Management Engineering & Internal Consulting

Best-Achievement of Operational Excellence in Healthcare Award Application
Business Transformation and Operational Excellence World Summit (BTOES19)

250-Word Synopsis

Mayo Clinic is the first and largest integrated, non-profit medical group practice in the world. Mayo effectively integrates clinical practice, research, and education to achieve its mission of "*the needs of the patient come first*". Mayo Clinic has more #1 US News & World Report rankings in medical specialties than any other hospital in the nation.

Mayo Clinic has major campuses in Rochester, MN; Scottsdale and Phoenix, AZ; and Jacksonville, FL. The Mayo Clinic Health System has approximately 70 locations covering several states and the Mayo Clinic Care Network has over 40 affiliated national and international healthcare organizations. Last year, 1.3 million people from all 50 states and 143 countries chose Mayo Clinic. To meet customer needs, Mayo employs 4,729 staff physicians and scientists and 58,405 allied health staff. Total revenue from current activity (in millions): $11,993.

In 1947, Mayo Clinic formed an industrial engineering team, now known as Management Engineering & Internal Consulting (ME&IC) to improve operational performance and replicate best practices from other industries. Today, ME&IC has over 200 professional and support staff who partner in the visioning, design, development and execution of Mayo Clinic's strategic priorities, core operational systems and transformation programs.

The following information highlights how ME&IC has grown into an enterprise shared service asset and shares examples of strategic initiatives with significant organizational impact: Reengineering for Bone Marrow Transplant, Robotic Process Automation, and Optimization of Appointment Scheduling.

The Operational Excellence project implementation process and timeline.

ME&IC began its shared service journey in 2013 leveraging lessons learned internally at Mayo and across various industries. A two-phased implementation approach was adopted beginning in 2014. The first phase focused on integrating staff in nearly identical functions from Mayo Clinic sites in Arizona, Florida and Rochester. In 2016, the second phase integrated staff distributed across multiple Mayo Clinic Health System sites.

The preparation to implement the shared service model included a literature review, customer and leadership interviews at each Mayo site, interviews with Mayo Clinic shared service leaders and benchmarking with external organizations and industries that have mature, best-practice shared service models.

The strategic objectives and scope of the operational excellence deployment (short and long term)

Initially, the shared service convergence and standardization focused on leveraging talent recruitment and retention best practices. As units from multiple states came together to form a single department, common best-practice processes were developed to source, hire and retain the best talent. Standardized job descriptions, career paths and compensation models were also created.

A Talent Management Oversight Group was formed to identify, manage and deliver professional education and to promote a culture of continuous and collaborative learning. Staff members are encouraged to publish project results in peer reviewed journals, to present at national and international conferences and to pursue professional board memberships. Staff members have averaged approximately 50-80 publications or presentations annually.

Today, the department strives to deliver exceptional end-to-end consulting and engineering experience and strategic value for the organization. Efforts to increase professional consulting and engineering excellence include continuously researching and benchmarking with other organizations and industries, as well as implementing interventions to accelerate business, technical and organizational knowledge.

The size of the deployment challenge

The ME&IC 200-member department is comprised of three sections and 14 work units located across all major Mayo Clinic sites. ME&IC staff support the strategic priorities of the organization that span the Clinical Practice, Education,

Research, Administration and Business Development. The repeat business for ME&IC is very high and sustains the value and credibility of the group.

The impact of the Operational Excellence deployment

ME&IC is comprised of health systems engineers (HSEs) and project managers (PMs). These staff support service lines that include strategy, design and execution; management, systems and process engineering; change management and organizational transformation; revenue enhancement and expense management, and advanced project management.

The role of ME&IC within the organization positions team members to have far and wide-reaching impacts, and assist with strategic priorities across all sites and businesses. The department leverages the following enabling characteristics as an advantage:

- End to end consulting – providing services from project initiation through final execution and sustainability
- Knowledge retention – knowledge from completed projects is retained and leveraged at Mayo
- Improved consulting cycle times – internal consulting staff are positioned to respond quickly on project deliverables
- Professional Credibility – long-term relationships enhance client understanding, buy-in and commitment
- Objective organizational perspective – strategic and operational experience at a site and organizational level allows staff to provide broad organizational perspectives
- Commitment to the Mayo vision – understands and is committed to the institutional mission and vision

The organizational results of Operational Excellence deployment

The ME&IC Balanced Score Card is designed to measure, monitor and report the shared service maturity and performance excellence. It aligns with the Mayo Clinic Balanced Scorecard and includes measures of customer and staff satisfaction, financial impact, project alignment with strategic priorities and talent management. Customer satisfaction over the last five years has remained consistently high ranging from 96 to 99 percent. Staff satisfaction has also remained relatively high with scores ranging from 93 to 95 percent. The following examples demonstrate the complexities, dynamism and variety of initiatives supported by ME&IC.

Initiative 1: Bone Marrow Transplant (BMT)

BMT is an effective therapeutic intervention for many patients with hematological malignancies and other blood and marrow disorders. Mayo Clinic experienced a 47.5% growth in BMT in a 5-year time period. While effective, BMT comes with high pharmacy and laboratory services. In analyzing costs and outcomes, variability across the three practice sites was identified.

A multidisciplinary team was chartered to address the costs and variability in BMT. The team included practice representatives, a project manager, health systems engineers and finance. After collecting, analyzing and modeling the data, the team designed a blended solution that would yield the best outcome.

For the pharmacy and lab, a standardize-to-value approach ensued. This entailed collaboration across the three destination medical practices to converge on a consistent, best practice which was identified by benchmarking across Mayo Clinic sites and with other healthcare organizations. Engaging the clinical practice with Pharmacy, Laboratory and Supply Chain personnel for procurement and contracts was valuable in understanding and leveraging opportunities.

For patient care, the Time Driven Activity Based Costing (TDABC)[1] approach was employed to understand the detailed costs of outpatient versus inpatient care models. Complex process maps reflecting the supplies, people, process times and supply costs for BMT care were developed for in- and outpatient models. Ultimately, these detailed maps provided documentation of care processes which could be standardized across all sites and served as a basis for analyzing the impact of future changes in the process.

Determinants of project success included the strong existing tri-site working relationship. Best practices existed at each site and this project provided the opportunity to leverage those practices and standardize the overall practice in a timely manner. Specific interventions included:

- Identification and implementation of chemotherapy best practices

- Standardized lab test utilization and blood product ordering parameters, both guided and supported by electronic decision support tools
- Standardized use of total parenteral nutrition
- Pilots and comparison models of both outpatient and inpatient care
- Partnering with patients and families on multiple fronts including enhanced communication and education on the dismissal process and timelines

The findings showed a significant cost reduction for patients treated in a mixed, primarily outpatient care model versus an all inpatient model (range due to autologous vs. allogeneic recipients). Additionally, there were opportunity costs identified with the mixed care model using less physical space and fewer resources. This resulted in slower resource growth required to support additional growth in BMT volumes. A key lesson learned was to keep an open mind as to the engineering and analytical tools and methods to best address the needs of the situation. In this case, a blended approach helped to optimize the care for patients requiring BMT.

Initiative 2: Robotic Process Automation

The National Institutes of Health awarded the Mayo Clinic Biorepository Program a grant to serve as the central national biobank for the All of Us[SM] Research Program Precision Medicine Initiative (PMI). This led to a rapid scale-up in agile laboratory operations to accommodate the million cohort samples, requiring systematic planning and implementation at Mayo's Biorepository facility. ME&IC HSEs were assigned to design and implement the scale-up plans.

The HSEs led the group through a standard Systems Development Life Cycle (SDLC), utilizing various process and systems engineering methods and models to complement the laboratory team's expertise and to facilitate the rapid scale up across the biorepository. The four phases of the SDLC include planning, analysis, design, implementation and maintenance.

With the anticipation of an additional 1000 specimens (7 tubes per participant) per day, operations moved from a single shift 5 days per week to double shifts 7 days per week. In addition, physical space in the lab nearly doubled from 35,000 square feet to 65,000 square feet.

To prepare for lab changes, the following methodology was utilized:

- Staff interviews were conducted to understand current state and process mapping was used to document these processes. The team then completed several multi-disciplinary mapping sessions to validate current processes and develop future state workflows to meet the specific needs of the All of Us[SM] collection. Each session documented not only process steps but also addressed open questions.
- Process maps were used to design and develop business requirements for new automation systems and for integration of lab instruments and the Lab Instruments Management System.
- Simulation modeling was leveraged to simulate the planned system for automated processing. Output of the simulation model was used to validate and enhance plans for the automated system as well as to estimate the workload on different instruments over the course of a day.
- A Capacity Model Calculator was created to determine supply requirements and storage capacity that allowed staff to quickly enter different collection volumes to get updated estimates for supply volumes and storage needs.
- As system changes were implemented, data was gathered to measure and compare expected and actual process efficiency and effectiveness in the context of the overall operation. Based on measures, continuous process improvements were implemented to optimize lab operations.

Though the lab has not reached the full capacity of 1000 PMI collections per day, volumes have increased to about 520 PMI collections (3,640 specimens/tubes) per day with an additional 200-250 internal collections. This project demonstrated the value of ME&IC engineering and consulting expertise to deliver on an urgent and complex strategic need.

Initiative 3: Chemotherapy Scheduling Optimization

The overall goals of this project were to improve the patient experience, integrate best practice, improve outpatient chemotherapy margins, and improve chemotherapy staff and facility utilization/efficiency while creating a legacy

process to manage this dynamic service across Mayo Clinic. A multidisciplinary group (Hematology, Medical Oncology, Pharmacy, Nursing, Revenue, Finance, and ME&IC) was assembled to focus on understanding, refining and improving the outpatient chemotherapy practice across seven main centers. The project team focused on two primary interventions:

- Chemotherapy Dashboard – to facilitate a more detailed understanding of the chemotherapy business and to develop a best practice across the enterprise. The chemotherapy dashboard was created to have real-time, useful, actionable data by drug, regimen, and indication across all outpatient chemotherapy sites.
- Scheduling – to review the functional components related to the administration of outpatient chemotherapy. Partnering with pharmacy, nursing, hematology, and medical oncology, ME&IC staff identified opportunities to optimize scheduling (staffing, staff mix, chair time, access, business hours, and operational efficiency) of the outpatient chemotherapy administration.

The development of the enterprise-wide Chemotherapy dashboard was a significant and positive result. The dashboard is used to identify opportunities by drug, regimen and site that could be enacted upon quickly by leadership. It has become a powerful tool for senior management to perform drill-down, detailed analysis to enhance efficiency and patient experience. The dashboard view allows the user to filter the data by site, year and month, as well as select different tabs for the summary, revenue by group and analysis for individual drugs. The team also developed a quick reference guide to assist new users in navigating and using the dashboard.

Another significant development was the analysis and modeling for the scheduling and administration of the infusion process. The goal was to optimize the efficiency of chemotherapy administration in the unit, focusing on nurse staffing levels and patient scheduling. The process involved numerous discussions and onsite observations with key stakeholders to understand current processes, care implications and identify opportunities. Data analysis involved reviewing descriptive statistics on daily volumes, actual versus scheduled appointment durations, and patient type distributions. Simulations were conducted using mathematical modeling (non-linear optimization) to minimize nursing constraints that were limiting chemo chair availability.

The overall results of the project were positive. The financial dashboard surveillance has already yielded net revenue recapture for the first five months. Operationally, the impact of the new schedule template has produced a more predictable and balanced workload for nurses offering a safer environment to meet patient needs at key points during the treatment plan. The new schedule template has increased chemo volumes by 9% and chemo-related productivity by 10% which is 20% higher than comparable external benchmarks[2]. Most important is that the capacity to serve more patients has increased.

Summary and Closing

Mayo Clinic's commitment to comprehensive business consulting and management engineering services (e.g. business case analysis, workflow optimization, business intelligence, advanced analytics) enables the organization to leverage the potential of these disciplines for strategic initiatives leading to significant patient benefits and financial savings.

The success of these strategic initiatives is highly dependent on engaged and visible leaders committed to the Mayo Clinic vision and partnering with strong multidisciplinary teams across the organization. The Mayo Clinic Values of Teamwork, Excellence and Innovation as well as the primary value: The needs of the patient come first are critical enablers. ME&IC remains committed to the institutional Mission and Vision as it delivers on its own Mission to partner with Mayo Clinic colleagues to achieve the best patient experience through objective, innovative and integrative business consulting and management engineering services.

References

[1] Kaplan RS. Improving value with TDABC. *Healthc Financ Manage.* 2014 Jun;68(6):76-83.

[2] Alternative Outpatient Chemotherapy Scheduling Method to Improve Patient Service Quality and Nurse Satisfaction. (2018, February). Last retrieved 11/28/2018 http://ascopubs.org/doi/pdf/10.1200/JOP.2017.025510