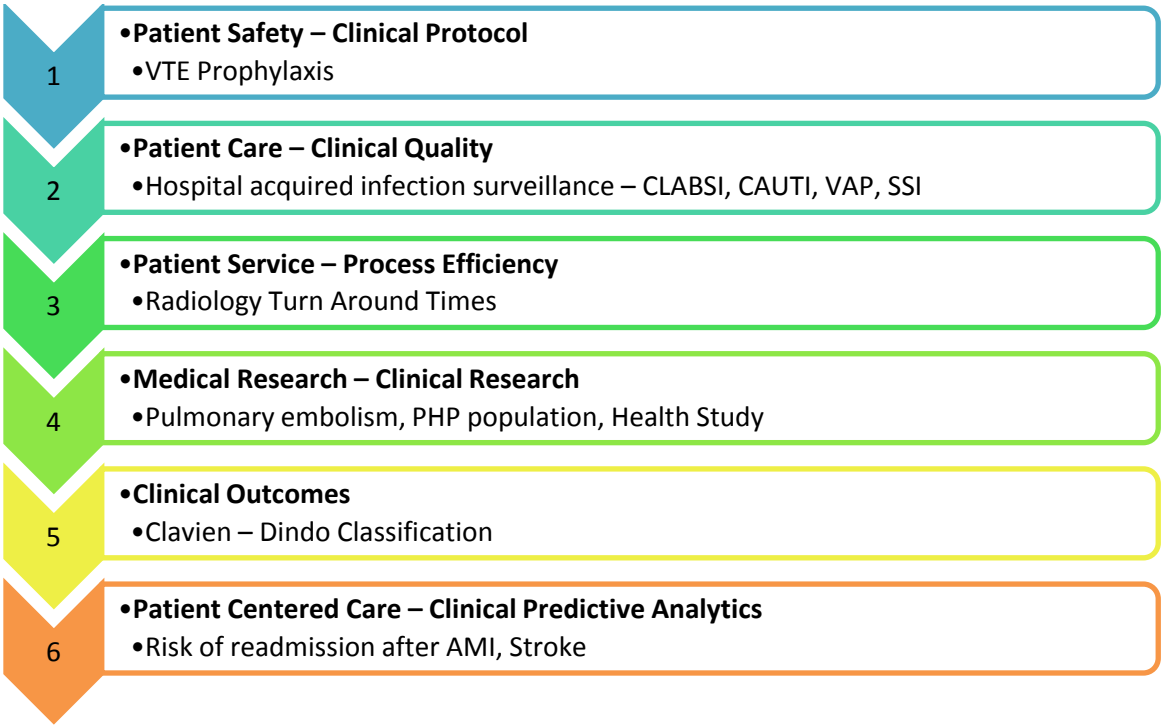
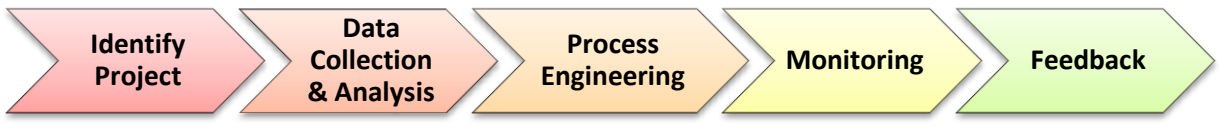
Clinical Data Analytics

Experts have defined Data analytics (DA) as the science of collecting, organizing, and analyzing very large sets of data with the goal of discovering patterns and draw suggestive conclusions. This department works with stakeholders from the Clinician community, Information Technology and Operations to integrate people processes, technology systems and data stores for improving care delivery and patient outcomes.

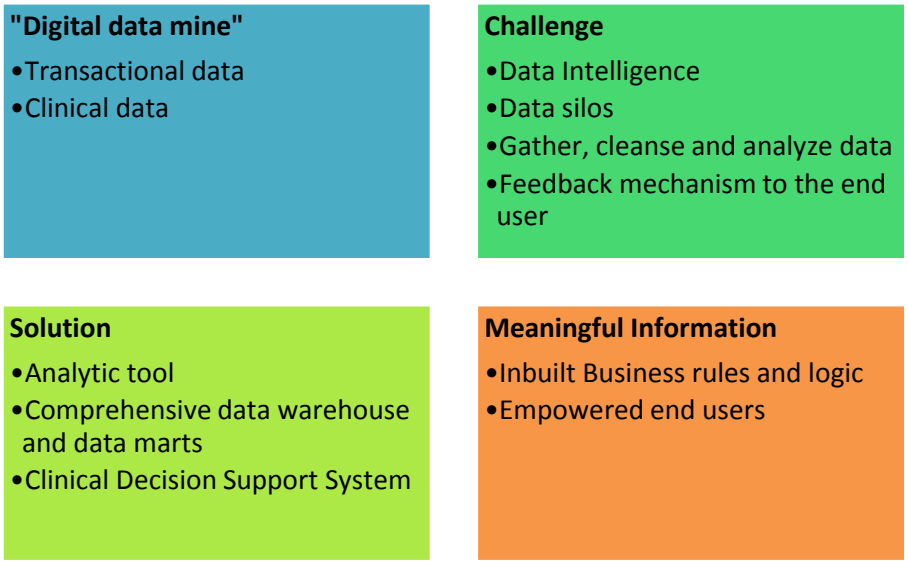
Healthcare organizations are just beginning to scratch the surface of data science to analyze and apply new insights from raw health data and information. Healthcare data like Electronic Health Record, Lab data, imaging data, Claims data are a valuable source of health-related information for a large number of patient population. Data analytics aims to utilize this rich data towards study of diseases and health condition patterns for patients and patient population. The Healthcare information ecosystem includes patient demographic characteristics such as gender, date of birth, residential address, apart from length of stay, admission & discharge status, medical history, clinical diagnoses, diagnostic results, medical procedures, disease progression details, dates of service, payer groups, hospital locations, billing charges etc. When combined and studied for a large cohort of patient, this data can uncover patterns and lead to predictive capacity for informing the risk and outcome of patient.





MHC implemented an Electronic Health Record system in the year 2011, following which patient medical records were maintained in a digital format. This resulted in the creation and ongoing enrichment of a rich clinical data repository. A journey to adopt and increasingly enhance the clinical system, since then has continued to this day, leading to addition of higher functionality and value for the system.

Journey - Post EHR:



<u>Activities undertaken are:</u>

- **Hospital Acquired Infections (HAI)** – A system driven surveillance program was set up for three of the hospital acquired infections, viz. ***Central line associated blood stream infection (CLABSI), Catheter associated urinary tract infection (CAUTI) and Ventilator acquired pneumonia (VAP)***. The surveillance algorithm was designed, based on high suspicion for HAI in the admitted patients undergoing intervention with in the hospital. A new process for tracking the HAI cases by the Infection control teams was put in place and integrated with the new tracking mechanism for an end to end surveillance and improvement in incidence of HAI cases.
- **Venous - Thrombo Embolism prophylaxis program**: This is a system triggered workflow on CPRS which makes it mandatory for every patient at risk to undergo VTE risk assessment, during their hospital stay. The goal is to prevent the development of deep venous thrombosis in the hospitalized patients, who could be at a higher risk of complication. With close follow up with clinical teams, and indigenously developed software that analyses clinical data, we are able to track improvements efficiently, and use the data for planning interventions in identified areas that need improvement. In a very short time, the graphs have shown significant improvement. Our target is to reach 100% by the next year
- **Free text classification tool for Pulmonary Embolism** – An in-house text analytics tool has been developed to help with automated classification of cases from free text analysis. Further work is planned to improve the classification accuracy of the tool.

- **Healthy patient database** – A huge dataset of anonymised patient records has been prepared from the records of patients coming for preventive checkups, for further analysis. We plan to classify the records as per defined health parameters, which can then be used for refining the assessment criteria for patient health.
- **Predictive model based on Health data analysis for risk of readmission in Acute Myocardial Infarction** - The primary objective of the project is to search through the existing data sets for hidden patterns of both the predictable and preventable events in managing the healthcare of individuals. Some of the events that will be considering are the risks of readmissions within certain periods (30 days, 90 days & 1 year) after discharge from the index admission, prediction of future length of care and future use of the hospital resources. It is anticipated that knowledge of these events before their actual occurrence will lead to more effective resource planning, better management of chronic and life threatening diseases outside of acute care settings. With early detection of sentinel events through patient education, home monitoring and regular follow-up, coupled with early intervention when required, we should be able to deliver the best in class healthcare in the most efficient way. Work is underway to build predictive models utilizing machine learning techniques derived from anonymised hospital patient records from diverse hospital data sources.

A memorandum of understanding was signed between MHC and Deakin University to jointly search for predictive factors of complication post-AMI

- **Online Antibiogram** - The Anti-Microbial Stewardship (AMS) program in collaboration with MSD Pharmaceutical relies on the online availability of microbial and antibiotic resistance information to the Clinician at the bedside. A mobile app provides Antibiogram access to clinicians anytime/anywhere. The mobile app has been launched and CME has been conducted in January 2016. The Antibiogram has been prepared using in-house patient flora and microbial antibiotic sensitivity data to inform the rational use of antibiotics.

- **Drug Resistance Index** - Antimicrobial resistance is the ability of bacteria, fungi, parasites, and viruses to grow, even in the presence of a drug that would normally kill or limit their growth. Drug resistance is a growing problem, particularly for infections such as MRSA (Methicillin resistant Staphylococcus aureus), VRE (Vancomycin resistant enterococci), tuberculosis, HIV, STDs, gonorrhea, flu, pneumonia, malaria, E. coli, salmonella, Campylobacter. The Drug Resistance Index(3) (DRI), developed by "The Centre for Disease Dynamics, Economics & Policy" is a composite measure that combines the ability of antibiotics to treat infections with the extent of their use in clinical practice. The DRI helps to study changing drug resistance over time and geography, simplifying the way antimicrobial resistance is tracked for its effect on population. Using the CDA platform, we are computing the index for our hospitals which will be used to track year on year, the changing antimicrobial resistance seen at our hospitals.

Table: Provisional Drug Resistance Index 2015 for Max Hospital Saket

Pathogen	**DRI Value (Method)**	
	(Antibiotics class)	**(Individual Antibiotics)**
E.coli	0.668512704	0.63512652
Klebsiella	0.794343178	0.783371635
Pseudomonas	N/A	0.511359374
Acinetobacter	N/A	0.85766725
S.aureus	0.192439121	0.191800273

- **Clavien - Dindo classification** – Is a classification of surgical complications used to measure surgical outcome on a standardized and internationally accepted & validated scale (4). The therapy used to correct a specific complication is the basis of this classification in order to rank a complication in an objective and reproducible manner. It consists of 7 grades (I, II, IIIa, IIIb, IVa, IVb and V). An assessment methodology [5,6,7] has been finalized with the department of GI Surgery which would be developed as a trigger based implementation on hospital based electronic health record system.
- **Educational outreach** - Under the HIMSS Asia Pacific educational webinar series[8], 2016, a webinar was presented with the topic "Incorporating Health Data Analytics for Patient Care - A Hospital's Perspective". It was a globally attended webinar organized by the most reputed organization working in the area of Healthcare Information & Management Systems.