EXECUTIVE SUMMARY
Organizational research literature attests to the fact that Information Technology (IT) governance is a crucial factor in a successful Electronic Health Record (EHR) implementation. Mount Sinai Medical Center (MSMC), located in New York, New York, set out to establish a robust governance structure from the outset of their Epic EHR implementation. Commitment to a strong leadership and governance model led to an on-time, on-budget EHR implementation. Key traits of the governance structure included a mandate for physicians to use the EHR, “overwhelming” communication from the C-suite, and organizational fortitude to convince the vendor to make changes to their long-standing methodology to better align with MSMC needs. Critical success factors included intensive C-suite involvement, the inclusion of 20 physician champions and 20 front-line nurses on the project, and early collaboration with the nurses’ union. MSMC deployed the Epic ambulatory EHR to 120 clinics during 2005 to 2010 and the Epic inpatient EHR in 2010 to 2011, successfully attesting to Meaningful Use Stage 1 in 2011. The program had a total budget of $127.5 million.

1. BACKGROUND KNOWLEDGE
The Mount Sinai Medical Center encompasses both The Mount Sinai Hospital and the Mount Sinai School of Medicine. The Mount Sinai Hospital, founded in 1852, is a 1,171-bed tertiary and quaternary care teaching facility and one of the nation's oldest, largest, and most respected voluntary hospitals. In 2012, U.S. News & World Report ranked The Mount Sinai Hospital 14th on its elite Honor Roll of the nation’s top hospitals based on reputation, safety, and other patient-care factors. Nearly 60,000 people were treated at Mount Sinai as inpatients in 2011, and approximately one million outpatient visits took place. Due to Mount Sinai’s location in the Upper East Side area of New York, New York, the hospital is located at an intersection of the wealthiest and poorest zip codes in the United States and has the responsibility of meeting the unique medical needs both of those from affluent backgrounds and of patients requiring indigent care.

The Mount Sinai Medical Center Board of Directors’ decision to implement a single vendor integrated EHR system was viewed as a necessary critical step in remaining competitive as healthcare transformed throughout the twenty-first century. Elemental in achieving success in this large scale project would be the foundations of leadership and governance laid down at the beginning. Industry literature affirms the need for visionary leadership and governance to drive successful EHR implementations.1 MSMC, like other academic medical centers, represents multiple entities including the Mount Sinai School of Medicine, the Mount Sinai Faculty Practice Associates, and the Mount Sinai Hospital. With each of these entities came a distinct set of requirements for the EHR including not only clinical value needs but also research and financial necessities. The initial scope of the implementation was to focus on the hospital ambulatory areas but attention also was needed on the future scalability of the system to the other covered entities within MSMC.
2. LOCAL PROBLEM BEING ADDRESSED AND INTENDED IMPROVEMENT

Local Problem: A failed inpatient Computerized Physician Order Entry (CPOE) implementation and a “stop and go” ambulatory EHR implementation in the early 2000s resulted in a lack of confidence among clinicians in MSMC’s ability to implement integrated health IT solutions. The complexity of the organization and the lack of historically similar projects provided a void in the planning process that needed to be filled with a robust, structured approach that differed from previous failed attempts at system implementation. The bar of acceptance for the selected EHR needed to be reached by meeting a variety of clinical needs but also by a solid IT infrastructure that supported the performance needed at the point of care. Enhanced program governance structure and senior leadership commitment was required. Challenges to be overcome included: a) a wide variety of medical specialties in many different care settings with varying requirements for the EHR; b) physicians and faculty disillusioned by prior EHR implementation efforts; c) disparate patient registration systems causing patient tracking difficulties; d) anticipated resistance to CPOE; and e) a combination of best of breed and home grown IT systems that had been optimized and in some areas had become very popular.

Intended Improvement: The change in the leadership and governance approach that was needed to make this project successful started with the system selection process. In 2004, a partnership between clinical informatics and IT leadership, led by Kristin Myers, Vice President of IT, resulted in a comprehensive inclusive selection process that ensured all clinical, research, and business users of the proposed system would be involved in selecting the best integrated system for MSMC.ii This process included researching industry evaluations of systems such as KLAS to ensure quality and sustainability of the system selected but also went a step further in outlining the specific needs of MSMC and how the selected EHR would be expected to provide this support. This structured process using scripted real clinical scenarios and structured feedback surveys allowed for multiple constituencies to participate in the selection and voice their concerns early in the process. This process was repeated again in 2009 when the scope of the project was expanded to inpatient with the intent of verifying that the selected EHR for ambulatory remained the best solution for the inpatient setting. This inclusive selection process made long strides in overcoming the skepticism over previous failed system implementations.

This early structured selection process was done in parallel with the creation of the first element of the governance structure, the Executive Steering Committee, a committee that would be responsible for ongoing strategic decisions and setting the vision related to the EHR. Senior IT leadership partnered with the chief medical and operating officers of the organization to research best practices in governance structure, with calls being made to Cleveland Clinic and Stanford Medical Center among other similar organizations to evaluate the path that other academic medical centers had gone down in developing a strong dynamic governance structure to guide decision making throughout the implementation process.

Figure 1: Strategies moved from Steering to tactile groups while unresolved tactical issues were escalated for broader input

Care was taken to represent not only the pertinent executive sponsors but also the needed clinical and administrative leadership in this strategic direction setting body. The remaining elements of the governance structure, which evolved over
time and continue a co-evolutionary process with the needs of the organization and the EHR system, stemmed from this foundational group. The right balance was needed to achieve the level of inclusiveness that allowed for pertinent perspectives to be heard while not paralyzing the process. Physician and nursing leaders tapped to be a part of the EHR governance workgroups were trained on system functionality similar to the IT analysts to ensure foundational understanding of the system and allow for a mental model for gathering information, decision making, and communication to their peers. This strengthened clinical governance model ensured that the EHR would be implemented in a manner to fully support safe, effective, efficient, and timely care delivery, while ensuring the project was completed on-time and on-budget. Moreover, a fully integrated EHR would provide opportunities for more advanced data analytics and clinical research. Specific goals for the governance committees included:

- Implement a robust EHR solution to accommodate the complexities of a major academic medical center
- Drive physician adoption of electronic documentation and order entry
- Ensure all clinical specialty perspectives were represented
- Commit to an accelerated, concurrent projects implementation strategy
- Implement a master patient index for a single registration system across Mount Sinai
- Replace legacy systems, including a best of breed ED system and multiple home grown systems such as the existing clinical data repository, without loss of function and with an eye for improved value

**Figure 2: Decision matrix designed to drive decentralized decision making while allowing for standardization**

<table>
<thead>
<tr>
<th>Individuals/Groups</th>
<th>Initiate</th>
<th>Input</th>
<th>Decide</th>
<th>Approve</th>
<th>Implement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice Based Groups</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epic Project Team</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work Groups</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Advisory Councils</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Executive Leadership</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

**Key**
- **Initiate:** Responsible for initiating and coordinating the decision process
- **Input:** Responsible for providing input on the decision
- **Decide:** Responsible for making the decision, soliciting and receiving approvals
- **Approve:** Responsible for reviewing and approving the decision
- **Implement:** Designs action plan to implement the decision and executes on decision

### 3. DESIGN AND IMPLEMENTATION

This EHR implementation program is among the largest and most complex projects in MSMC’s history. Governance and leadership of the system-wide EHR implementation required unprecedented collaboration across all points of care delivery. Figure 3 and 4, Appendix A illustrates MSMC’s Clinical Governance Model and the executive participants. The governance structure was built to be sustainable and has evolved to continuously prioritize optimization requests and provide oversight on future rollouts.

In addition to this governance structure, the development of a strong program management office within the IT department, led by Kristin Myers, Vice President of IT, was deemed necessary to ensure that best practices from the field of project management were consistently applied to keep the project progressing and meeting milestones (Figure 5). Two senior directors, one on the Epic applications side and the other on the program management side assured analysts and project managers worked together every step of the way. This decision to allocate resources and build a PMO despite vendor recommendations that analyst staff take on these responsibilities led to an innovative and strengthened project team. This resulted in consistency and resilience in meeting project objectives throughout the life cycle of implementation. In 2011, MSMC was awarded the prestigious Project Management Institute Project of the Year award for New York demonstrating the strength the PMO developed for this project.
In 2009, the Epic Project Inpatient Team (EPIT) was formed along with the Inpatient Physician Advisory Committee (IPAC). These teams integrated over 20 physicians, 20 nurses, and ancillary staff from all inpatient specialty areas and complimented the existing Ambulatory Workgroup. Clinical leaders including physicians and nurses involved in daily provision of clinical care were subsidized through the project budgeting process to dedicate a range of their time from 10 to 100 percent in accomplishing the project goals. These clinicians were responsible for taking pending design decisions back to their local peers to gather input providing direction to IT staff in configuration of the system to optimize workflow. A dual reporting relationship was established for these groups to ensure that IT and clinical leadership worked in collaboration in directing task completion. This dedicated clinical leadership embedded in the governance structure ensured consistent stewardship in decision making and information gathering through peer to peer interactions. Involvement of these bedside care delivery clinicians safeguarded against a design based on assumptions and how things are supposed to occur. An example of this clinical partnership is the creation of forums for targeted system design, modified from vendor recommendations, to identify potential problem areas and proactively plan for design decisions that vetted the complexities of areas such as critical care and perioperative care across the large inpatient care setting.

**Figure 6: Inpatient design grid to track progress of decisions in all focused design sessions**
C-suite members were also used extensively to project a strong vision, to communicate, and to persuade members of the institution of the wisdom of this major initiative. Early in the project this included speaking to the value of the EHR in most business meetings and aligning the system goals with organizational objectives. Later in the project the Executives participated in creating a video attesting the values of the system in MSMC and to achieving success in the coming decades. One of the duties of each executive was to focus on a group of physicians that were not yet convinced of the benefits of CPOE. Frequent 1 on 1 discussions with renowned physician leaders highlighting the value the EHR could bring to them addressed the “what is in it for me” question. Relationships were nurtured from the beginning, so that when the go-live date came and physician use mandates went into effect, the C-suite relationships were already in place to address any resistance.

The Executive Steering Committee was responsible for top-level key decisions and reporting to the MSMC board on the progress of the Epic program. Various subcommittees focused around clinical disciplines such as pharmacy, physician order entry, and nursing documentation were formed to address challenging tactical issues. Their recommendations were elevated to the Hospital Patient Care Advisory Team (HPCAT), chaired by the Inpatient Physician Champion and the Inpatient Nursing Champion, who would vet the issues before making final recommendations to the Executive Steering Committee. This HPCAT group consisted of representation from many other business areas such as compliance, privacy and security, and medical records and from ancillary systems such as clinical laboratory, radiology, and pathology. This final stop before the Executive Steering Committee confirmed broader perspectives on any issues that needed to be escalated. This group was also an information sharing group to ensure all members remained informed of decisions and progress on the implementation. Despite this path for escalation, the goal was for decisions to be made locally in the individual workgroups to ensure those most familiar with the topics were the ones making the decisions. The strong integrated governance structure allowed for this to happen while also ensuring that standardization occurred where appropriate and where none was present before.

### Application Implementation Overview

<table>
<thead>
<tr>
<th>Phase I - Live (2006 - Present)</th>
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<tbody>
<tr>
<td>Ambulatory - FPA, Hospital Clinics, Remote Sites - started in 2005 and is ongoing</td>
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<table>
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<tr>
<th>Phase II - Live (Fall 2010)</th>
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<tbody>
<tr>
<td>Epic as enterprise Clinical Data Repository replacing home grown legacy system</td>
</tr>
<tr>
<td>Pharmacy - Inpatient and Ambulatory (Willow)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase III - Live (Spring 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computerized Physician Order Entry (CPOE)</td>
</tr>
<tr>
<td>RN Clinical Documentation</td>
</tr>
<tr>
<td>Emergency Department (ASAP)</td>
</tr>
<tr>
<td>Health Information Management (Medical Records)</td>
</tr>
<tr>
<td>OB (Stork)</td>
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</tbody>
</table>

<table>
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<tr>
<th>Phase IV - Live (Summer 2012)</th>
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<tbody>
<tr>
<td>Physician Documentation</td>
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<table>
<thead>
<tr>
<th>Phase V - In Progress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Clinical Implementation at Mount Sinai Queens - CPOE, Documentation (RN/MD), Pharmacy and ED</td>
</tr>
</tbody>
</table>

**Figure 7: Summary of Phase I through V activities, with physician documentation being the most recent application implemented**

**4. HOW HEALTH IT WAS UTILIZED**

Epic project governance affected all key healthcare IT design decisions made during the EHR implementation. MSMC is among the nation’s leading health systems to achieve EMRAM Stage 6 (applying for Stage 7 in 2013) and to have met CMS Meaningful Use Stage 1 requirements. The governance board vetted every significant design issue. Various clinical and operational applications were vetted prior to implementation through the governance committees. Specifically in areas where legacy systems were well entrenched, additional effort was made to establish specific requirements necessary for transition to the new integrated system. Any functionality not currently present was vetted for clinical and financial impact and when deemed necessary by the steering committee was pursued for development with the vendor. For each step in the implementation process, research was done to identify what best practices had been developed by other sites with multiple connections made with other institutions to elicit lessons learned and formulate the best path forward for MSMC. Also, with the weight of the governance bodies, Epic was convinced to alter their steadfast methodology to meet MSMC needs. This included greater due diligence of the current state and more validation sessions.

**5. VALUE DERIVED OUTCOMES**

- The implementation strategy starting with ambulatory clinics and gradually increasing the scope across the Faculty Practice and into inpatient through the replacement of the clinical data repository first and then to full use of the EHR
allowed for incremental exposure to system functionality, which enhanced adoption and added impetus for further system progression.

- Having the future state workflows validated by department stakeholders and peer clinicians ensured consensus prior to starting inpatient implementations. This also allowed for discovery of niche workflows that had not been uncovered in the early discovery stages of the implementation.
- For the first quarter of 2012, MSMC ranked number one among all Epic enterprise level clients for provider inpatient orders entered using CPOE and number three for ED orders entered.
- The first ambulatory implementation cycle times took up to 12 months. Through clinical governance committee vetting of refined processes, operational procedures, and changes to clinical workflows, implementation cycle times are now three months on average.
- Other values derived include: a) increase to 98 percent discharge summaries completed within 30 days of discharge; b) 90 percent inpatient orders entered by providers; and c) 81 percent admission medication reconciliation.
- Quality alerts, CDS, reporting, etc., infused throughout the system
- All NPSGs and NPP measures were met.

6. LESSONS LEARNED

Challenges: From a governance perspective, the largest challenge was ensuring inclusive representation from all needed stakeholders. This proved to be a daunting task due to the time commitment required of nonsubsidized staff. Through the work of the clinicians who were part of the governance structure, as well as executive communication, this was quickly viewed as a critical commitment from resources across the organization. Several iterations were also needed to establish the right working groups with the right participants to progress decision making and address any historical issues in specific areas without overwhelming the decision making process. A second challenge was a large voluntary physician population with a disenfranchised perspective of large scale organizational projects. This was addressed by identifying voluntary physician spokesmen as part of the subsidized physician group to bring this perspective to decision making and act as a conduit for communication back to their physician practices. Further work was also done to identify potential resisters in this community and partner both IPAC member physicians as well as executive sponsors to build strong relationships throughout the process. This resulted in minimal issues at the activation and clear escalation paths for issues that did arise.

Lessons Learned: Other lessons learned include the early formulation of the EHR modules that would be included in the implementation. While CPOE, nursing and physician documentation, and full functionality in ED and OB were planned, the perioperative area was not included due to an existing and well established legacy system in this area. Despite extensive work in the design phases to account for transitions of care around this area, a large portion of the post live efforts were focused on this area to achieve satisfactory levels of performance. Inclusion of this area as part of the initial scope, while adding to the complexity, may have resulted in better outcomes and a more solidly integrated system.

Late in the implementation process, the evaluation for replacement of the legacy fetal monitoring system was deemed necessary to improve integration with the EHR. Despite thorough vetting of both the existing system and the new OBIX system, the final integration was not as well integrated as was ideally needed in this critical clinical area. More thorough current state analysis in this area was needed to identify this need early in the discovery phases for inclusion in the scope of the project.

Initial projections for the dedicated clinical staff included an engagement of two years to allow for implementation tasks to be completed. A realization after the activation was the EHR system represented new knowledge and skills for nursing that required ongoing competency development. This direction of permanent clinical informatics resources was identified as a national trend through the knowledge sharing with other organizations such as Johns Hopkins and Cleveland Clinic.

7. FINANCIAL CONSIDERATIONS

In order to achieve the successful implementation of this far reaching project, financial commitments were needed to ensure that early training and certification of key personnel at the vendor site in Wisconsin were completed. In total, dozens of ambulatory clinicians were sent through multiple trips to Wisconsin for certification and all inpatient nursing directors (14), physician governance committee members, and many executives attended a fundamentals course to ensure basic understanding of system functionality.
In addition to the expense related to training, a key to the multidisciplinary governance approach was the subsidized clinician time which ensured availability for robust participation. For nursing this constituted 20 FTEs and for physicians up to 20 FTEs spread across many specialties.

**Figure 8: Financial Considerations**

<table>
<thead>
<tr>
<th>Type of Expense</th>
<th>Total Cost</th>
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<tbody>
<tr>
<td>Epic certification costs for Clinical Informatics</td>
<td>$200,000</td>
</tr>
<tr>
<td>Program Management Office resources</td>
<td>$1,500,000</td>
</tr>
<tr>
<td>Salary Subsidies Physician</td>
<td>$1,800,000</td>
</tr>
<tr>
<td>Salary Subsidies Nursing</td>
<td>$2,000,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$5,500,000</strong></td>
</tr>
</tbody>
</table>

Meeting CMS Meaning Use stage 1 requirements has been a governance committee priority. MSMC’s total potential Meaningful Use incentive capture is $32.7 million.
Figure 3: MSMC Implementation Governance Structure

Executive Steering Committee
Wayne Keithley, COO- chair
Dr. Dupree, CMO- co-chair
Kristin Myers, VP of IT- facilitator

Members
Deputy CMO, CIO, VPs of Operations, VP of Compliance,
VP of IT and Epic Program Director, Inpatient Physician Champion,
Sr. Director of Nursing, VP of Perioperative Services

Hospital Patient Care Advisory Team
Inpatient Physician Champion- chair
Sr. Director of Nursing- co-chair

Members
Director of Medical Records, Director of Pharmacy, VP of Patient Financial
Services, Chair of Medical Records Committee, Chief Privacy Officer,
Lab/Blood Bank, Radiology, Pathology, Clinical Documentation Program,
Quality/Risk Management, VP of Compliance

Labor Relations Rep

Inpatient Physician Advisory
Clinical Documentation-RN
Clinical Documentation-Ancillary
Emergency Department
Pharmacy
Health Information Management

Medical Board Chair
Figure 4: MSMC Optimization Governance Structure

**Executive Steering Committee**
- **Chair:** Wayne Keathley, COO
- **Co-Chair:** Dr. Erin DuPree, CMO
- **Facilitator:** Kristin Myers, VP of Information Technology

**Members**
- Susan Russell-Knox, Sr. Director, PMO; Dr. Mark Callahan, CMO; RP; Kumar Chatani, CIO; Frank Sino, VP, MIS; Finance; Dr. Bruce Brawar, Interim CMO; Mark Delaney, VP of IT, Dr. Erin DuPree, CMO; Dr. Douglas Lubs, CFO, FPA; Dr. Joseph Kanney, Lead Technical Informatics; Wayne Keathley, COO; Pat Lamb, VP, Hospital Operations; Michael McCurry, Sr. VP, Penet.; Terriers; Dr. David Nierman, CMO; MS; Carol Fortescue, CNO; Jeni Scanlon, CIO; Michael Seidman, CIO, FPA; Kathleen Scher, VP of Nursing, MS; Caryn Schwab, Executive Director, MS; Judy Ritts, VP and COO, MS; Jane Whitney, VP of Compliance and CCO; Sonia Zabala, Inpatient Nurse Champion

**Patient Safety Notification Group**
- **Chair:** Dr. Erin DuPree
- **Frequency:** Quarterly
- **Members:** Various
- **Objective:** Proactively address potential patient safety issues and rectify existing EHR identified patient safety issues

**Informatics Planning Committee**
- **Co-Chairs:** Dr. Bruce Brawar and Ken Koppenhafer
- **Members:** ACMIO's and IT Directors and Managers

**Forms Committee**
- **Chair:** Dr. Bauml
- **Frequency:** Monthly
- **Note:** Formerly known as the HIM Workgroup; review and approve all forms (paper and electronic)

**Core Measures**
- **Chair:** Lori Finkelstein-Blond
- **Frequency:** Bi-weekly

**Ambulatory Workgroup**
- **Chair:** Dr. Callipart
- **Frequency:** Bi-weekly
- **Members:** Physicians, Nursing, Compliance, Finance, Administration, Ancillary Staff
- **Objective:** Cross-functional group created to review and execute optimization initiatives required across all ambulatory departments

**Inpatient Optimization**
- **Chair:** Dr. Klein
- **Frequency:** Bi-weekly
- **Members:** Physicians, Nursing, Pharmacy, Ancillary Staff, Finance, Compliance
- **Objective:** Cross-functional group created to review and execute workflow optimization initiatives

**Meaningful Use**
- **Chair:** Dr. Callahan
- **Frequency:** Bi-weekly
- **Members:** Various
- **Objective:** Review meaningful use compliance and compensation

**Research**
- **Chair:** Dr. Kanney and Bill Fultz
- **Frequency:** Monthly
- **Members:** Various
- **Objective:** Review and execute research initiatives

**Clinical Decision Support**
- **Chair:** Dr. Kanney
- **Frequency:** Monthly
- **Members:** Various
- **Objective:** Review and execute clinical decision support tools for both inpatient and ambulatory

**Emergency Department Optimization**
- **Chair:** Dr. Bauml
- **Frequency:** Bi-weekly
- **Members:** Various
- **Objective:** Review and execute optimization requests and initiatives specific to the Emergency Department

**Employee Pharmacy Optimization**
- **Chair:** Joanne Meyer
- **Frequency:** Weekly
- **Members:** Pharmacy
- **Objective:** Review and execute optimization requests and initiatives specific to the Employee Pharmacy

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iii Poe, S. (2010). Building nursing intellectual capital for safe use of information technology: A systematic review. *Journal of Nursing Care Quality* 26(1). pp 4-12