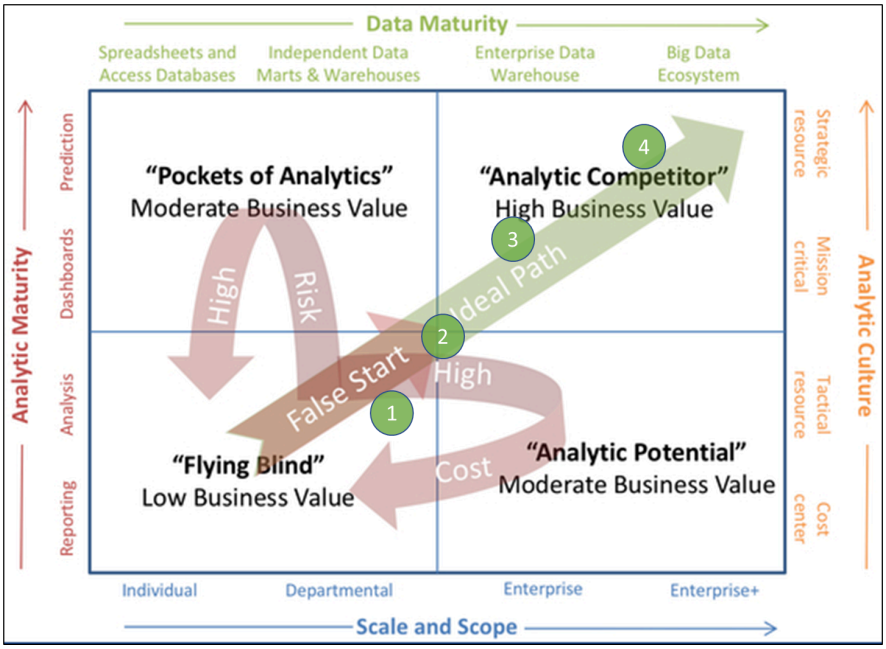
Transforming Analytics

Group 3 - Andrew Whelan, Andrew Nesbitt, Kay Quiballo, and Elaine Evangelista

Analytics at Gillette Children's today consists primarily of operational and financial reporting. The data is fragmented and not well integrated into operational practices where reporting exists and is largely absent from the clinical environment. To advance our mission of every child crafting their own story, we need to leverage clinical data to aid in the clinical decision making process showing patients, families, and clinicians what the predicted outcomes of their treatment decisions will be.

Through consistent documentation and leveraging our unique expertise into statistical modeling, we can provide predicted outcomes prior to intervention and along the way surface insights into practice variation with the goal of spreading those practices with better outcomes and reduced costs.

Our analytic maturity, today, is providing lower than desired business value. Our journey along this path will be done with a series of projects. The first project to take us from our current state (1) will be to create the start of a clinical data warehouse (2) where clinical data across different providers can be aggregated into a larger picture. Next, we will take that clinical data warehouse and use it to create clinically relevant dashboards (3) highlighting practice variation and the effect on outcomes. Additional value will be created as we develop statistical models (4) for predicting patient outcomes dependent on treatment while being sensitive to the complex conditions our patients have.



To achieve this transformation, we will need dedicated analytics leadership to succeed in adoption and integrating mission critical data into many different departments. In addition, this transformation will require data analysts, engineers, project management, visualization developers, clinician and operational leadership involvement.

Transformation Framework

Current State: Flying Blind due to lack of enterprise-wide analytic solutions

Gillette Children's currently implements tactical reporting at the department level since an enterprise data solution is still in the beginning stages.

The transformation framework below outlines stages for advancing Gillette Children's analytic maturity with regards to improving decision-making focusing on the following outcomes:

- Efficiency improvements
- Reduced variation in care
- Improving patient health

Data utilization and analytic maturity increases as the hospital moves from the efficiency initiatives of setting up the data warehouse and automated reporting, to conducting analyses to reduce variation in care, to the more advanced stages of implementing predictive analytics to improve patient health.

<table>
<tr><th>Analytical Maturity Status</th><th>Managed Care Outcomes</th><th colspan="2">Analytic Initiatives</th></tr>
<tr><td rowspan="3">Stage 5
Analytical Competitors</td><td rowspan="3">Improve Health</td><td>Level 8</td><td>Direct-to-Patient Analytics & Artificial Intelligence</td></tr>
<tr><td>Level 7</td><td>Personalized Medicine & Predictive Analytics</td></tr>
<tr><td>Level 6</td><td>Clinical Risk Intervention & Predictive Analytics</td></tr>
<tr><td rowspan="2">Stage 4
Analytical Companies/ Analytical Potential</td><td>Reduce Variation</td><td>Level 5</td><td>Waste & Care Variability Reduction</td></tr>
<tr><td rowspan="3">Improve Efficiency</td><td>Level 4</td><td>Automated External Reporting
• Potential but not critical activity to coordinate with external care providers and other stakeholders</td></tr>
<tr><td rowspan="2">Stage 3
Analytical Aspirations</td><td>Level 3</td><td>Automated Internal Reporting</td></tr>
<tr><td>Level 2</td><td>Standardized clinical vocabulary and patient registries</td></tr>
<tr><td colspan="2"></td><td>Level 1</td><td>Enterprise Data Warehouse</td></tr>
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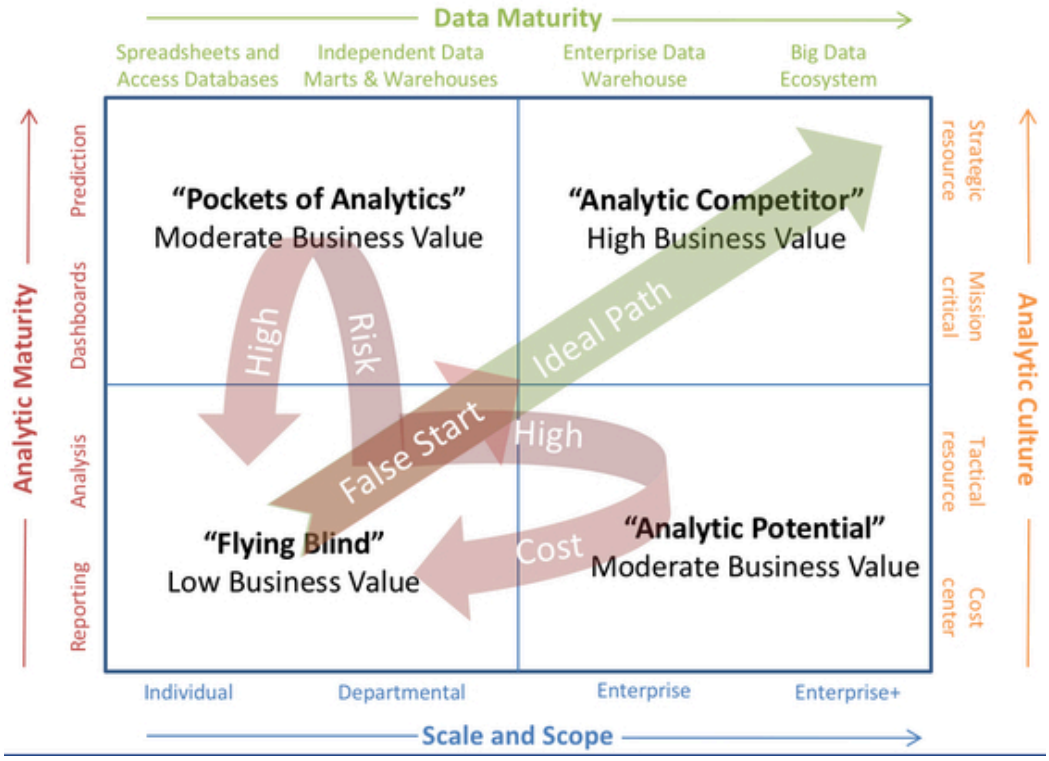
Source: Adapted from 2021 Health Catalyst presentation

Analytics Gap and Strategy

Patients and families are the center of Gillette's mission and each child crafting their own story drives our strategy. Analytics at Gillette today consists of operational and financial reporting. The data is fragmented and not well integrated into business practices where reporting exists and is largely absent from the clinical environment. Utilizing clinical data will allow us to inform patients and their families of the outcomes of patients who have gone before them. Looking at prior patient outcome data tied to intervention choices will improve patient decision making and inform the clinician of potential success for a given intervention decision. This decision making will be critical to prove our value as healthcare drives more toward population health and value based care.



Using the Eckerson maturity model for analytics (Eckerson 2018), Gillette is today providing low business value. We're providing reporting with little analysis, available data is at the department level in most areas, there is an enterprise data warehouse for operational data and we are using analytics as a tactical resource to evaluate decisions. Past efforts involved expanding data maturity and scale of data availability. This has been costly without a noticeable change in culture or maturity of the reports/analysis produced. To become an analytic competitor we will need to grow our maturity and culture along with available data. This will require a governing body to oversee the projects and their adoption across the institution, a dedicated member of the executive team to champion and be responsible for this transformation, and a roadmap of projects to guide us on this path.

Dimension	Gillette Children's Current Analytic Activities
Analytic Maturity	• Reporting is ad-hoc • Dashboards are localized at the department level
Data Maturity	• Enterprise warehouse development has begun, but is localized on operational data • Clinical decision-making based on spreadsheets and localized databases
Scale and Scope	• Analytic resources are not utilized and staff is not embedded in all departments
Analytic Culture	• Analytics is a tactical resource and is not deployed as an enterprise-wide resource • Some executive team members see analytics as mission critical, but its not fully embraced by the entire executive team

Pipeline of Demonstration Projects (Applications)

Projects that make up our roadmap to becoming an analytic competitor will start with storing clinical data more consistently and progress to demonstrating the value Gillette provides to patients, families, our community, and payers. Our first task will be to create a Data Warehouse filled with clinical data out of the EHR. The existing data is operational and financial and missing these critical elements. This creation of this Warehouse will require each department's participation to get their data into the Warehouse, as well as creating systems to regularly ingest new data that they are making. During that work, we will be providing each department with Power BI dashboards and reports, to give robust and consistent feedback that is relevant to each team; both leadership and individual contributors.

As the Warehouse data grows and contains more of the clinical record, we will move towards modeling care outcomes. Analysts and scientists, in partnership with clinicians, will explore the data, finding the most relevant parts of the data to include in the model, and then iteratively improving model performance to get a product that can be used with patients, clinicians, and payers. The development of models will be time consuming, as each new model will need to be tailored for each patient cohort we are privileged to care for.

Once we have a model that has scored sufficiently well for us to introduce it to patients, we will use the model to educate patients on potential outcomes and start to share the decision making with them. We'll need to ensure we are tracking how well the model works in the real world. We will be incorporating feedback from patients and hospital staff on how we can better improve model performance and the actual care plans that the patients and staff are using. The output of our models will need to be translated into care plans - and so graphic design and how we convey information will need to be standardized or templated as more and more models are introduced. Once we can build Care Plans from models regularly we'll have reached Analytical Maturity Stage 5, "Analytical Competitor."

Creating Care Plans can be just the beginning of what can be done with this system. Future applications of the system will be important to scope out towards the end of model development and implementation - we can take the system in many different directions, such as integrating mobile applications for remote patient monitoring, improved communication platforms for faculty, and cloud-linked point of care devices.

People and Technology Infrastructure Investments

Gillette will need to make significant investments in order to get the proposed capabilities up and running. Teams will need to be built or expanded, and current technology investments will need to be expanded as well. The primary investments are listed below, broken out by People and Technology. In addition to changes in people and technology, we'll also need to change the way some of our teams work. Currently, folks working with data and building reporting apps are following an agile methodology and work schedule. We are going to utilize the Scrum methodology and work schedule for our projects, and so the teams on agile will need to be engaged and moved over to Scrum so we are all working on the same timeframes.

Data Team and Hospital Support Staff	
Role	**Justification**
Data Analyst	A Data Analyst will be needed to help work with the data being collected during the build out of the system, and provide support on reporting after the system is built out
Data Engineer	A Data Engineer will be the specialist responsible for building data pipelines and ensuring that data from many different sources is flowing seamlessly into the system
Project Manager	A Project Manager will be needed to own and oversee the project and lead implementation of various phases (Power BI reporting, Care Plan)
Business Intelligence Developer	The Business Intelligence Developer's responsibilities will include building Dashboards and other reports for hospital staff and executives.
Hospital Staff	Responsible for translating the clinical workflow, and to create processes for realistic data entry at the point of care.

Technologies	
Platform	**Overview**
Azure SQL Server	Most of our data will be hosted as SQL tables within one or many SQL Server databases.
Data Factory	This will be the foundation of the system. It will use data pipelines to run the logic that underpins the models and other Data Science tasks that we need. Everything from data ingestion to model training and adjustments will be driven by Data Factory
Power BI	This will handle the majority of our reporting needs - it can build dashboards and other reports from data that is collected
Reporting Apps or Data Platform	To replace excel reporting, a data platform or Reporting Apps will be needed to fill this need. Power BI can fill most of these needs, but custom reporting may be needed as well.

Top Three Risks and Mitigation Strategies

Data Culture - Data is often used as a means to an end and not something central to decision making. There is a lot of potential for the organization to centralize data and use it to propel decision making to another level. From Eckerson's readings, an analytical leader needs to show the organization the importance of data and convince them to believe in this goal. Ensuring culture moves toward data-centered is mitigated by providing direct insight into data entered for the department leadership team to understand the impact of the data entered to the data available.

Getting leadership on board with a data-centered culture is essential to securing appropriate funding and to improving analytic maturity. The risk of failing to secure funding creates a gap between the current climate of data, and the resources (like staffing and technology) that is needed to bridge the gap to higher analytical potential.

Talent Risk - Several risks come into play when it comes to obtaining new talent and integrating them into the existing teams. As mentioned above, a huge risk is obtaining funds and resources for the transformation. This goes back to ensuring there is a culture where people believe in the importance of data. Without this type of environment and a persuasive leader, even the promise of results may be difficult to secure funding for required staffing.

Once the transformation has secured funding, another talent-related risk is the collaboration of the data team, and existing faculty. Having faculty that understands both the hospital and data aspects is ideal. To mitigate teams that may not understand both sides, integrating buffer time into the timeline will get data and hospital experts acquainted. Understanding each other's fields will lead to smoother communication and collaboration during the project.

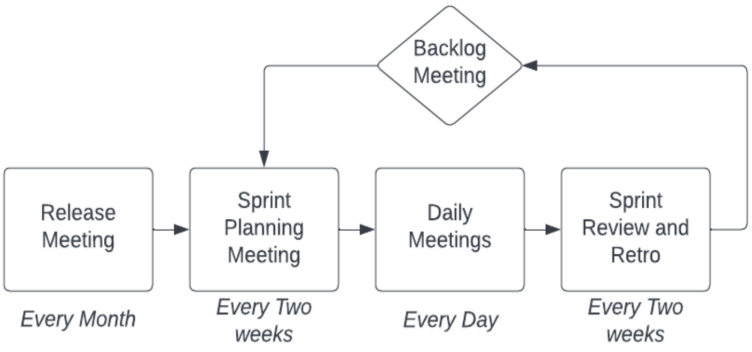
Regulatory Changes - The Centers for Medicare and Medicaid (CMS) could impose new documentation requirements for billing that don't exist today and aren't incorporated into the warehouse schema.

- Solution: Monitor CMS documentation guidelines and maintain an agile warehouse that can adapt to the need for documentation changes. These changes could come from either a regulating body or internal practice preference.

Revisit Initial Demonstration Project

The Demonstration Project focused on outlining the deployment of the data warehouse and how Agile-Scrum and CRISP-DM will play a role in the process. Although the Transformation Plan outlines important aspects like the resources needed and the project pipeline, the Demonstration Project dove deeper into the methods.

In preparation for the first sprint, the project manager will take a lay of the land, assess if additional resources are needed, and if any further decisions are needed to clarify direction. Once data architects have built the infrastructure of the data warehouse, data analysts and BI Developers work together with hospital departments to transfer their data and assess their reporting needs.



Biweekly sprints and regular meetings will ensure that the data teams are fulfilling the needs of hospital staff and that the data warehouse is functioning properly. Getting regular feedback is essential to the Agile-Scrum and CRISP-DM methods of iterative improvement. As the deployment of the data warehouse no longer demands improvement, the data team can move on to sprints that focus on the applications outlined in the sections above like improved dashboards and statistical modeling for patient care plans.

Analytical Leadership Profile: Chief Analytics Officer

The Chief Analytics Officer will develop the roadmap and create the vision for the hospital's analytic transformation. A key aspect of this role will be to develop the data culture and secure executive sponsorship and commitment to the analytic transformation to ensure that the hospital can continue to mature into an analytic competitor.

Leadership Style: Adaptive and Transformational

Adaptive and Transformational leadership styles would be highly relevant to the role of Chief Analytics Officer.

Adaptive leadership is concerned with what's needed for leaders to prepare and encourage people to deal with change and challenges that are not clear-cut or easy to identify. The analytic transformation we are proposing will require most clinicians to change their workflows and potentially learn new tools to record their data. The transformation meets the criteria of a technical and adaptive challenge because while the technical aspect makes up a majority of the challenge, there may be currently unknown problems that arise as the enterprise transforms. The CAO will also need to "Get on the Balcony" (Northouse, 2019) to understand the larger picture of the current analytics practices and create the vision to develop the analytic maturity of the hospital.

Transformational leadership is focused around the process of developing employees and "moves followers to accomplish more than what is usually expected of them." (Northouse, 2019) The CAO should have charisma and motivate both the executive team and lower-level employees to push through the challenges of this enterprise transformation. The leader will also need to create an environment for the analytic team to grow their skills and provide individualized consideration amongst team members to align their talents and responsibilities.

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