

2023 Summer Research Internship Project Summaries

Below is a list of projects available for the 2023 Summer Research Internship Program at Gillette Children's Specialty Healthcare. The program will start with orientation in June and end with a poster symposium in August.

Carefully review the available projects. Pay special attention to the minimum requirements, which are outlined for each project. Tailor your statement of interest to highlight which projects are of most interest to you and how you are qualified to make a meaningful contribution. As part of the online application process, you will need to rank your project preferences. Efforts will be made to accommodate your choices.

1. Remote Monitoring of Key Gait Parameters Using Cell Phone Video

Research area: *Gait and Motion Analysis* | **Mentor:** *Andrew Georgiadis, MD* | **Number of students:** *1 student*

Requirements: *Intern can be an undergraduate or graduate student; preferred experience with Microsoft Excel and REDCap*

Description: Ambulatory children and adults with musculoskeletal and neurological impairments may be assessed by instrumented gait analysis. Optical-based motion capture systems represent the current gold standard in quantitatively assessing human movement, but these systems are time and resource-intensive. Furthermore, the laboratory represents an artificial testing environment that may not fully represent the real-world capabilities of patients in their daily lives.

Deep learning and modern pose algorithms have been developed to estimate gait parameters and body segment motion from 2-dimensional video. The motion laboratory at Gillette Children's has collaborated with artificial intelligence researchers to develop a machine learning strategy to predict 3-dimensional joint kinematics and other gait parameters using the 2-dimensional data extracted from cell phone video. This active pilot study will test whether the machine learning predictions for several gait parameters are reliable and reproducible in the "real world."

Intern tasks will include working directly with research participants and assisting staff with study recruitment and data entry. Additional projects or areas of work will be assigned as appropriate based on time and need.

2. Falls and Fall-Related Injuries in Adults with Neuromuscular Conditions

Research area: *Gait and Motion Analysis; Rehabilitation* | **Mentors:** *Elizabeth Boyer, PhD and Linda Krach, MD* | **Number of students:** *1 student*

Requirements: *Intern can be an undergraduate or graduate student*

Description: Adults with neuromuscular conditions, like cerebral palsy, fall about 2-3 times more frequently than the general older adult population. Not only can these falls cause injury, they also can lead to embarrassment, anxiety, loss of independence, and activity avoidance.

This study aims to understand how frequently falls and fall-related injuries occur in adults with cerebral palsy and spina bifida and what patient-factors are associated with greater rates of falls or fall-related injuries (e.g., age, sex, concomitant conditions, gross motor function). At Gillette's Adult Clinic, patients are asked these questions during clinic visits.

Intern tasks will include extracting this information and other data from the electronic medical record, with opportunities to be involved in the data analysis and manuscript preparation.

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3. Identifying key characteristics of bowel and bladder continent catheterizable conduit (CCC) revision among patients of the National Spina Bifida Patient Registry (NSBPR); and

Exploratory investigation of retrospective hospital acquired conditions (HACs) data to identify common themes, associations, patterns and clusters

Research area: Health Services Research - Outcomes and Care Delivery | **Mentor:** Rhonda Cady, PhD, RN | **Number of students:** 1 student

Requirements: Undergraduate or graduate student, with coursework or experience in qualitative data analysis or epidemiology, programming, and statistical analysis and/or data mining

Description: The intern will work on multiple projects within the Health Services Research program.

Neurogenic bladder and bowel commonly occur in individuals with spina bifida. A continent, catheterizable conduit (CCC) is a surgically created enteric tunnel between the bowel or bladder and the skin. The goal of CCC procedures is management of neurogenic conditions to promote continence. However, complications can occur and include stomal incontinence, stomal stenosis, stomal prolapse, CCC stricture, and false passage. Prior studies indicate a correlation between weight and surgical outcomes and that obesity directly correlates with the development of stomal stenosis in patients who have undergone CCC procedures.

The National Spina Bifida Patient Registry (NSBPR) is a collaboration of over 20 sites that care for children and/or adults with spina bifida. The demographic, intervention and outcome data collected by each site is aggregated and used to improve the quality of spina bifida care. Using the large NSBPR dataset, we will examine the frequency and distribution of revision rates of bladder and bowel CCC procedures and identify key characteristics of patients who undergo revisions. Potential statistical methods include t-test, chi-square, ANOVA and survival analysis.

The second project will assess hospital acquired conditions, commonly referred to as HACs, are conditions that develop during a hospital admission, can cause harm to patients, and are often preventable. Commonly defined HACs include catheter-associated urinary tract infection, central line-associated blood stream infections, surgical site infections, pressure ulcers, falls and ventilator-associated events. In this study, we will use qualitative analysis strategies, data-mining techniques and descriptive statistics to explore previously collected data on HAC occurrences over the past 8-10 years. The goal of this exploratory investigation is to identify associations between patient characteristics and occurrence and non-occurrence of HACs. This information will be used to develop future research and process improvement protocols.

Intern tasks for both projects will include data gathering and entry in addition to basic statistical analyses and presentation.

4. Chronic Pain Outcomes Following Non-Pharmacological Treatments Provided in Pediatric Tertiary Pain Clinic

Research area: Pain and Comfort | **Mentor:** Chantel Burkitt, PhD | **Number of students:** 1 student

Requirements: Intern can be an undergraduate or graduate student

Description: Non-pharmacological interventions, such as osteopathic manipulative treatment (OMT), can present an alternative approach to treatment and management of chronic pain in children and adolescents with neuromuscular conditions. Evaluating the effectiveness of these treatments can be challenging in clinical settings where time and resources may be limited. Pain assessment tools were implemented as part of an organization wide initiative to improve and standardize pain assessment measures at a pediatric tertiary care center. The goal of the study is to assess pain in response to non-pharmacological treatment interventions among patients with and without neuromuscular diagnoses.

Intern tasks will include gathering OMT and pain assessment scores from the medical record and completing data entry and basic statistical analyses. Additional projects or areas of work will be assigned as appropriate based on time and need.