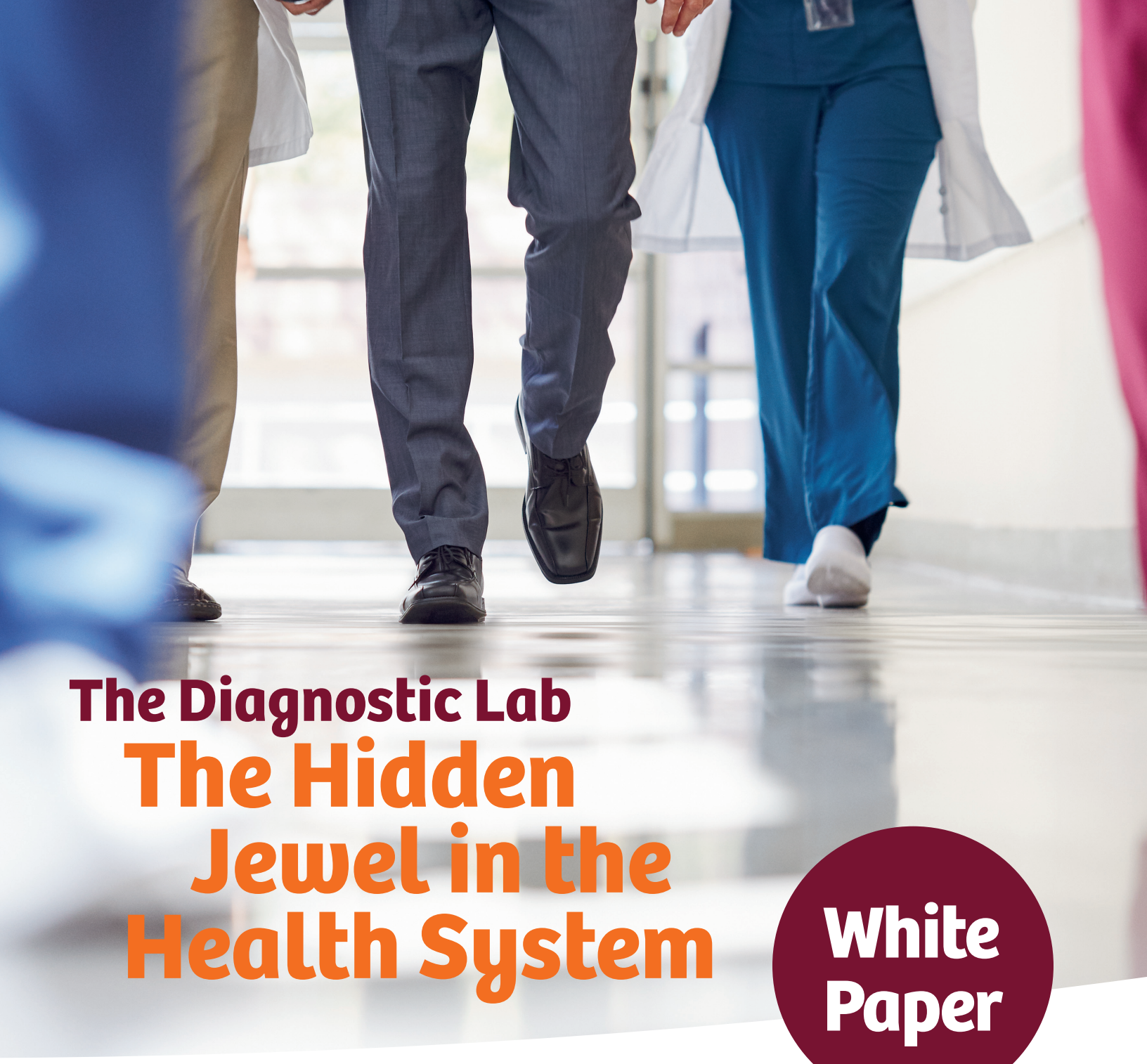

The Diagnostic Lab

The Hidden Jewel in the Health System

White Paper

Laboratory services and technologies have been shown to improve physician and patient satisfaction, drive patient outcomes at reduced costs, and strengthen hospital reputation and revenue in the long term – yet the value of the diagnostic lab often goes unrecognized.

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SIEMENS Healthineers

Executive Summary

Laboratory services and technologies are unquestionably important steps throughout the patient's clinical journey. Yet, investment in these services and technologies may not be a priority because the value they provide may go unrecognized.

A three-pronged research initiative—which included a primary study of U.S.-based hospital physicians and lab directors, an extensive review of published studies and real-world case studies, and interviews with physicians and hospital executives—helped demonstrate the value of laboratory services in the healthcare system. The initiative found:

Big value for relatively small investment.
Several studies have shown that test results from in vitro labs drive about 70 percent of clinical decision making and comprise less than five percent of hospital costs (Cadogan et al., 2015; Lippi et al., 2016; Plebani, 2015; Rohr et al., 2016; Sarata and Johnson, 2014).

Enhanced patient and physician satisfaction, patient safety, and hospital reputation.
According to the Siemens Healthineers study *The Value of In Vitro Diagnostic Testing* (2017), turnaround time (TAT) of in vitro diagnostic lab results is a key factor that drives patient and physician satisfaction and patient safety. According to the study, nearly three-quarters of emergency medicine physicians, hospital lab directors, and internists agreed that improving TAT is directly linked with satisfaction and safety. Additionally, Chicago-based Swedish Covenant Hospital reported that due to investment in its lab, patient and physician satisfaction improved and the hospital attracted more patients.

Reduced costs.
New technological developments within the laboratory have contributed to reducing costs throughout the healthcare system. For example, 65 percent of top technology hospitals as defined by U.S. News & World Report have an average Medicare Spending per Beneficiary (MSPB) score below the national average (Avalere, 2015). Additionally, Swedish Covenant Hospital reported that between 2002 and 2016—as the hospital was making strides in reducing TAT—the number of full-time employees within the technical area declined, resulting in a cost savings of more than 20 percent. This cost savings was a direct result of Swedish Covenant's decision to upgrade its laboratory operations, including introducing lab automation, streamlining processes, and reducing manual intervention throughout the system.

"The diagnostic laboratory is an instrumental part of the continuum of care for every inpatient, every ER visitor, and every outpatient that comes through our organization."

Anthony Guaccio, CEO,
Swedish Covenant Hospital

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Introduction

In vitro diagnostic laboratories play a vital role in healthcare systems, especially as they shift to a value-based model. Advancements in the field will not only solidify certainty about the presence and diagnosis of diseases, but also improve patient experience, assist in prognoses, and monitor the clinical course of diseases (Fang et al., 2011). Additionally, several studies have shown that test results from in vitro labs drive about 70 percent of clinical decision making and comprise less than five percent of hospital costs (Cadogan et al., 2015; Lippi et al., 2016; Plebani, 2015; Rohr et al., 2016; Sarata and Johnson, 2014).

While patients do not always have direct exposure to the lab, evidence suggests labs are indispensable and a hidden jewel in the health system because they help reduce late-stage healthcare expenditures, which can in turn decrease costs for patients, providers, and governments (Rohr et al., 2016).

As the role of the in vitro diagnostic lab is growing in the healthcare system, embracing innovation and technology within the lab has become essential. This dynamic was explored in depth in the 2017 study *The Value of In Vitro Diagnostic Testing*. In the study, 300 U.S. hospital physicians were surveyed to explore the value of in vitro diagnostic testing to patients, providers, and the healthcare system as a whole. The study found that 80 percent of emergency physicians and hospital lab directors/pathologists agree that increased investment in technology for in vitro diagnostic lab automation can ultimately improve patient care.

An average of 71% of emergency physicians, hospital lab directors and internists agree that improving turnaround time of laboratory results is a very important factor in improving patient safety.

Improving Patient and Physician Satisfaction, Strengthening Patient Safety

The value of investing in the diagnostic lab has proven to be a crucial factor in improving patient safety and patient and physician satisfaction, particularly through improvements in TAT. This was determined by *The Value of In Vitro Diagnostic Testing* study and the Swedish Covenant Hospital case study.

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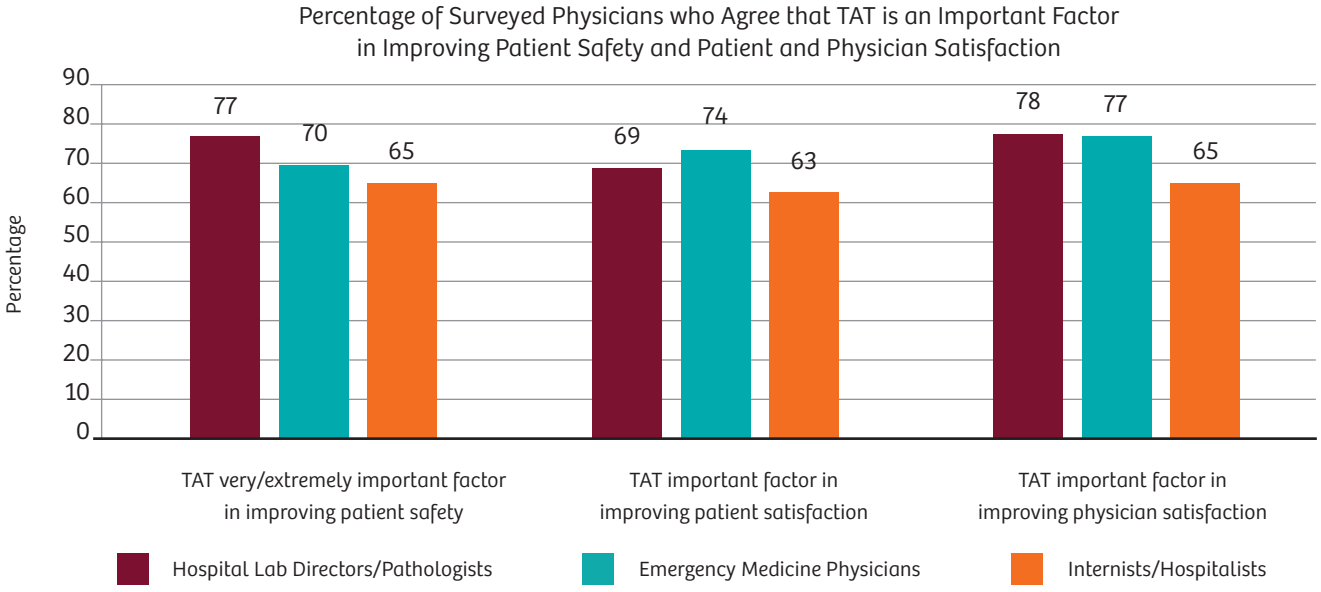
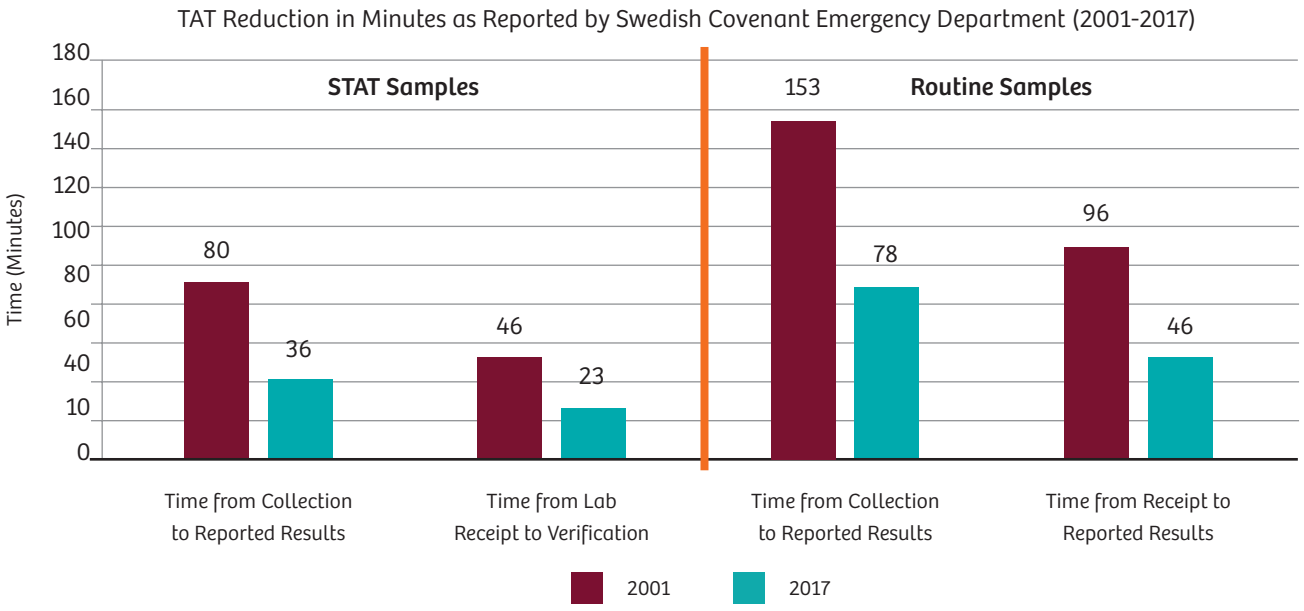
According to *The Value of In Vitro Diagnostic Testing* study, ER physicians, internists/hospitalists, and lab directors unanimously agree that TAT drives significant physician and patient satisfaction, as well as patient safety.



An evaluation of Chicago-based Swedish Covenant Hospital found that while the hospital was making strides in reducing TAT, it recorded improvements in physician and patient satisfaction in the form of fewer blood draws and reduced bed time. As a result, Swedish Covenant enhanced its lab's ability to meet the needs and commitments of the hospital's patients and physicians, including faster diagnoses and the ability to get patients on the appropriate treatment more quickly. From 2001 to 2017 they were able to reduce TAT of STAT samples by 55 percent. The routine sample TAT was reduced by 49 percent in the same time period.*



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Driving Hospital Reputation and Performance

Clinical and financial improvements driven by the lab—including enabling a shorter TAT and improving referral satisfaction—also deliver indirect benefits, from enhanced reputation to improved competitive positioning. At Swedish Covenant Hospital, the hospital's ability to improve patient and physician satisfaction bolstered its reputation. In turn, the hospital attracted more patients.

"We invested in our lab to improve profitability and clinical excellence by measures including reducing errors, improving quality, meeting physician needs, and improving turnaround time," said Susan Dawson, lab supervisor at Swedish Covenant.

While measuring reputation and competitiveness can be challenging, improvements in the scope and volume of procedures performed at Swedish Covenant are important performance indicators. As depicted in the table to the right, the shift to a more outpatient-focused model at Swedish Covenant is in line with worldwide industry trends and is a key example of how these efforts are enhancing the hospital's reputation.

Swedish Covenant was able to improve it's competitiveness by an increase of almost nine percent of outpatient procedures over the course of 5 years.*

The value of embracing technology in the lab to increase patient and physician satisfaction—and ultimately patient care—as well as to improve financial performance is embodied by the ongoing partnership between Swedish Covenant and Siemens Healthineers.

In 2002, Swedish Covenant expanded its long-standing partnership with Siemens Healthineers through a new initiative designed to improve its laboratory equipment and processes by embracing technological innovation.

Through this partnership, Swedish Covenant tasked Siemens Healthineers with significantly upgrading its laboratory operations, introducing lab automation, streamlining processes, and reducing manual intervention throughout the system. As a result of this partnership, Swedish Covenant has transformed its lab operations to harness change and drive maximum performance and efficiency. The hospital achieved significant improvements in clinical excellence, financial performance and reputation, and competitiveness.

Procedure Type	2011	2016	Change
Total procedures	802,385	826,708	+3.03%
Inpatient	384,781	372,532	-3.18%
Outpatient	417,604	454,176	+8.76%

"If patients trust the lab, and the wait times for results are short, patients gain a tremendous sense of well-being,"

Dr. Eric Gluck, an internist and critical care physician associated with Swedish Covenant.

Reducing Costs, Improving Outcomes

The financial and clinical impact of embracing technology in the lab has also been examined. Hospitals in the US that incorporated innovative medical technologies have Medicare Spending per Beneficiary (MSPB) scores below the national average (Avalere, 2015). This suggests hospitals that have adopted the latest medical advances and provide technology-intensive care have helped reduce government spending on healthcare. Avalere found that 65 percent of top technology hospitals as defined by U.S. News & World Report have an average MSPB score below the national average, compared with 56 percent of the non-top technology hospitals. Additionally, Avalere (2015) found that the top technology hospitals with at least 200 beds had lower mean MSPB scores compared with other hospitals (0.9794 versus 1.0033, respectively; $p<0.0001$), which indicates investments made in larger hospitals in particular can have a meaningful impact.

The Value of In Vitro Diagnostic Testing study also showed that physicians strongly believe that investment in laboratory technology leads to cost savings, increased revenue, and better patient care (see graph).

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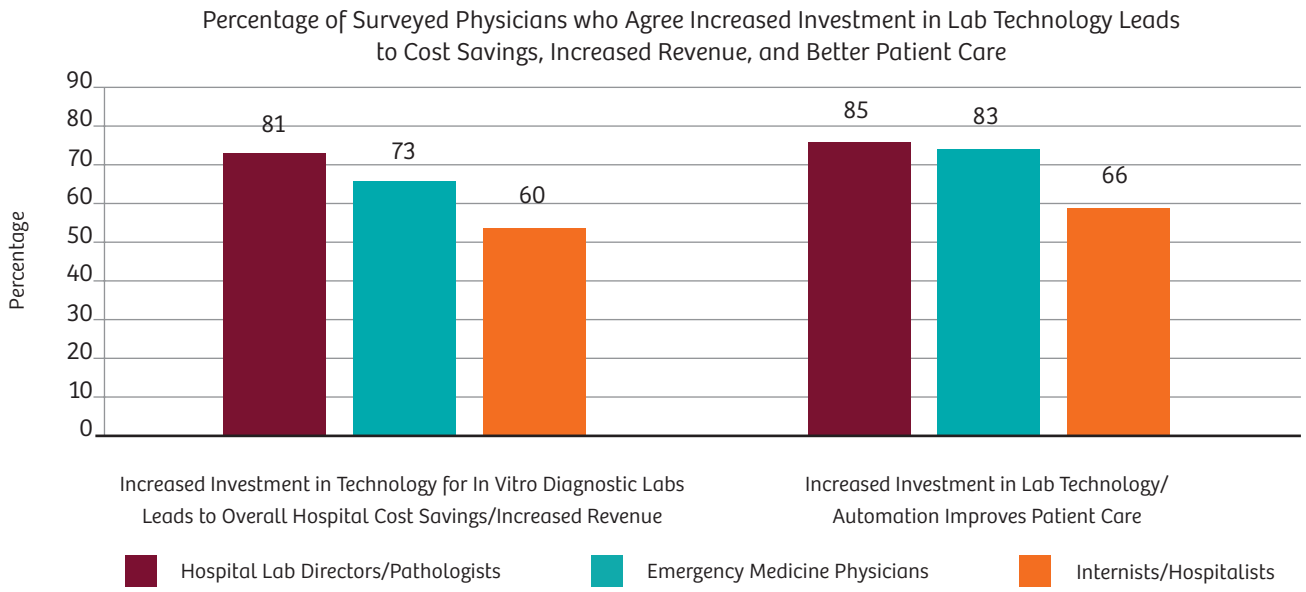

Evaluating Technology Investments

According to the Avalere study (2015), senior executives at five top technology hospitals said their organizations work closely with clinicians to adopt technologies that meet the following criteria: ability to improve patient outcomes; impact on hospital revenue and profitability; prestige associated with technology/procedure; and impact on patient referrals.

More specifically, the study determined that many top technology hospitals have implemented formal processes to evaluate, approve, and manage the integration of new technology into care delivery. When evaluating investments, considerations include:

- A technology's ability to increase referrals and overall procedure volume
- Technology, even at a high cost, that would make the hospital a market leader and contribute positively toward its reputation
- A new technology that would make the hospital the first and only provider within its market to offer it
- The impact of a technology on a specific procedure's profitability, a 30-day episode of care, or the annual department or hospital budget
- The "halo effect" of a new technology and its ability to increase revenue beyond the procedure itself, including pre- and post-procedure tests, imaging and other services used by the patients and their families
- Innovative technologies that may result in cost offsets or savings by reducing complications and health resource use, influencing recovery time and patterns of post-acute care and driving overall efficiencies

Conclusion

The lab plays a significant role in ensuring physicians can manage their patients' treatment regimens accurately and efficiently, thus improving patient experience. It is also integral to improving hospitals' profitability and clinical excellence by reducing errors, improving quality, and meeting physician needs.

In the age of value-based care, the lab is emerging as the hidden jewel in the health system. Investment in innovative lab services and technologies will enable hospitals to improve patient outcomes while reducing costs, strengthen physician and patient satisfaction, and enhance revenue and reputations for hospitals in the long term.

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CASE STUDIES

Case Study: Ankara Numune Training and Research Hospital

The decision to embrace innovation has directly benefited the lab at the Ankara Numune Training and Research Hospital in Ankara, Turkey, where hospital managers conducted a literature review in order to identify strategies used to improve lab efficiency.

Study Design:

- Hospital managers identified and implemented strategies that would be applicable in the local setting to improve lab efficiency. They assessed the impact on clinical use and costs over the course of 12 months.

Study Findings:

- Use of computerized decision support systems improved physician prescribing behavior.
- IT systems with computerized alerts can warn clinicians and lab specialists when certain tests are ordered excessively, indicating the importance of collaboration between physicians ordering tests and the lab team providing the services.
- Organizational strategies including a focus on how Total Quality Management can optimize use of lab services.

Study Outcomes:

- A hospital committee began an educational campaign to inform clinicians about lab costs and use.
- The committee reorganized its laboratory test-ordering system to detect overused tests and prompted notes to alert the requesting physician about redundancies.
- The hospital reduced the number of lab testing orders from the previous year, ranging from 12.6 to 85 percent. The one year impact of the study was calculated as a total savings of $371,183.

Case Study: Swedish Covenant Hospital

Swedish Covenant saw financial benefits in conjunction with its investment in technological upgrades within the lab, allowing the hospital to operate more efficiently and deliver improved outcomes at a lower cost. Improvements through automation hardware and software were able to address a lack of qualified staff, ensuring more tests per full-time employee (FTE) could be performed. Importantly, the reduction in staff did not affect the TAT for tests within the Emergency Department or routine work.

"We are a standalone hospital and, in order to thrive, we have to continually become more efficient and be able to offer an equal or better service to our physicians and our patients than some of the larger systems that we compete against," said Anthony Guaccio, Chief Executive Officer of Swedish Covenant. "The multi-year upgrade of the laboratory diagnostic system helps us remain competitive in this rapidly changing environment."

Specifically, between 2002 and 2016 – while TAT improved – the number of FTEs within the technical area declined, resulting in a cost savings of 20.48 percent. This incorporated all technical FTEs for the dayshift covering the Chemistry, Hematology, Coagulation and Urinalysis departments, plus all technical FTEs in the lab for the evening and night shifts, including the lab supervisor.

In addition, between 2011 and 2016, Swedish Covenant produced 12.28 percent more tests per FTE, and the ratio of FTE time needed per result declined by 11.02 percent.

"As reimbursement becomes less certain, we have to become more efficient if we're going to retain the workforce that we have," said Guaccio. "This is very important for us, and this equipment certainly helps us do that."

*The outcomes obtained by the Siemens Healthineers customer described here were realized in the customer's unique setting. Since there is no typical laboratory, and many variables exist, there can be no guarantee that others will achieve the same results.

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