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Rethinking Mayo Clinic supply chain saves valuable lab time

Founded in 1864 and headquartered in Rochester, MN, the Mayo Clinic is a nonprofit American academic medical center focused on providing the best care to every patient through integrated health care, clinical practice, education, and research. A leading health care system, its practice specializes in treating difficult cases through tertiary care and destination medicine.

The Mayo Clinic's 63,000 employees include more than 4,500 physicians and scientists, along with another 58,400 administrative and allied health staff, across three major campuses in Rochester, Jacksonville, FL, and Phoenix and Scottsdale, AZ. It operates many of the highest regarded medical residency education programs in the United States; spends more than $660 million a year on research; and has more than 3,000 full-time research personnel. Mayo Clinic researchers contribute to the understanding of disease processes, best clinical practices, and translation of findings from the laboratory to clinical practice.

In addition, the Mayo Clinic partially owns and operates the Mayo Clinic Health System, which consists of more than 70 hospitals and clinics across Minnesota, Iowa, and Wisconsin; operates the Mayo Clinic College of Medicine and Science, a nonprofit college dedicated to training medical and allied health professionals at Mayo Hospitals; and operates a clinic in London, UK in a collaboration with the University of Oxford and Oxford University Hospitals NHS Foundation Trust.

In 2018, more than 1.2 million patients from all 50 states and 138 countries were seen at Mayo Clinic facilities. The Mayo Clinic offers highly specialized medical care, and a large portion of the patients are referrals from smaller clinics and hospitals across the upper Midwest and elsewhere in the United States, generating approximately $15.6 billion in revenue in 2021.

The Mayo Clinic has ranked number one in the United States for six consecutive years in U.S. News & World Report's Best Hospitals Honor Roll, maintaining a position at or near the top for more than 35 years. It has been on the list of "100 Best Companies to Work For" published by Fortune magazine for 14 consecutive years. Drawing in patients from around the globe, the Mayo Clinic ranks among the top U.S. health care facilities for performing transplants, including both solid organ and hematologic transplantation.

Above: Test tubes and petri dishes

"It was an exceptional project. The Mayo Clinic is already known for being a high-performing organization. The Tauber team took their clinical labs to a new level, improving their supply chain management and allowing lab staff to transform time savings into increased testing capacity."
Lawrence Seiford, Tauber Institute Business Co-Director

The Mayo Clinic's Department of Laboratory Medicine and Pathology (DLMP) performs testing services for diagnostic and therapeutic evaluations, completing 27 million tests annually for both internal and external patients. Tens of thousands of unique laboratory supplies are required to perform hundreds of distinctive medical tests and services. To source, procure, manage and distribute inventory, DLMP partners with the Mayo Clinic's Supply Chain Management (SCM) group.

Dr. David Chesney
College of Engineering

Dr. Lisa Pawlik
Ross School of Business

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Organic growth in testing volume and COVID-19 pandemic-related supply chain disruptions put pressure on DLMP's inventory management practices and revealed areas of opportunity for improvement. DLMP's 125 production labs were each independently managed, which led to great variation in how inventory was handled and by whom. Limited SCM support and inadequate technology systems inhibited positive change.

To deal with this issue, the Mayo Clinic brought in a student team from the Tauber Institute for Global Operations at the University of Michigan, consisting of **Andrew Johnston**, working on a Master of Business Administration (MBA) degree, and **Amalia Siavelis**, a member of the Engineering Global Leadership Honors (EGL) program, which leads to BSE in Biomedical Engineering and MSE in Industrial and Operations Engineering degrees.

"The Covid-19 pandemic severely impacted the health care supply chain, and the Mayo Clinic was not immune from disruptions and delays," said Johnston. "Our team was brought in to address challenges with managing supply inventory for Mayo Clinic's diagnostic labs, which account for $2 billion in patient testing services annually."

The Tauber team leveraged a framework of people, processes and technology to identify inventory management improvements that would net financial and operational gains.

"Our project was designed to immerse our team into the Mayo Clinic labs as quickly as possible," said Johnston. "We accomplished this by visiting over 40 labs across three Mayo Clinic campuses in Minnesota, Arizona, and Florida, where we spoke with 150 different people across laboratory medicine and supply chain roles.

"The labs themselves were all very different, from the sample type being processed to the equipment used to the physical space of the labs and where they did or did not keep inventory," he continued. "The Mayo Clinic has 125 diagnostics labs, so our solution had to be both detailed but also flexible in order to implement."

The Tauber team also held benchmarking conversations with 15 industry partners to create a current state gap analysis.

"Our team recommended the Mayo Clinic invest in a more robust centralized supply chain planning and execution group," said Johnston. "The first phase was to improve daily operations by shifting responsibility of managing lab supplies from science-focused lab technicians to a dedicated logistics-focused team responsible for keeping proper inventory levels and working with suppliers on complex order execution."

Next, the Tauber team conducted a proof-of-concept implementation within two DLMP labs to measure the impact of their recommended changes and evaluate their ability to scale solutions.

"We conducted a pilot for one week at two labs in Rochester, MN, one at Mayo Clinic's downtown campus and the other at its Superior Drive location, a facility that has larger lab space and does more external lab testing than the typical hospital setting," said Johnston. "Our team was able to implement lean concepts addressing 20 unique items, resulting in an immediate savings of around $10,000. More importantly, our team was able to receive buy-in from both laboratory and supply chain leadership about the feasibility of our proposed people and process changes for a full-scale rollout across the organization.

"During the pilot implementation phase, our team tried out lean visual management techniques so that employees could more easily determine if inventory levels were too high or too low," he continued. "For example, we created a rotating bin kanban system where each bin contained a fixed number of parts. The bins were clear so one can easily see what was inside them and had lids that were kept on if they were completely full. This simple change reduced the reconciliation time, a weekly time-intensive task, from minutes to seconds."

Above, left to right: Andrew Johnston and Amelia Siavelis

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Finally, the Tauber team refined their analysis and delivered final recommendations and a phased rollout roadmap. The team identified the potential for significant revenue gains through laboratory capacity advancements and cost savings through the application of lean principles. Over three years, the Tauber team projected that Mayo Clinic can net $112 million.

To unlock this value, the Tauber team recommended that the Mayo Clinic form SCM teams for supply logistics and complex order management, and transfer inventory responsibilities from laboratory staff to these new, improvement-focused groups.

"The Mayo Clinic has approved the addition of 20 new supply chain employees to lead day-to-day execution of supply chain strategy and began hiring in the fourth quarter of 2021," said Johnston. "Mayo Clinic is looking to invest in making improvements to their supply chain robustness to ensure that they can continue to serve patients even in times of severe disruption."

As a result, it is estimated that 83,000 laboratory hours per year would be returned to DLMP lab activities. In addition, the Tauber team built the business case for improved data analytics and project management capabilities in order to transform DLMP's inventory management from a business challenge to a strategic advantage.

Overcoming these significant business challenges was crucial for this project.

"The healthcare industry is less mature in their operations than a traditional manufacturing environment," said Johnston. "The implementation of sound process is crucial now as these organizations look to accelerate through technology investments in the near future.

"There was a significant change management hurdle to overcome that stemmed from Mayo Clinic's core value of putting patients first," he continued. "Any idea that our team recommended first needed to be vetted so that it would not negatively affect Mayo Clinic patients. To overcome this key requirement, our team looked to frame problems as ways that we can both improve operational costs and the patient experience while at the Mayo Clinic."

Tauber Institute Business Co-Director Lawrence Seiford said, "It was an exceptional project. The Mayo Clinic is already known for being a high-performing organization. The Tauber team took their clinical labs to a new level, improving their supply chain management and allowing lab staff to transform time savings into increased testing capacity."

Student Team:
Andrew Johnston – Master of Business Administration

Amalia Siavelis – EGL (BSE Biomedical Engineering & MSE Industrial and Operations Engineering)

Project Sponsors:
Joe Dudas – Division Chair, Supply Chain

Bruce Gilmore – Director, Supply Chain Management

Kari Solak – Performance Consultant, Supply Chain Management

Faculty Advisors:
David Chesney – College of Engineering

Lisa Pawlik – Ross School of Business

About Tauber Team Projects

The 2021 Tauber Team Projects resulted in $989 million in savings according to sponsoring company calculations, an average of $43 million per project over 3 years.

Each two to three-person Tauber Team consists of graduate engineering and/or graduate business students. Along with receiving high-level corporate support from the sponsoring company, each team is advised by a College of Engineering and a Ross School of Business faculty member and overseen by a Tauber Institute Co-Director. The projects begin on-site in May and continue for 14 weeks. Students present the results of their projects and compete for over $40,000 in scholarships at the U-M Tauber Institute's annual Spotlight! Team Project Showcase and Scholarship event, held each September in Ann Arbor, Michigan. Spotlight! provides outstanding opportunities for students and corporate partners to establish relationships while exploring innovations in operations and manufacturing.

To learn more about the Tauber Institute for Global Operations, visit tauber.umich.edu or contact us at 734-647-1333.

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