# Using Business Analytics to Drive Efficiencies – A Rural Hospital's Approach

Brian Bartel

March 1st, 2021

## Authors Note

The organization(s) referred to in this paper will remain anonymous. Correspondence concerning this article can be directed to Brian Bartel at bartelb@gmail.com

**Abstract**

Healthcare expenses continue to rise and yet hospitals are realizing consistently shrinking margins. Healthcare supply costs are typically the second largest expense to a hospital and must be managed in a manner that ensures providers have access to quality products but also with an emphasis on cost awareness and expense reduction strategies. Healthcare supply chains must leverage their data in order to make better business decisions to reduce costs and increase operational efficiencies through the use of business analytics. Understanding what data is available and having the skillsets to compile and structure the information in a manner that makes analysis and business reporting capable is becoming increasingly important for supply chain leaders. Building a set of metrics or Key Performance Indicators (KPIs) will allow the supply chain to identify goals and work in a structured manner to achieve these objectives. Supply chain leaders must understand their data and be able to analyze the relevant information to help make informed decisions that reduce future costs, mitigate risks and drive efficiencies for the organization. This paper will illustrate why supply chain leaders must use business analytics to drive efficiencies, build measurable metrics, increase productivity, and reduce waste.

**Table of Contents**

**Using Business Analytics to Drive Efficiencies – A Rural Hospital's Approach**

The healthcare supply chain is an essential function of hospital operations and is interfaced with almost every department and operating unit in the system. The cost of healthcare continues to rise and according to Centers for Medicare & Medicaid Services health spending in the United States accounts for almost 18% of the Gross Domestic Product, realized as $3.8 trillion or $11,582 per person (Centers for Medicare & Medicaid, 2020). According to a recent study hospital supply expense is the second highest expense behind labor and can make up between 15-40% of total costs, which is further compounded by a fragmented and complex supply chain unique to the health care sector (Abdulsalam et al., 2019). In order to reduce costs and maintain financial viability, it is evident that proper supply chain management methodologies and oversight is an important and critical function of the health care industry.

Health care supply chain departments manage thousands of unique items in warehouses, storerooms, clean utility rooms and Periodic Auto-Replenishment (PAR) locations which are largely dependent on timely deliveries from distributors and vendor partners. Due to the complexity of health care and a patient-centered focus, it is imperative that the supply chain delivers a constant supply of these critical items and mitigate the risk of stock outs. On the dark-side of this pressing need to keep stock of critical industry specific products is the risk of overstocking items and the continual change of products resulting in obsolescence and/or expired items, which are direct costs and impact the financial viability of an organization.

The health care supply chain must focus on ways to properly source reliable streams of quality products, manage inventory levels, partner with clinical colleagues and drive operational efficiencies to ensure adequate on hand supplies while also working to reduce the cost of operations. Using available

data and business analytics, new insights on opportunities and efficiencies can be identified, tracked and reported in order to drive deeper operational excellence. In order to drive efficiencies, supply chain leaders must use business analytics to make informed decisions, build measurable metrics, increase productivity, and reduce waste.

## Introduction to Business Intelligence and Business Analytics

Technology continues to change at accelerating rates and the Internet of Things (IoT) connects an expanding list of devices, capturing data in multiple streams and makes it available for analysis that lead to insights on improving operational efficiencies. Businesses have long understood the importance of data in making informed decisions and newer technologies, such as machine learning and artificial intelligence, are opening the doors to deeper understanding of operations. The health care supply chain must be able to tap into this data, structure it, and create defined reports to make better decisions based upon the analysis.

### Business Intelligence

Business intelligence focuses on examining data and trends to make better decisions for *current* operations and is defined as the process of "using data to make intelligent business decisions by monitoring, collecting and reporting data for interpretation ("What's the Difference Between", 2019). Business intelligence (BI) helps organizations, managers and teams to make informed decisions based on data rather than by intuition.

**Business Analytics**

Business analytics utilizes the *current* data derived from business intelligence in a way that can help predict *future* patterns with a goal of improving current operations and make better decisions for the future ("What's the Difference Between", 2019).

Gavin (2019) identifies the following three primary methods of business analysis:

- Descriptive: The interpretation of historical data to identify trends and patterns.
- Predictive: The use of statistics to forecast future outcomes.
- Prescriptive: The application of testing and other techniques to determine which outcome will yield the best result in a given scenario.

As an organization or individual grows in their understanding and use of business analytics the analysis will move from descriptive "what happened" to predictive "what will happen" and finally to prescriptive "how to change operations to meet a goal or metric". It is important to note that depending on the complexity of the dataset or the operational goal, the business analytics process may be using a combination of the three types to best suit the objective.

**Healthcare Applications in Supply Chain**

Health care supply chain teams have vast amounts of data that reside in their Materials Management Information System (MMIS) and/or the Enterprise Resource Planning (ERP) software. Data from purchases, requisitions, PAR levels and item files all contain integral pieces of information that, if analyzed, can help an organization identify areas of opportunity to decrease costs and increase efficiencies. Many larger healthcare systems and IDNs have dedicated BI or analytics teams that are able to pull information from large data warehouses and often use software to automate routine or recurring

reports. However, many hospitals don't have the resources to fund a dedicated analytics team that can assist supply chain with deeper analysis of operations.

In order to provide greater value, health care supply chain leaders must be able to identify their data and be trained on utilization of the information to open dialogue with clinical colleagues, executive leadership and other business units in order to make better and data-driven decisions. "Basing decisions on measureable data and documented analysis can help you make smarter decisions that lead to consistent, repeatable success you can build on, learn from and use to grow" (Jain & Sharma, 2014, p. 68). Basic business analytics of operations will create process flow efficiencies that reduce slow or non-moving stock and on-hand inventory levels while increasing inventory turns, contract compliance and the overall value the supply chain team brings to the hospital.

## A Rural Hospital's Approach

The hospital used in this paper will remain anonymous but the approach taken and resulting efficiencies are being replicated with success in other organizations. In this instance, the hospital is a member of a national Group Purchasing Organization (GPO) and contract compliance is driven through a committed model. The hospital is a member of a larger organization, but standardized datasets and analytics were not present.

The supply chain team operated 7 days a week prior to this project and was comprised of the following:

- Manager (full time, Monday-Friday)
- Buyer (full time, Monday – Friday)
- Distribution Clerk (full time, Monday – Friday)
- Distribution Clerk (part time, weekends and 2 days during the week)

- Receiving Clerk (full time, Monday – Friday)

Looking at processes that relied heavily on paper copies, manual processes and "tribal knowledge" it was evident that there was opportunity for improvement in operations. In order to make effective changes it was necessary to be able to pull data that could accurately show an analysis of past historical data, support current operations and provide a frame work for goal-setting and improvement in future state operations.

**Finding the Data**

The MMIS used at this hospital is a UNIX based operating system, capable of running canned reports and queries that pulls information on contract compliance, fill rates, purchasing details, PAR usage files and other routine supply chain data. Unfortunately, these reports have limited functionality as the only options to export the reports are: printed on physical paper, printed to screen or "view only" mode in the MMIS module, or to a virtual printer that saves the file in a text .txt file. Historically, reports were printed on paper resulting in massive physical files of data that was difficult if not impossible to analyze with any degree of confidence. Years of data were stored in banker's boxes taking up valuable space with little to no value unless someone retrieved the boxes and pulled the data manually line by line.

Fortunately an individual in finance was familiar with a software application called DocuAnalyzer, which was a private label of Datawatch/Altair's Monarch software that could "trap" specific lines of data from a .txt file through user defined "models" and export this into an .xls report that could then be analyzed using Microsoft Excel. This was a critical tool that allowed the supply chain director to build specific models for each .txt report and transform this once inaccessible data into a

format that could be utilized by Excel to create lookups, reports and Key Performance Indicators (KPIs) that would be formulated into a monthly dashboard.

**Using Excel.** Many trained data scientists and business analysts suggest that the use of Microsoft Excel is an archaic and cumbersome way to structure data into reports; however, the prevalence of Excel on nearly every business computer, basic familiarity with the software and a plethora of online tutorials and videos to explain various tools and formulas online make the program a go-to for basic business analytics. In addition, many supply chain's budgets are relatively low and rely on manual methods to conduct operations. These online tutorials can make analyzing data sets simple and efficient. Some useful functions of Excel that can be used to create detailed analysis are: VLOOKUP, IF Statements, CONCATENATE, Formulas, Charts, Pivot Tables and Conditional Formatting.

For those new to business analytics or those that want to begin compiling data into structured reports that can be used to make better and more informed business decisions, Excel remains an excellent, powerful and cost efficient tool.

**Building Reports & KPIs**

In January of 2018, the supply chain director pulled various data from the 12 months prior and began to analyze opportunities for improvement in operations. The healthcare supply chain director identified that the hospital supply chain structure could be broken down into three distinct categories or functions:

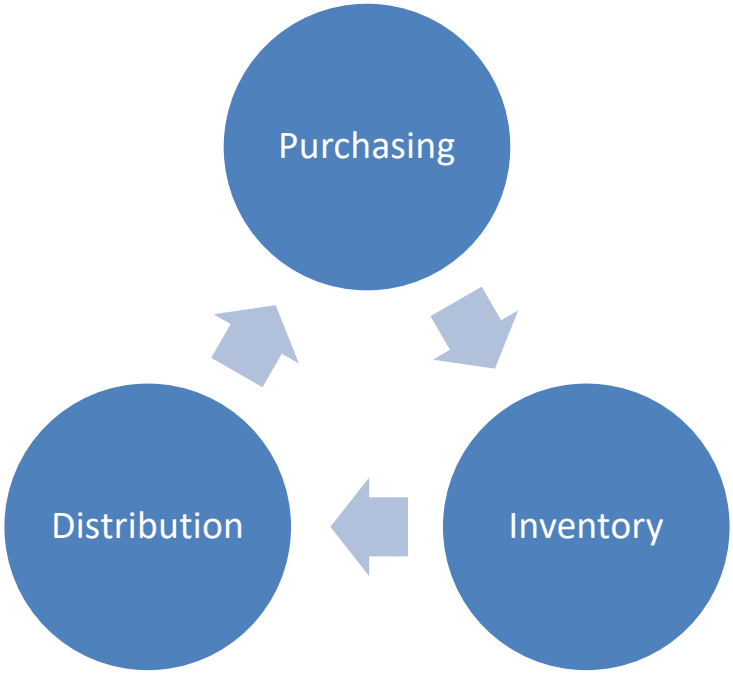
1) Purchasing – The function that includes sourcing, contracting and purchasing goods and services.
2) Receiving/Inventory – The process of receiving and storing physical goods in a warehouse, central supply or storeroom.

3) Distribution – The process of building/managing PAR locations and replenishing each location with stock.

Each of these three distinct areas is impacted by and is dependent on the others in order to operate and, when looking at changing processes, it is critical to look at both the upstream and downstream impact that change will have. If a cost or time savings opportunity exists in one of the areas but will result in more work or higher expenses in other areas, then that project should likely not proceed.

**Figure 1**

**Healthcare Supply Chain Structure**




*Note:* The three areas of supply chain are reliant on each other and form a circular process for supply replenishment.

The hospital supply chain director created distinct KPIs for each function of the supply chain that were also tied to the effectiveness of the other function's operational success. This ensured that each metric would benefit not only the specific function of supply chain, but would positively affect the supply chain operation as a whole. These metrics were kept in an Excel spreadsheet and reported in the supply chain dashboard at the close of each month as reports were generated. This created a routine data capturing stream of standardized data and a consistent reporting timeframe that could be replicated month after month, which would lead to the emergence of trends and opportunities for business analytics to be used.

**Purchasing**

Upon analysis of operations it was evident that the purchasing function was not utilizing the full functionality of the MMIS and was reliant on either faxing or physically calling in orders. There was little tracking of open purchase order lines, which would result in out of stocks and increased costs when rush overnight orders had to be placed. Looking at purchase order (PO) history data, there were zero orders sent by email and only about 25-35% of orders sent via electronic data interchange (EDI). **Electronic Data Interchange (EDI)**

GHX EDI enables buyers and sellers to transact through automated e-commerce processes, resulting in tremendous time savings and more accurate information regarding transactions. There are three primary EDI functions available through the GHX My Exchange that interfaced with this hospitals MMIS (*Understanding GHX Transactions*, n.d.):

1) PO 850 - Provides goods or services purchase information to the trading partner.
2) POA 855 - Acknowledges receipt of a purchase order and confirms product availability. Pricing is included but may not always represent invoiced price. Can be used as notification

of a vendor-generated order advising a buyer that a vendor has or will ship merchandise as prearranged in their partnership.

3) INV 810 - Sends billing information in an electronic document to a trading partner when products ship. Provides payment information regarding products or services provided.

Using the MMIS and a DocuAnalyzer model, the supply chain director was able to extract the vendor master file and run a report on EDI-enable vendors. Working with the GHX customer success manager a list of EDI capable "trading partners" was presented and cross-referenced against the existing vendor master file. For all vendors that were EDI capable trading partners that were not active as EDI vendors in the MMIS purchasing file, the supply chain director used the GHX My Exchange site to request and build trading capability with those vendors.

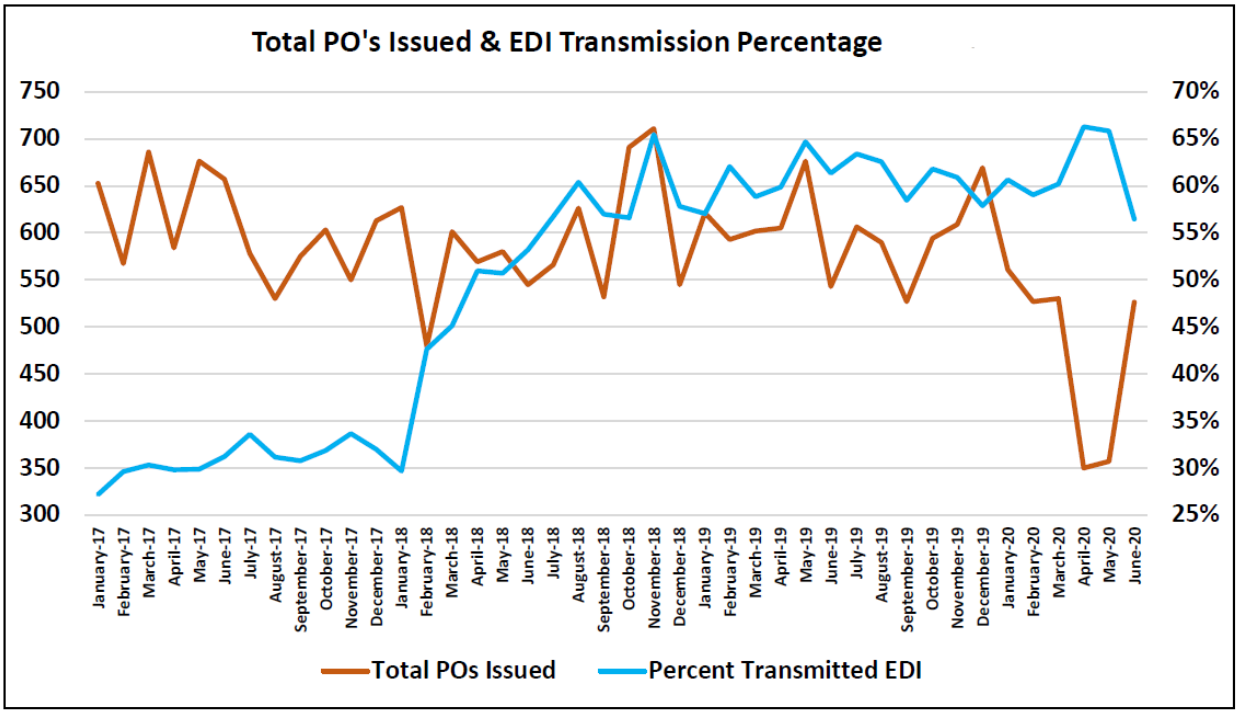
In January of 2018 the supply chain director implemented the EDI project to onboard and build e-commerce activity with all applicable vendors and by August had increased PO transmission by EDI to over 60% (Figure 2). The purchasing department was creating around 550 to 600 PO's a month, which resulted in an increase of around 165 PO's that moved from fax or call ins to EDI (Figure 3). The ability for the buyer to send POs in a bulk process and get purchase order confirmations back within a short time frame (typically within 15 minutes to 2 hours) that included pricing discrepancies and backorder notifications, provided greater transparency than the old method of faxing or manually calling orders in. By March of 2020, there were very few fax and call in orders and EDI order percentage was consistently between 60-65%.

The supply chain director also implemented a tracking log of daily PO's so that the buyer could check off the PO number when a confirmation was received. This proactive approach allowed for proactive management of orders and would be integral in reducing and mitigating out of stocks and

managing backorders. The hour or two of daily time savings of EDI would allow the buyer role to focus more on inventory management and PAR optimization strategies with the supply chain director. These monthly metrics were retired in August of 2020 after demonstrated continual success of the EDI program and monitoring of new vendors through GHX onboarding.

**Figure 2**

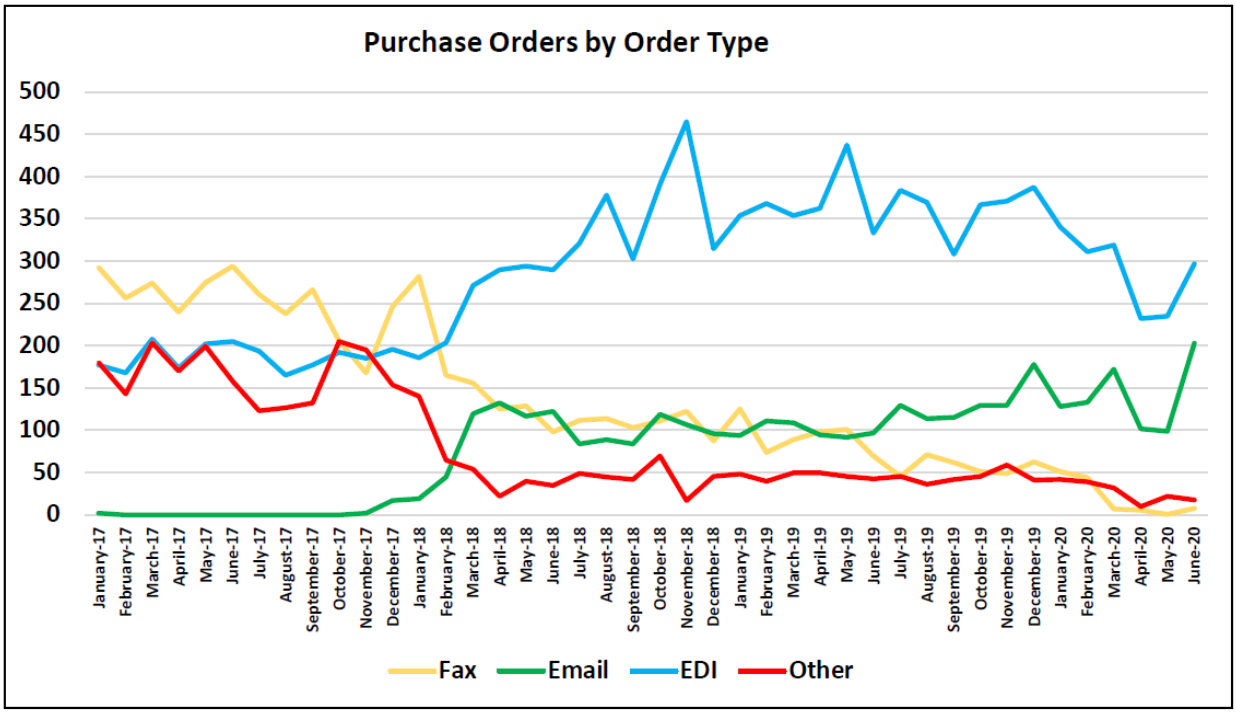
**EDI PO Transmission Percentage**




*Note:* The percentage of PO's issued via EDI increased from 30% to over 60% within 5 months of project initiation. This automation flow freed up significant time for the buyer to work on other value added activities rather than manually managing orders via fax confirmations and phone calls. EDI provides a quick turnaround for purchase order confirmations and alerts the buyer of pricing discrepancies and backorder situations allowing the purchasing team to be proactive as opposed to reactive.

**Figure 3**

**Purchase Orders by Order Type**




*Note:* Through the process EDI and email rates increased while fax and other declined.

**Accounts payable downstream improvement.** As with the other functions of supply chain, the purchasing processes have both upstream and downstream impacts on other operational units. In this instance, the accounts payable (AP) department typically received most invoices by physical mail, which required a tremendous amount of manual work to open and sort mail, resulting in late payments and associated fees. By integrating the INV 810 process, all of the EDI capable vendors were now able to send automated invoices directly to the AP department module in the MMIS, resulting in a significant reduction in paper invoices and automating much of the AP process.

As a part of this process, the supply chain director identified that the MMIS had functionality for the AP team to send invoice discrepancies for pricing, UOM, and receipts to the purchasing and receiving teams via the MMIS. Historically, the AP team sent paper copies of invoices down in green folders with highlighted lines, handwritten messages and sticky notes describing discrepancies. The ability to automate this through the MMIS modules was a huge win in that daily communications were sent via the MMIS to the individual directly responsible for the discrepancy. Likewise, reports could be run to see how many discrepancies were being held and who was currently holding them in their queue to resolve. This function resulted in drastically reducing outstanding invoices, increasing on-time payments and improving the communication and collaboration between supply chain and AP.

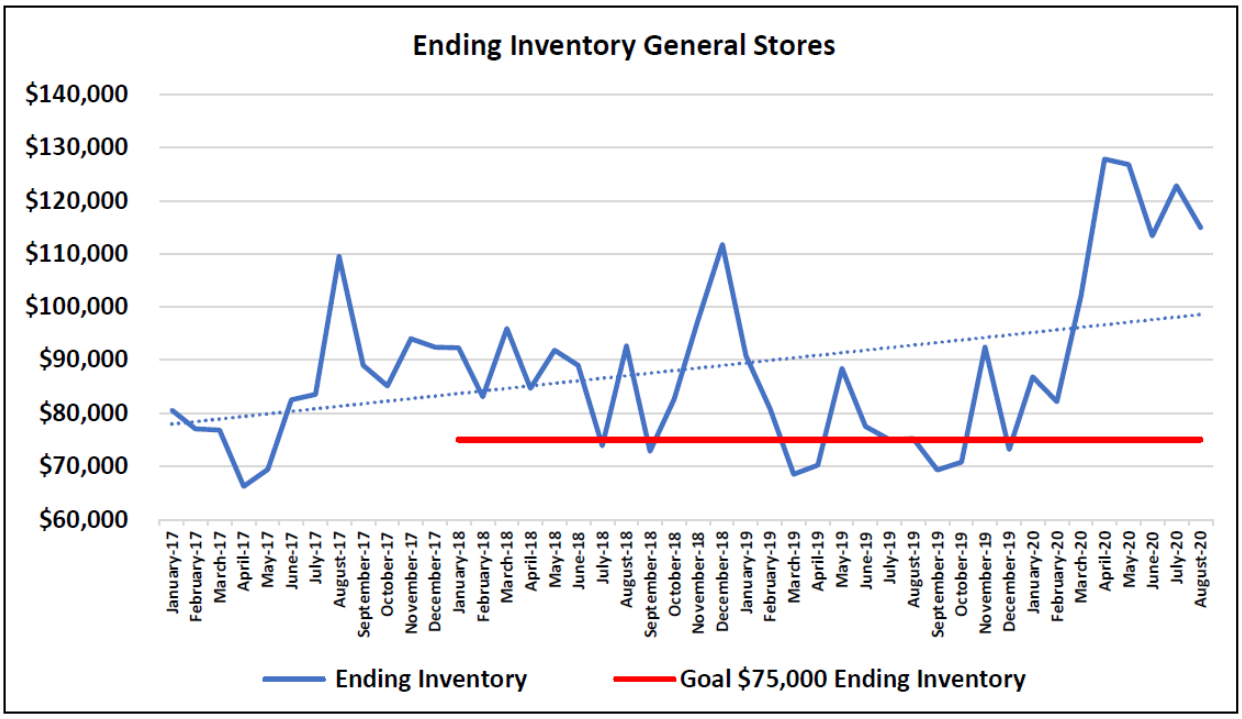
**Inventory**

Inventory has not only the financial cost associated with the dollars tied up in static inventory and holding costs but also in terms of taking up valuable space. Those who have worked in healthcare understand that space is always a constraint and it is important to optimize the utilization of all areas effectively. Effective inventory management looks to properly maintain stock levels of high moving and critical supplies while eliminating or lowering on hand quantity of slow and non-moving stock.

One of the first metrics to measure is on-hand inventory and it was imperative to build a procedure to track these levels. The hospital would complete month end processes to close out each month and report the ending inventory valuation to the accounting team each month (Figure 4). This was an easy metric to track and was built as a part of the monthly supply chain dashboard to show a snapshot of inventory levels on a consistent and repetitive interval.

**Figure 4**

**Ending Inventory**



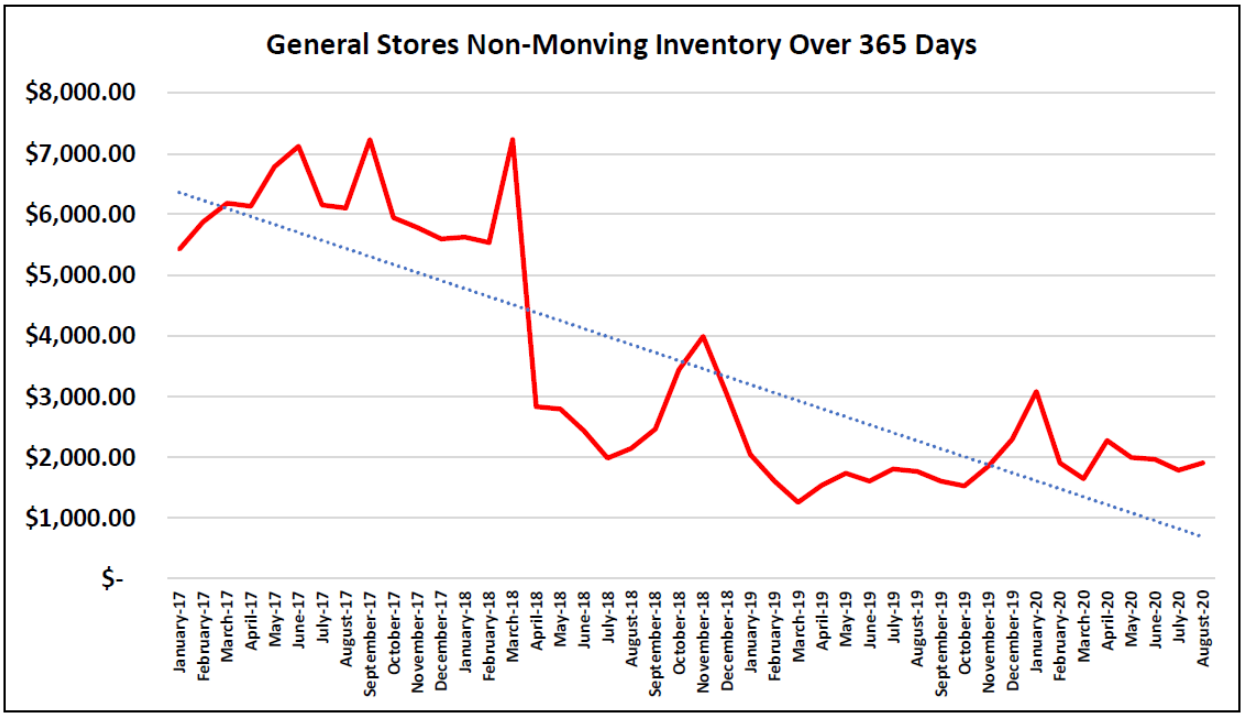

*Note:* Ending inventory was trending down until COVID-19. As a result of COVID-19 surgical supplies were not being utilized at historical quantities while PPE requirements (and costs) increased dramatically, resulting in higher stock levels. The $75,000 goal of ending inventory is no longer feasible as supply chains reevaluate just in time (JIT) models. The spike in August of 2017 was attributed to increased stock on hand due to the solar eclipse as the hospital was in the path of totality and a visitor surge was expected. The spike at the end of 2018 was due to the days the holidays fell and holiday shipping schedules required additional stock on hand to ensure adequate supply levels.

**Non-moving inventory.** In order to free up space and lower on-hand inventory it is imperative for supply chain to look at slow and non-moving inventory. In early 2018 the hospital storeroom was keeping around $90,000 of inventory on hand and about $6,000 of non-moving inventory with over 365

days of no usage, which is roughly 6.6% of overall inventory value. By running an analysis report of these items and presenting the data to clinical leaders, the decision was made to clean up roughly half of these items and keep those items that were identified as critical supplies for emergent use on hand for patient safety. As a result of this project the slow moving inventory would be reduced to less than $3,000 and freed up space for optimization of other products (Figure 5).

**Figure 5**

**Non-Moving Inventory**




*Note:* When presented with this data, clinical leaders were not aware that many of these items were being stocked and could have been obsoleted earlier if they had been presented with the information earlier. This report would serve as a valuable monthly tool to spot items that stopped being utilized after 12 months and could be presented to clinical leaders with data showing that these items were no longer being utilized.

**Storeroom optimization project.** With the efficiencies created through the EDI purchasing project, the buyer was able to focus on evaluating reorder points and min/max levels in the storeroom with the supply chain director and receiving clerk. This project showed that the current storeroom was not setup for easy stocking or pulling of supplies. Carts could not be pushed down the aisles and resulted in back and forth movement and wasted time. It was decided that the team needed to rearrange the shelving units and set up the storeroom to promote a better flow. Using Excel, the team designed the new setup and went to work moving products with the freed up space from the non-moving inventory cleanup. Over the course of a couple weeks the project was completed and the shelving units were moved, creating a better flow for picking of supplies and overall organization (Figure 6).

This project also freed up space as the receiving clerk worked to optimize storage locations and make it easier for the distribution team to pull high use items. Unbeknownst at the time, this extra space was invaluable when COVID-19 hit and the supply chain quickly pivoted to purchase masks, N95 respirators, respiratory supplies, gloves and isolation gowns. Without the storeroom optimization it would have been very difficult for the storeroom to hold this excess inventory. A benefit of solid inventory management is space optimization and process flow improvements.

**Figure 6**

**Storeroom Layout - Old and New**


*Note:* After measuring the storeroom and shelving units, Excel was used to create a map to scale where 1 square = 6 inches. This allowed the team to evaluate product placement, increase distance between shelving units for carts to easily pass and a serpentine function that increased efficiency in pulling times.

**Inventory Turns**

With metrics in place for inventory values, decreased non-moving items and a more efficient storeroom the supply chain director wanted to understand how efficient the storeroom inventory was. A common metric used to evaluate inventory is the inventory turnover ratio. The inventory turnover is how many times an organization sells/uses its stock in a given period (Fuhrmann, 2021) and is calculated as follows:

**Cost of Goods Sold** = Beginning Inventory + Purchases during the period − Ending Inventory

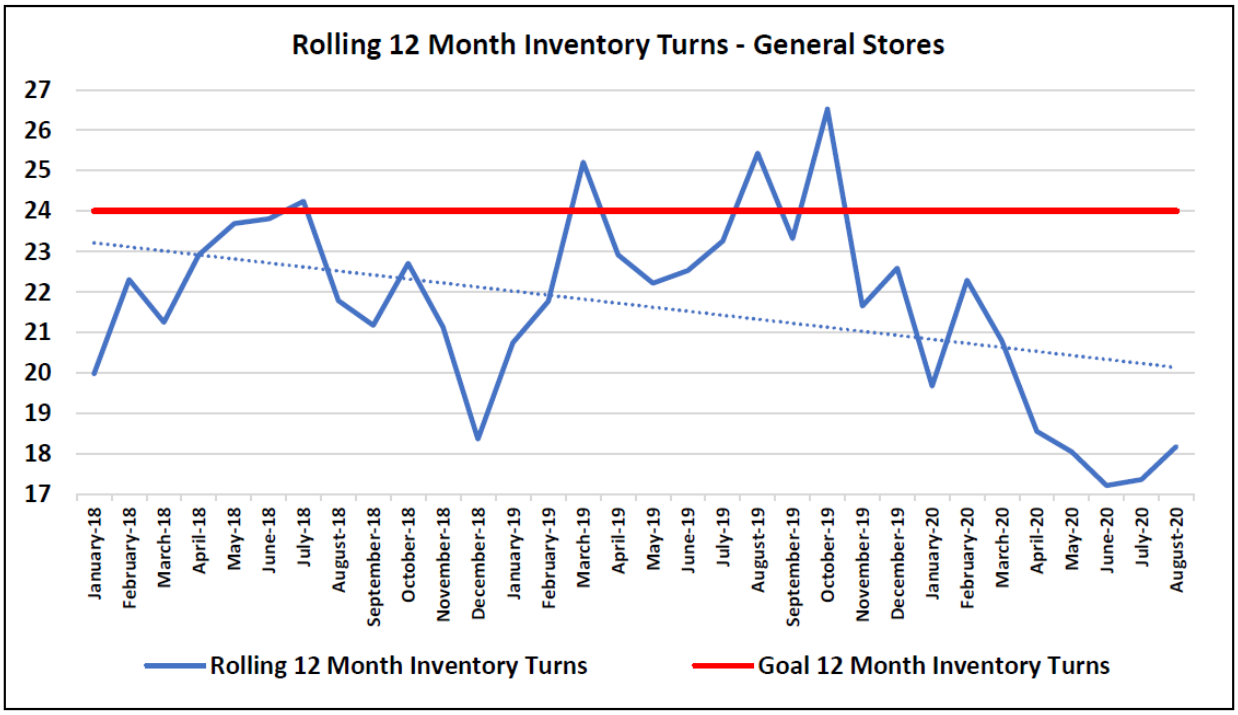
**Inventory Turnover Ratio** = Cost Of Goods Sold ÷ Average Inventory

With the monthly reports, the supply chain director was able to pull beginning inventory totals (prior month ending total) and the ending inventory monthly total. Using another model to pull purchase order history for 12 months, the supply chain director could analyze all expenses that hit the inventory holding GL account on a monthly basis which was the "purchases during the period" input. This formula reports the Cost of Goods Sold (COGS), which could then be divided by average inventory for the period and resulted in the annual inventory turnover ratio. Using another tab in the monthly supply chain dashboard Excel spreadsheet these totals could be input and calculated automatically to show the annual turns the storeroom inventory was generating (Figure 7).

Tracking inventory turns is an excellent way to monitor inventory levels and optimize efficiencies over time. The higher the inventory turns are, the more times the inventory is sold/used or "turned over"; in contrast lower inventory turns indicates more stagnant inventory levels. Maintaining fill-rates and adequate levels of on-hand quantities for high use items is critical when inventory turns are increased.

**Figure 7**

**Rolling 12 Month Inventory Turns**




*Note:* Prior to COVID-19, the inventory turns was trending up. The dip in December 2018 was due to high on hand quantities to get through the winter holidays and reduced shipping schedules from med/surg distributors.

**Fill Rates**

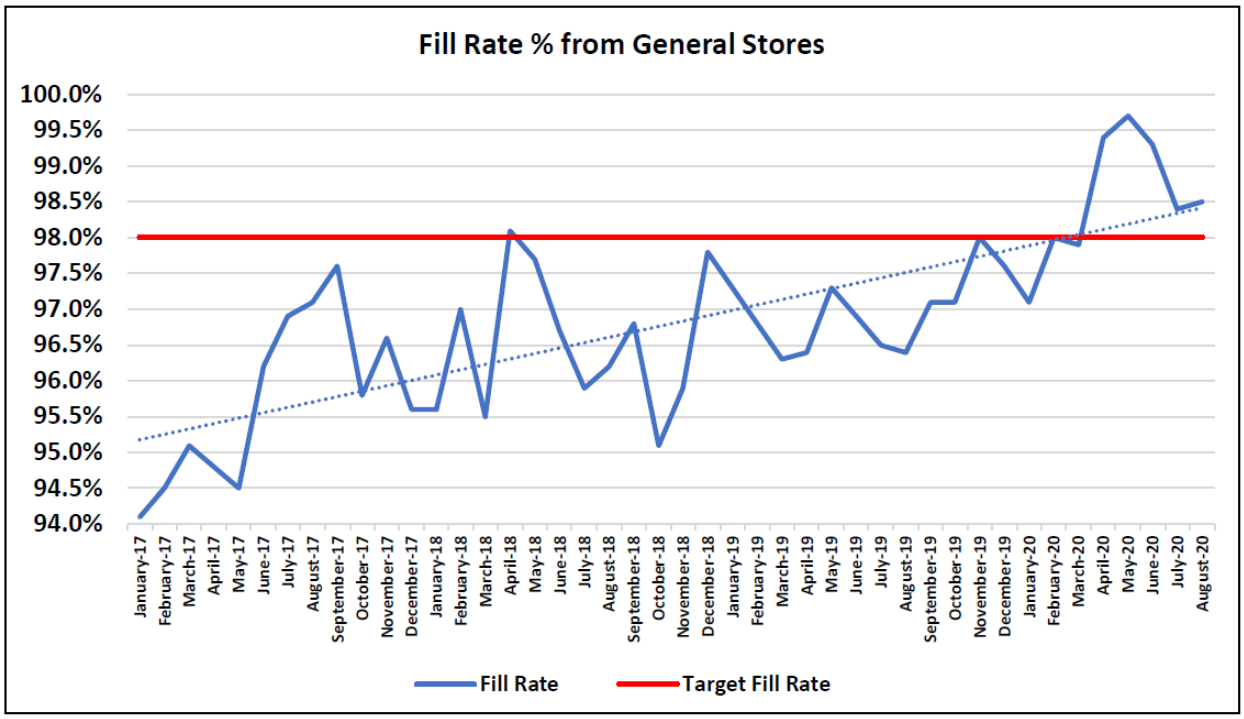
By reducing on-hand inventory levels and increasing inventory turns it was critical to focus on stocking adequate levels of high use items. When reducing inventory levels one of the biggest concerns is running too lean and risking out of stocks. By using the data from the reports and optimizing the stock levels in the general stores with the input of the buyer, receiving clerk and distribution team, the supply chain team continuously increased fill rates as a result of the supply chain optimization project (Figure

8). The receiving clerk built monthly cycle counts into the schedule to ensure on hand quantities were correct. Constant communication occurred between the receiving clerk, buyer, distribution team and supply chain director in daily morning huddles and allowed the team to be proactive when an issue or backorder occurred.

The fill rate was one of the greatest accomplishments of this supply chain optimization program and when shared with clinical leadership they continuously commented that their trust in the data and supply chain operations had increased as a result of this project. The hospital supply chain had data that showed it could be more effective and provide better fill rates with less on hand inventory while increasing inventory turns, proving that the project was bringing efficiencies in terms of work and costs.

**Figure 8**

**Fill Rate Percentage**




Goal: 98% Fill Rate

*Note:* Fill rate was one of the top metrics and it was the goal of every individual on the supply chain to communicate when there was low stock, higher usage (spikes) or any other information that could ensure the team would be proactive in managing stock levels.

**Distribution – PAR Analysis**

With greater efficiencies in operations it became apparent that the supply chain team could accomplish more with fewer resources. Using the DocuAnalyzer tool and various reports from the MMIS, the supply chain director was able to create a PAR Analysis Tool that pulled PAR stock min/max levels and matched up past daily usage to identify how many individual items were being requested and pulled for each individual PAR location. The VLOOKUP formula in Excel is a powerful tool and the ability to use conditional formatting to highlight various datasets allowed for a report to be created that showed how many days on hand of inventory was being kept in each PAR. The report was set to pull the "MAX" quantity used during a period and then add a safety stock on top of that number, which was then calculated against the max quantity listed on the PAR. This data helped project a "worst case scenario" and provided resiliency in case of a patient surge, spike in usage, or backordered products.

The supply chain director worked with the supply chain team to identify "core areas", or those areas that operated on a daily basis and should get the most attention – ER, Med/Surg, ICU and Birthing Center. The other PARs were evaluated and pushed to days during the Monday-Friday workdays and limited to only a couple days (or 1 day a week) depending on how their usage correlated to PAR levels. The supply chain team then evaluated the reports and increased stock of any areas that showed a max PAR level would not be enough to make it through a day without stocking or replenishment activities. The data reported very few items that needed adjusting and the supply chain director presented the findings to the CFO and clinical leadership and requested permission for the Materials department to be

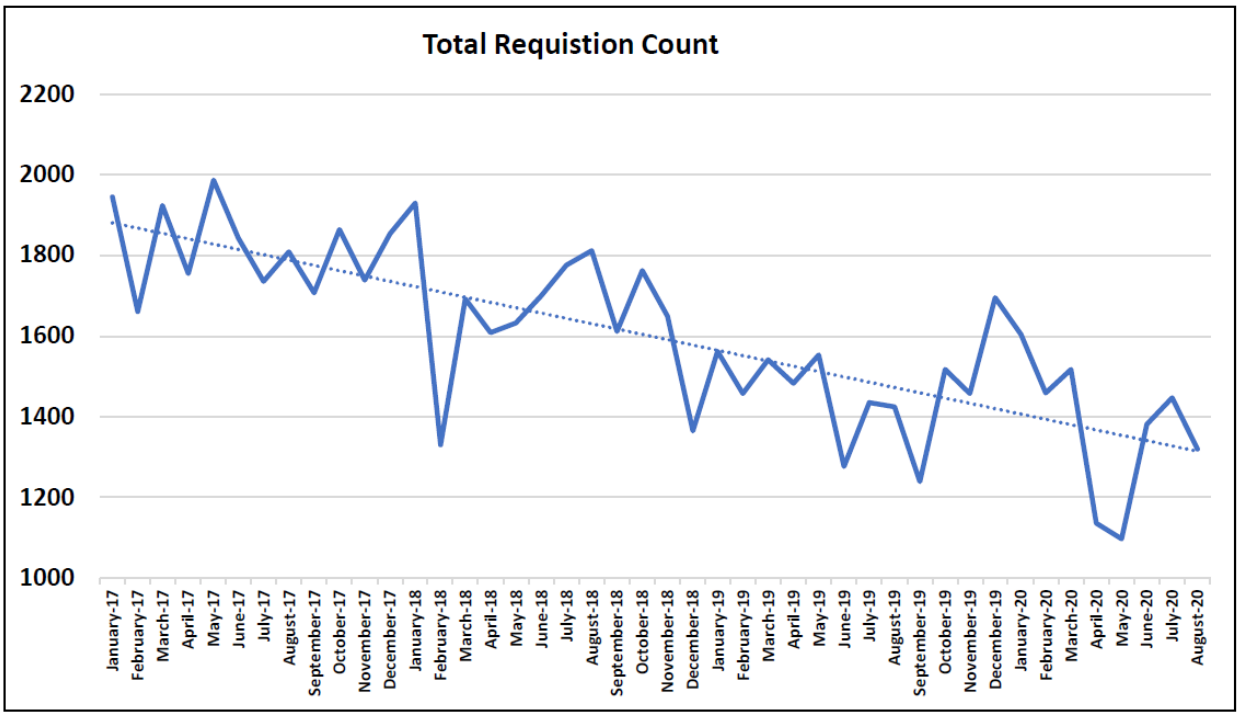
closed on Sundays. It was critical that nursing teams knew the supply chain had analyzed their stocking levels and communication was pushed out regarding the change and that little to no impact would occur. After a few weekends it was apparent that the data was correct and the Special Issues Board that was used by nursing supervisors to write down stock they had to take from the storeroom on Materials off hours showed only items that were not on PAR locations and were due to emergent/non-standard needs during off hours.

The supply chain director went to work analyzing the additional data sets and was determined that the PAR levels were set high enough to make it through another day of usage and approached leadership with discontinuing weekend Materials coverage altogether. This was met with some resistance but solid data showed that stock levels supported this and the team was granted the approval to trial moving away from weekend coverage while keeping one person on call for Saturday in case they needed support. During a month there were no calls to the on call Materials employee and it was determined that the project was a success.

"The key to real change lies not in the implementation of a new process, but in getting people to hold one another accountable to the process" (Patterson et al., 2011 p. 13). Using the data from the monthly reports the materials team was able to be more efficient with their time by stocking to max PAR levels less frequently as opposed to bringing up small quantities of items every day. This seemed counterproductive to long tenured staff that were used to daily counts and voiced fear that without visual inspection of stock levels they would run out as opposed to trusting the data of historical usage paired with safety stock numbers built into the equations for future demand. Trusting in the data resulted in a significant reduction in total requisition counts as the team was able to focus on core areas and weekly schedules that allocated resources more evenly (Figure 8)

**Figure 9**

**Total Requisition Count**




*Note:* Requisition counts significantly decreased as the supply chain team focused its efforts on PAR optimization efforts. Paired with an increasing fill-rate this was a huge win for the supply chain and clinical staff who felt more secure in their stock levels after reviewing the data.

**Labeling Project**

As a part of the PAR optimization, visibility was critical for supply chain staff and clinical staff. Using data from PAR reports and the Item Master, labels were created for all PAR locations that the supply chain managed. Each label had the description, internal item number, manufacturer number, PAR information, min/max quantities and a barcode of the internal item number. White labels were used for stock items (those items that were kept in the storeroom) and yellow labels for non-stock

items. This color coding system served as visual indicator for clinical staff as they could quickly identify if an item was stocked in the storeroom or if it was a special order. Another benefit of the label was that information regarding the product was easily accessible and they could quickly communicate product information to the supply chain team rather than calling it by a name that may not be familiar with the supply chain staff. This was a huge project as thousands of individual items needed labels in over a hundred PAR locations, but the transparency gained was incredibly beneficial to both supply chain and clinical staff.

**OR Integration – Advanced Tools for Demand Planning**

With the supply chain optimization project success, the supply chain director advocated for deeper integration with the OR supply chain, which had traditionally reported to the OR Manager with a dotted line reporting structure to the supply chain director. After some turnover of long standing OR employees, the supply chain team was granted access to oversee the ordering and replenishment of surgical supplies. The past employees had years of knowledge and were able to forecast usage based on their experience, but all of this tribal knowledge was lost when they left.

The first project conducted by the supply chain team as they integrated with the OR was to ensure that all items resided on a valid PAR and to create labels on all PAR items in the OR supply rooms. Using the same labeling structure as other department PARs, white labels indicated stock items and yellow labels were used for non-stock products. While the supply chain staff worked on this large project the supply chain director was concerned about a lack of visibility into the needs of the OR. Using the data from preference cards, the supply chain director was able to extract a report from the OR module of the electronic health record (EHR) that pulled the requested items for each case. This was difficult as the EHR was managed in a different system than the MMIS. By creating another

DocuAnalyzer model the supply chain director was able to extract the supply list by individual preference card and then to pull another report on upcoming scheduled OR cases. By stitching together these datasets, the report would show the amount of supplies that were anticipated to be used for that time period with the exception of emergent cases that were not on the schedule.

Working in Excel, the supply chain director created a query that linked the items to the Item file and then back to the PAR max quantity levels and the storeroom levels using IF excel formulas and VLOOKUP. A pivot table consolidated the data to analyze those items with anticipated usage that was less than on hand quantities in the storeroom for stock items or on the corresponding PAR for non-stock and flag it as an alert using conditional formatting.

The report was updated on a weekly basis with fresh input from current stock levels and surgery schedule and presented a data driven approach to demand planning in the surgical suites. This report gave the new supply chain OR materials coordinator deeper insight into upcoming scheduled cases and allowed them to proactively order items ahead of time for scheduled cases rather than hope that on-hand quantities were enough or risk overnighting shipments. This data was invaluable and helped the individual feel more comfortable in their new role and provided a transparent and data focused approach to inventory management in a high stress environment.

## Conclusion

The healthcare supply chain is responsible for significant costs and is a large percentage of overall healthcare expenses; with diminishing margins it is increasingly important for supply chain teams to source reliable streams of quality products while working to reduce associated costs with operations. Maximizing the efficiency of operations through the use of data provides an incredibly powerful opportunity for all healthcare supply chains to improve by identifying, capturing and analyzing these

data sets and allows the supply chain to drive deeper value for organizations. Supply chain leaders must understand their data and be able to analyze the relevant information to help the make informed decisions that reduce future costs, mitigate risks and drive efficiencies for the organization. Business analytics allows supply chain teams to build resiliency and transparency into operations through quantifiable metrics, allowing supply chains to improve the quality of care and reduce overall costs.

**References**

Abdulsalam, Yousef & Schneller, Eugene. (2019). Hospital Supply Expenses: An Important Ingredient in Health Services Research. Medical Care Research and Review. 76. 240-252. 10.1177/1077558717719928.

Centers for Medicare & Medicaid Services. (ret. 2021, January 30). National Health Expenditure Data Historical. Retrieved from https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/NationalHealthAccountsHistorical

Fuhrmann, R. (2021, January 20). How to Calculate the Inventory Turnover Ratio. Investopedia. https://www.investopedia.com/ask/answers/070914/how-do-i-calculate-inventory-turnover-ratio.asp

Gavin, M. (2019, July 16). Business analytics: What is it and why is it important? *Harvard Business School Online*. Retrieved from https://online.hbs.edu/blog/post/importance-of-business-analytics

Patterson, K., Grenny, J., McMillan, R., & Switzler, A. (2011). Crucial Conversations Tools for Talking When Stakes Are High, Second Edition (2nd ed.). McGraw-Hill Education.

Jain, P., & Sharma, P. (2014). Behind Every Good Decision: How Anyone Can Use Business Analytics to Turn Data into Profitable Insight (Illustrated ed.). AMACOM.

*Understanding EDI Transactions*. (n.d.). GHX. Retrieved January 30, 2021, from https://www.ghx.com/ghx_learning_center/help/webconnect/understanding_edi_transactions.htm

What's the Difference Between Business Intelligence and Business Analytics? (2019, October 17). Retrieved from https://www.michiganstateuniversityonline.com/resources/business-analytics/difference-between-business-intelligence-vs-business-analytics/