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Fargo Health Group:

Managing the Demand for Medical Examinations Using Predictive Analytics

The Fargo Health Group Case

The history of Fargo Health Group dates back to 1916, when Dr. Nathaniel Scott Fargo settled in Birmingham, Alabama, and opened his gastroenterological health clinic under the name Birmingham Gastro. His ambitions and dedication to medicine were passed on to his sons, Drs. Daniel Paul Fargo and Charles Anthony Fargo. The two joined their father's practice in 1932 and 1936, respectively. In the 1940s, the reputation of the clinic was burgeoning and the quality of the health care it provided to its patients was no longer a secret. The Fargo family decided to extend the healthcare services provided by their practice by inviting other doctors and scientific researchers to join them. Within a few years, the practice was already providing a wide spectrum of healthcare services, from podiatric medicine to audiology. In 1952, the practice was renamed Fargo Health Group.

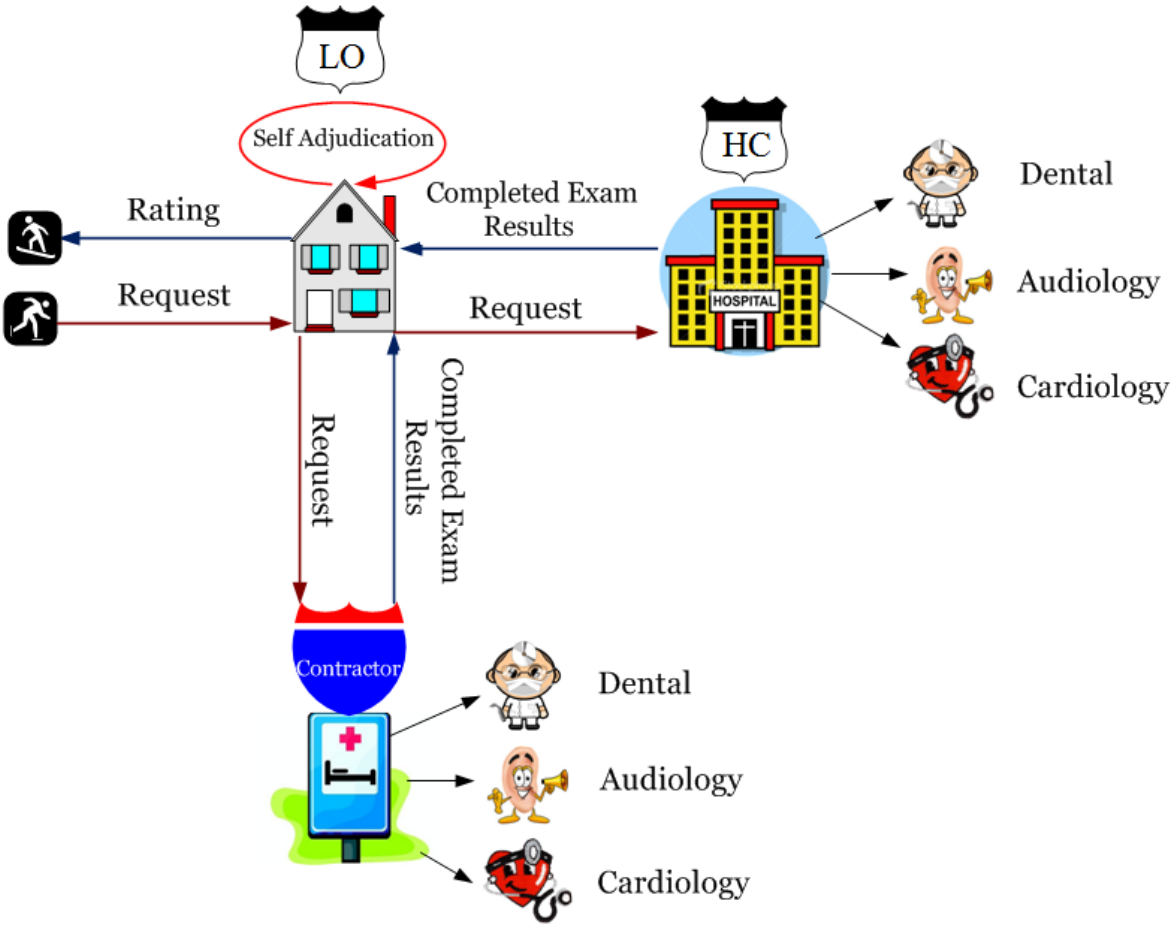
Fargo Health Group initially struck some traditional health care practitioners as unorthodox due to its dedication to practicing medicine through teamwork. Over the years, however, as the name of the organization was becoming a brand among patients and as Fargo's medical success stories were spreading by word of mouth, public acceptance was inevitable. The key to Fargo's success was the new model of medicine in which the knowledge and skills of physicians from various specializations were "pooled" together for the benefit of their patients and the quality of healthcare. Today, Fargo operates through 34 clinics across the United States.

This case was prepared by Davit Khachatryan, Assistant Professor of Statistics & Analytics at Babson College, based on published sources. It was developed as a basis for class discussion rather than to illustrate effective or ineffective handling of an administrative situation. It is not intended to serve as an endorsement, source of primary data or illustration of effective or ineffective management.

Among its current services, Fargo provides disability compensation benefits to thousands of patients every year. The total compensation paid to patients in 2013 reached $2.25 million. The Quality Assessment Office (QAO) of Fargo is responsible for the collection of disability examination data from the 34 clinics and the subsequent analysis of that information. The QAO serves as a think-tank that oversees the disability examination process throughout the entire country and consults individual clinics on how to improve the quality of health care and how to enhance customer satisfaction with the disability examination process.

The disability examination process starts with the patient submitting a request for disability compensation to one of the organization's 34 Local Offices (LOs). A customer representative from the LO subsequently assists the patient in the evaluation of the request, and either self-adjudicates it on the basis of the relevant information already available at the LO or, as is often the case, forwards the request to one of Fargo's 34 Health Centers (HCs), requesting that the HC perform the necessary disability examinations. It is mandated by Fargo management that HCs complete and send back the results of disability examinations within 30 days after the receipt of the request from the LO. In other words, the HC's clock starts ticking the day it receives the request, and it has only 30 days to complete the request and report the results back to the requesting LO. Each day beyond the allocated 30-day timeframe costs Fargo $200 worth of fines paid to the Regional Office of Health Oversight (ROHO). Obviously, such overdue examinations negatively impact the health and wellbeing of patients as well as the reputation and financial condition of Fargo.

In actuality, however, due to the lack of examining physicians, HCs often do not have the capacity to meet the mandated 30-day timeframe. In such circumstances, the HCs are late completing the requested examinations and, as a result, often report back late to the LOs, thus exceeding the 30-day deadline. Alternatively, when HC management foresees the potential delay when receiving the request, the HC sometimes returns the request to the requesting LO right off the bat, together with the explanation that the rejection stems from the HC's being understaffed. In the latter case, the LO then reroutes the request either to other Fargo HCs in the vicinity (an infrequent scenario) or, more frequently, to one of the neighboring out-of-network Outpatient Clinics (OCs) with the hope that the OC will find the available staff and perform examinations on a timely basis. It should be stressed that, since the OCs don't belong to Fargo's network, each request examined by an OC costs on average $1,250 more than the amount that Fargo would pay for an in-house examination of the request, had there been adequate in-house capacity. In addition, while the HCs are managed by Fargo and are thus required to abide by the 30-day deadline, there is no guarantee that the OCs will, since, as mentioned above, the OCs are not in Fargo's network. Thus such rerouting of requests from HCs to OCs represents yet another major financial and reputational burden for the organization. The diagram of the disability examination process for a hypothetical medical request consisting of 3 examinations is displayed below.



During the last end-of-year management meeting, Jay Rubin, the Director of QAO, stressed the importance of an accurate, data-driven planning of examining physicians at the HCs. According to Mr. Rubin, predictive analytics is what the organization needs to reduce the costs to the OCs as well as the fees paid to ROHO. QAO collects and hosts extensive data on historical incoming examination volumes from each of the 34 Fargo clinics and for each examination type. Mr. Rubin shared with the management (and later in the afternoon with Anthony Bryant, the CEO of Fargo Health Group, who was absent from the meeting) his vision: that if the HCs are somehow able to "learn" from the historical request volumes, then that could potentially lead to a more effective scheduling of examining physicians at the HCs. According to Mr. Rubin, history may not necessarily repeat itself, but it can provide clues on what may be happening in the future.

It should be mentioned that, for a long time, Mr. Rubin's data-analytic vision had been politely welcomed by the upper management at the organization with the only obstacle being that Fargo did not have the appropriate staff to commit to such a major undertaking. Perhaps it was due to this reason that Mr. Rubin half-sarcastically stated that, "If for the last ten or so years

we could afford Local Offices to contract out our requests to third-party OCs, then I guess we should be able to contract out the development of this predictive model, or should we not?" On the evening of that same day, Fargo issued a contract seeking external efforts to conduct a pilot study that could lead to the development of the predictive analytic product that Mr. Rubin has advocated over the years, and which could help Fargo accurately guess the incoming volume of medical requests and thus use that information to improve the scheduling of physicians.

Assignment Details

You and your team submitted a proposal for the pilot-study with Fargo Health Group, and have recently been notified that you are being awarded the contract. Your team's task on this urgent assignment is to propose a data-driven approach that will effectively accomplish Mr. Rubin's vision. To arrive at the procedure, you are provided a dataset, culled from Fargo Health Group's data repositories, on the historical monthly examination volume of cardiovascular examinations from the HC located in Abbeville, Louisiana.

Your client company (Fargo) is looking for two things: a presentation/pitch to the management explaining the data-driven approach for anticipating the incoming cardiovascular examination volume at the Abbeville HC, and a written deliverable report detailing your approach. The deadlines for both the presentation and the report will be announced by the instructor at the project kick-off. During the final presentation, the management of your client company expects that your engagement team will:

- Present the business problem and emphasize the necessity for a data-analytic solution;
- Clearly explain your team's data-analytic approach to tackle the business problem that your client is facing;
- Explain the nature and structure of the received data, and how data inconsistencies and issues were resolved by your team;
- Apply the data-analytic approach that your team designed using the data that were received and "cleaned" by your team. The team also needs to elaborate on all the undertaken modeling and forecasting approaches by clearly comparing and contrasting them;
- Emphasize and summarize the key findings as well as observations, and recommend further steps that your client should undertake in the data-analytics realm, which could potentially lead to another engagement with your consulting team;
- Fit the presentation within the allocated timeframe;
- Deliver the presentation in a way that is well-organized and accessible to both technical and non-technical audiences; and
- Provide clear and thorough answers to all the questions asked by the client.
- Note that each presenter will have anywhere from 3 to 5 minutes for his/her pitch, except for the first presenter who will both open up the presentation for 3-5 minutes and conclude it for another 3-5 minutes.
- The management expects that in the written deliverable report your engagement team will:
- Discuss the business problem and the data-analytic approach undertaken by your team for solving it;
- Explain in detail how each data inconsistency/issue (outlier, missing value, duplicates, etc.) was resolved prior to the analysis;

- Carefully apply the data-driven approach that your team designed to the data that you received and "cleaned." Employ the necessary technical sophistication and depth, including but not limited to accurate residual diagnostics, model fitting summaries, and model validation; and
- Clearly lay out all the assumptions behind both the data-analytic approach and the time series models that you used.
- Note that there is no set page limit for the written deliverable report. The report should be typed in Times New Roman 12-size font using 1-inch margins on both sides of each page. In addition, page numbers and double spacing are required throughout the entire document. All figures and tables should have clear captions and legends, and should be appropriately referenced within the text. In addition, figures must have clearly labeled axes. The report should be spell-checked and follow the proper rules of grammar.
- You have a unique opportunity to help Fargo Health Group to better plan for the incoming examination demand, and thus enhance the quality of its service in providing state of the art health care to patients. Good luck on your important mission.

Logistics and Organization

The engagement team will be formed by the instructor prior to the engagement kick-off. The team will consist of either 5 or 6 members. Throughout the entire project, the team members are expected to collaborate. Rather than solely focusing on individual tasks, each student is expected to take full ownership of the engagement and add her/his contribution in all stages of the work. Collaboration is in the best interest of each student, in light of the fact that each team member gets the same grade for the written deliverable report. At the completion of the project, students will be required to submit a peer-evaluation assessing the collaborative skills and effectiveness of their team members.

The instructor will serve as the "client" for the engagement. As such, the instructor will promptly address any questions, which should be addressed by email or in person during scheduled status updates or extra appointments scheduled by the team. Notice that students are expected to have meaningful questions regarding the data inconsistencies (outliers, missing data, etc.) during the scheduled status update meeting, at the latest. It should be emphasized that a number of subtleties regarding the data are left out from the caselet and are instead supposed to be brought to light as a result of thoughtful and relevant questions asked by students during the first status update meeting, at the latest. Note that, while clearly answering the questions asked by the team, the instructor will not provide solutions but may instead direct the teams towards the right approach in case the team is significantly off track with its approach. During the final presentation, the team is expected to defend its approach by clearly demonstrating how it works and by carefully addressing all of the instructor's questions.

Following the engagement kick-off, the engagement team has to determine internally how to split the tasks among its team members, and who will present what, during the final presentation. However, there are fixed responsibilities that the instructor has pre-defined for students to choose from. Note that the role that a student assumes throughout the engagement should match his/her role during the presentation. For example, the student responsible for cleaning the data has to present about the data cleaning efforts. The structure of the presentations for both 5-member and 6-member teams is outlined below. During the first internal team discussion/meeting, the engagement team should distribute the exact roles by choosing those from the second column of the corresponding table below.

For 5-member Teams

Team Member	Role
A	Explain the business problem that the team is trying to solve and provide a background of the subject matter (3-5 minutes)
B	Explain the structure of the data, the cleaning of the data, and the data-analytic solution (in a nutshell) that the team is proposing (5 minutes)
C	Present the analysis of the 1st time series model that was used to model the data (5 minutes)
D	Present the analysis of the 2nd time series model that was used to model the data (5 minutes)
E	Present the analysis of the 3rd time series model that was used to model the data (5 minutes)
A	Compare models 1-3 and conclude the presentation (3-5 minutes)

For 6-member Teams

Team Member	Role
A	Explain the business problem that the team is trying to solve and provide a background of the subject matter (3-5 minutes)
B	Explain the structure of the data, the cleaning of the data, and the data-analytic solution (in a nutshell) that the team is proposing (5 minutes)
C	Present the analysis of the 1st time series model that was used to model the data (5 minutes)
D	Present the analysis of the 2nd time series model that was used to model the data (5 minutes)
E	Present the analysis of the 3rd time series model that was used to model the data (5 minutes)
F	Present the analysis of the 4th model (can be **any** model, not necessarily a time series model) that was used to model the data (5 minutes)
A	Compare models 1-4 and conclude the presentation (3-5 minutes)

The engagement team will email the instructor, no later than the date set by the instructor at the engagement kick-off, of the exact task assigned to each member.

Scheduled Status Updates and Deliverables

The following is the list of the status updates and deliverables that the engagement team is required to adhere to. The deadline for each of these action items will be announced by the instructor at the engagement kick-off.

Action Item	Description
Breakdown of Responsibilities	Engagement team notifies the instructor of the role that each team member is responsible for throughout the engagement;
First Status Update	Engagement team meets with the instructor to clarify the data-related questions. Questions pertaining to definitions of data attributes, and nature of missing values and outliers, as well as data dictionaries, all are particularly relevant at this meeting. At the end of the meeting, the team is expected to have a solid understanding of the data and should be ready for subsequent data cleaning;
Second Status Update	Engagement team meets with the instructor to provide an update on data cleaning/preparation efforts as well as on the formulation of their data-analytic approach. Relevant topics of discussion include but are not limited to resolution of missing values, outliers, and duplicates, as well as the logic behind the data-analytic method. It is expected that at the end of this meeting, students are able to successfully complete the data preparation and enter the modeling stage of the engagement;
Presentation	Engagement team presents its work. After delivering the presentation, engagement team is expected to put the finishing touches on the written report before the submission;
Deliverable Report	Engagement team delivers the written report;
Peer Evaluations	Each team member evaluates the effectiveness of her/his peers through an online peer evaluation survey.

Grading

To evaluate the objectives outlined above, each student's performance on this caselet may be assessed in line with the scheme below, varying the component weights as the instructor finds appropriate:

Grading Component	Weight
Presentation	20%
Deliverable Report	60%
Received Peer Evaluation	10%
Submitted Peer Evaluation	10%

Each student's overall grade for the caselet will be based on:

- Student's presentation to the class. This component will be graded based on the overall soundness of the presented content, as well as student's presentation and communication skills;
- A written deliverable report that the team will submit on the date set by the instructor at the engagement kick-off. Each team submits a single deliverable and each team member gets the same grade for the report. The grading of this component will be strictly based on technical soundness, accuracy, breadth, and depth of the content;
- Peer evaluations, submitted by the student's team members on the date set by the instructor at the engagement kick-off, assessing the student's effectiveness when working with his/her team members;
- A peer evaluation, which the student will submit on the date set by the instructor at the engagement kick-off, assessing the effectiveness of his/her team members. Note that simply submitting the completed evaluation will earn the student the 10% of the project grade outlined in the table above.