Our PSM Biostatistics Internship at Spectrum Health
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Purpose and Background
Spectrum Health is a not-for-profit health system based in West Michigan. Spectrum Health Hospital Group includes 11 hospitals, 170 ambulatory and service sites, 1,050 employed physicians and advanced practice providers and Priority Health. This makes Spectrum Health West Michigan’s largest employer with 21,000 employees.

According to the 2013-2014 Best Hospitals rankings, Spectrum Health is ranked among the best hospitals in the nation. In addition, Spectrum Health Blodgett, Butterworth, and Helen DeVos Children’s hospitals earned Magnet Recognition, which is considered to be one of the highest honors bestowed upon a health care organization. Only 5 percent of hospitals in the country possess the level of healthcare quality and professionalism needed to receive this prestigious designation.

The research conducted at Spectrum Health Offices of Research Administration (SHORA) is held to the same impressive quality standard as hospital patient care. The SHORA team assists doctors, nurses, and other health professionals in navigating the complexities of human-subjects research approval, identification of funding sources, and compliance with national laws and regulations. SHORA currently contains four specialized teams including pediatrics, med surgery, cardiovascular, and oncology. Grant and finance teams as well as Spectrum’s own IRB board is also housed in SHORA. This makes for multidisciplinary collaboration.

Objectives
The goal of this internship was to utilize and further develop our skills as biostatisticians while providing assistance as members of the Spectrum Health Research Department. T tests, chi-square tests, ANOVA, and logistic regression were among the techniques used to analyze data. These techniques were first learned in class and then applied in a real-life research setting. We also utilized our knowledge of sample size determination, power analyses, SAS mapping, and randomization to research projects given to us by other employees of Spectrum Health.

Consulting
In addition to using our analytical skills, we were able to gain experience consulting during our internship at Spectrum Health. We met with various staff throughout the hospital system on a weekly basis, including nurses, doctors, research coordinators, and medical students. As a result, we gained experience interpreting statistical concepts to non-statisticians.

Previous GVUS interns had developed a request form to assist in the consulting process. Researchers filled out this form prior to meeting with the statistical interns. This form informs the statistical interns of the nature of the request, any necessary background information, and a brief overview of the research study prior to the consultation.

At times a protocol and/or other additional resources would also attached. This additional information allowed the statistical interns to be more prepared when entering the consulting session as they would gain additional information on what question the researcher was trying to answer. This also allowed the statistical interns to independently brainstorm about how to answer the question efficiently, effectively, and accurately; this usually included the statistical analysis and plan.

Experience: Identifying risk factors for next day discharge following angioplasty
Background
- Being able to determine significant predictors of next day discharge following angioplasty is important in being able to identify best clinical practices and/or possible complications associated with angioplasty.
- Discerning whether a significant predictor reflects a clinical practice that can lead to extending the patients’ stay or a certain complication was one of the main aims of this study.

Methods
- Possible predictors of discharge time (next day or same day) were narrowed down using a “first cut” – a chi-square test of independence or goodness of fit was performed for predictors
- Fisher’s Exact Test was used for this “first cut” when assumptions were not met.
- Predictors making it past the “first cut” were then entered into a logistic regression model and removed using backwards selection and a p-value threshold of 0.10. The use of a logistic regression model allowed for odds ratios to be calculated and output graphically (as seen below).

Objectives
Discerning whether a significant predictor reflects a clinical practice that reflects keeping the patient longer than potentially necessary is a large proportion of our projects involved sample size calculations and power analyses. Results of these calculations were often used in the statistical portions of study protocols and grant applications. The figure below is an example of a plot we might use to explain our calculations to those with a limited statistical background. This plot was created using PROC POWER in SAS and illustrates the relationship between power, sample size and effect size in a two-sample t-test.

Experience: Sample Size and Power Analysis
A large proportion of our projects involved sample size calculations and power analyses. Results of these calculations were often used in the statistical portions of study protocols and grant applications. The figure below is an example of a plot we might use to explain our calculations to those with a limited statistical background. This plot was created using PROC POWER in SAS and illustrates the relationship between power, sample size and effect size in a two-sample t-test.

Experience: Pioneering Lung Study
Investigation of factors associated with time to death following lung re-transplantation, a notion not currently found in literature. A Cox Proportional Hazards model was constructed and Kaplan-Meyer curves were compared over surgical time eras.

Experience: SAS Applications
Learn and apply techniques in SAS that we did not have the opportunity to use in our coursework. One of these techniques is using PROC GMAP as a geographical data visualization tool. The figure below was created to illustrate Spectrum Health’s patient population density by county in the state of Michigan. Similar techniques can be used for national and global data.

Experience: Additional Projects
NICU: Sound Study
- Average weight gain, cognitive development and sound measurements were compared between single room and open bay environments in the NICU at Helen DeVos Children’s Hospital.

EMS Weight Estimation
- EMS and 911 dispatch caller estimated weights of pediatric patients were compared to the patient’s weight on scale upon arrival at the hospital. This study aimed to investigate how accurate these estimations are.

Neutropenia and Infection in Infants
- This is a comprehensive study aimed at investigating if there is a statistically significant association between neutropenia and infection in infants.

Pneumonia and Narcotic Use
- The purpose of this study is to determine if there is a statistically significant association between being hospitalized for pneumonia and being a narcotic user.

Challenges
The biggest challenge we faced while interning in the Spectrum Health Research department was the lack of a statistical mentor. However, this pushed us to research and discover new techniques on our own, which proved to be a valuable experience. Another challenge we faced was organizing and prioritizing multiple ongoing projects. We received approximately 30% more assistance requests than any other intern team from previous years. Working together and using resources such as online SAS documentation and conference proceedings helped us to quickly and efficiently prioritize projects and meet deadlines.

Impact
Overall, our internship experience at Spectrum was extremely beneficial and provided us with important tools to use in our future endeavors. This opportunity has allowed us to gain a comprehensive view of the research process, including IRB approval, grants and patient enrollment and tracking. Through this experience we have come to appreciate the complexity of the research process.

We also had the opportunity to work with different groups of people and be involved in many different kinds of research projects throughout the hospital system. This provided us with a diverse work experience, strengthened our collaboration skills and allowed us to grow as biostatisticians.

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*"Life is not just a series of calculations and a sum total of statistics, it’s about experience, it’s about participation, it is something more complex and more interesting than what is obvious.*

Daniel Libeskind