Center for Health Services Research and Patient Safety

Research, Translation, Practice

Letter from the Director

The beginning of the academic year is a re-invigorating time for CHRP, and this issue highlights key facets of the Center's mission and vision.

We have a research methods article on cluster analysis, continuing our commitment to using this newsletter as an educational mechanism for researchers. In that same vein, we are debuting the Hot Topics in Health Services Research column, which will highlight a health services research study with relevance to the Center's work. As CHRP faculty are strongly committed to student research, I am pleased to present the efforts of Dr. Shirley Blanchard by showcasing three of her recent projects with occupational therapy students. We also take a look at how teaching concepts can evolve and be strengthened through integration of research concepts and ideas discussed during journal clubs. Finally, I am excited to see the expertise of our research scientists being recognized with Dr.'s Amy Abbott and Kimberly Galt speaking at local and national events, respectively.

CHRP welcomes anyone to join us as we continue advancing our research and educational efforts. May the beginning of the academic year be a re-invigorating time for all of you as well!

Kevin Fuji, Pharm.D., M.A.
Director, Center for Health Services Research and Patient Safety (CHRP)

Cluster Analysis Technique

By Amy A. Abbott, Ph.D., R.N.

Cluster analysis is a term that has been used since the late 1930s and has been defined as a collection of algorithms that uses similarity rules to group cases (individuals or objects) into homogeneous categories or clusters.[1] The goal of this exploratory technique is to reduce large amounts of data into smaller "clusters" of items. This process maximizes the differences of items between the clusters while minimizing the differences of items within the clusters (see Figure 1).
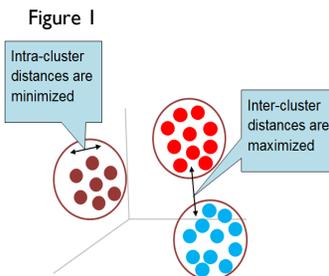
Figure 1

Intra-cluster distances are minimized

Inter-cluster distances are maximized

Image obtained from: http://apandre.files.wordpress.com/2011/08/clusterdistances.jpg.

This method of grouping allows for the discovery of taxonomies within the data, but compared to other statistical procedures it does not offer any "statistical significance" nor does it offer an explanation of why these taxonomies exist. It is up to the researcher conducting the study and doing the clustering to put a label or a name to each cluster based on their knowledge about the data. Figure 2 presents an example of clusters within the

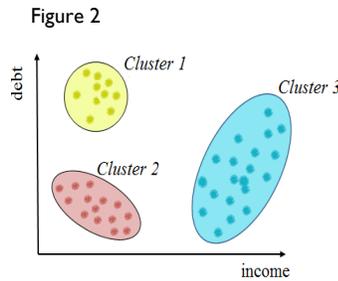United States population based on their debt and income.

Figure 2

Image obtained from: (http://www.analyticsvidhya.com/blog/wp-content/uploads/2013/11/Clust1.gif)

Two researchers may name these clusters differently based on their own background and analysis; therefore Cluster 1 might be named the "low income, high debt" cluster (or the "debt-tolerant" cluster); Cluster 2 might be named the "low income, low debt" cluster (or the "live-within-your-means" cluster) and Cluster 3 might be called the "high-income, low-debt" cluster (or the "smart-spenders" cluster). For this reason, there is some subjectivity in providing an explanation of the data through naming of clusters.

There are several different types of cluster algorithms that are used but the major types are either hierarchical, k-means clustering, or two-step cluster.[2] Each type produces clusters of items.

In **hierarchical clustering**, algorithms of results are produced in nested clusters that are organized in a hierarchical tree fashion. These clusters can be visualized as a dendogram that creates sequences of merges/splits (see Figure 3). This type of clustering does not require that a certain number of clusters be obtained but rather that the dendogram is stopped or cut at proper levels based on changes in distances of items within the tree. These divisions or clusters are then explained through the expertise content knowledge of the researcher about the data or the literature on the subject matter.
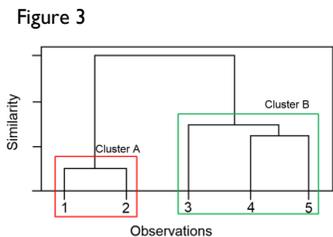
Figure 3

Image obtained from: http://www.alanfielding.co.uk/multivar/images/dend5.gif.

There are two main types of hierarchical clustering: agglomerative, which begins with each point as an individual cluster and then at each step or iteration, merges the closest pair of clusters; and divisive, which starts with one big cluster

Cluster Analysis Technique

and then at each step splits the cluster into smaller points. In summary, hierarchical cluster analysis involves choosing a statistic that quantifies how far apart (meaning how similar) the two cases are. Then, a method is selected for group formation. After this is done, the last step is to determine how many clusters are needed to represent the data. This is accomplished by looking at similar clusters are when new clusters are created or existing clusters are collapsed.

K-means clustering is a partition-approach to grouping data where the number of clusters (k) is specified prior to starting the technique. Each cluster is associated with a centroid/mean that is assigned to the cluster with the closest centroid. The centroids of each cluster are recomputed until the centroids no longer change and the set k is reached. It is important to note that the clusters produced vary from iteration to iteration and the centroid is usually the mean of the points within the cluster. This technique is very sensitive to outliers as they may initially be used as the cluster centers, leading to clusters with small number of cases/outliers. Researchers must carefully examine data before starting this type of analysis and remove any outliers.

Two-step clustering is used for exploring the natural grouping of cases/objects in very large data sets. In this type of analysis, cases are assigned to "pre-clusters" in the first step. The second step, involves taking the pre-clusters and using a hierarchical clustering algorithm to create new clusters. The number of clusters can be specified as in k-means or they can be determined based on preselected criteria within the algorithm. This type of cluster analysis allows for different levels of variables (continuous and categorical) to be used. The assumptions of this method are that the continuous variables follow normal distribution while categorical variables have multinomial distributions and the variables are all independent.

Application of the Cluster Analysis Technique in Nursing Research

Symptom cluster nursing research is an emerging area of study. Symptom clusters have been defined as consisting of two or more symptoms that are related to one another and occur simultaneously. Symptom cluster research has been conducted in oncology, medical surgical, mental health, and cardiac populations.

In a study of oncology patients, Dodd, Miaskowski and Paul (2001), used hierarchical cluster analysis to determine that there were four distinct groups of patients based on symptom severity.[3] These clusters were: 1) those with all low symptom severity; 2) those with all high symptom severity; 3) those with low fatigue and high pain; and 4) those with low pain and high fatigue. These findings were the first to suggest that a specific symptom cluster could affect the outcomes of those patients receiving chemotherapy. Since the 2001 study, this area of research has significantly expanded and includes many different subgroups of patients within the above-mentioned populations.

Application of the Cluster Analysis Technique in Health Services Research

Cluster analysis has also been used in health services research. Examples of how this technique can be used include: identification of clusters of organizations that share common strategic features; testing a homelessness pattern of shelter utilization; and to present how clusters of chronic conditions impact prevalence, health consequences, and implications for quality, care management and costs.[4]

Vogeli et al., was able to classify nearly 70% of hospital-led health networks and 90% of hospital-led health systems into four clusters for health networks and five clusters for health systems. This structure provided a framework for assessing policy issues such as Medicare Provider Sponsored Organizations and insurance regulation.[4]

Okazaki (2006) used the two-step cluster analysis technique to understand information about mobile Internet adopters in Japan.[5] Using the variables of gender, age, marital status, occupation, income, household structure, and attitude and perception, they found that four clusters existed that profiled users and their views (both positive and negative), attitudes and perceptions about the mobile platform.

Conclusions

It is important to realize that there are several different types of cluster analysis but clusters in research have been determined through multiple other statistical tests as mentioned above. Understanding the data will help determine which technique or analysis will be best suited to your research.

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1. Alexander MS. *Quantitative Applications in the Social Sciences Series (Book 44, Cluster Analysis)*. Thousand Oaks, CA: Sage Publications; 1984.

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3. Dodd M, Miaskowski C, Paul SM. Symptom clusters and their effect on the functional status of patients with cancer. *Oncol Nurs Forum*. 2001;28:465-470.

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5. Okazaki S. What do we know about mobile Internet adopters? A cluster analysis. *Inf Manag*. 2006;43(2):127-141.

Hot Topics in Health Services Research: Patient Engagement with Blue Button

By Kevin T. Fuji, Pharm.D., M.A.

The Hot Topics in Health Services Research article highlights a recent health services research study that tackles an issue of national importance and is related to the ongoing work of CHRP. In this first article, the national push for patients to have increased access to their health information is examined in the context of the Veterans' Affairs MyHealtheVet combined personal health record and patient portal, and the Blue Button Initiative.

Nationally, the adoption of electronic health records (EHRs) to improve safety, quality, and efficiency of care is being stimulated through the Medicare and Medicaid EHR Incentive Programs (more commonly known as "Meaningful Use"). As focus continues to grow on engaging patients in their own care, patient portals within EHRs have been proposed as a tool to facilitate this engagement.[1] Patient portals are defined as: "a secure online website that gives patients convenient 24-hour access to personal health information from anywhere with an Internet connection."[2] Subsequently, Meaningful Use Stage 2 contains a core measure designed to enhance patient electronic access to their health information; requiring eligible professionals or hospitals to attest that 5% of patients during the reporting period view, download, or transmit their health information to a third party.

The Blue Button Initiative was created to allow patients better access to their health information online. The Blue Button tool allows patients to go online to view and download their health records (including medication lists, laboratory test results, allergies, etc.) and share this information with health care providers and family members.[3]

The study conducted by Turvey et al. (2014) used a survey to characterize the Veterans' Affairs' (VA) Blue Button users, examine their perceptions about Blue Button's impact on their health, and examine the role of Blue Button in sharing information with non-VA health care providers.[4]

The authors found that self-rated computer ability and having a system for organizing health information were factors strongly associated with Blue Button use. For non-users the major reason for not using Blue Button was a lack of awareness about the feature. For those non-users who were aware of Blue Button, the top three reasons for non-use were: 1) they did not know how to use it; 2) they only used MyHealtheVet for prescription renewal; and 3) they preferred to use other mechanisms for health information tracking.

Current Blue Button users were most interested in accessing their laboratory results (71.4% of respondents) and their current VA medication list (57.8%). Only 11.8% of respondents shared the Blue Button printout or file with a family member, and only 9.7% shared it with a non-VA health care provider.

Overall, perceived benefits of Blue Button use included helping patients understand their health history as their information was in a single location (73.3%); helping patients monitor their laboratory results better (72.2%); and making it easier for patients to share their health information with others (67.9%).

In terms of lessons learned, the authors suggested that even for respondents who had sufficient computer literacy, using Blue Button may have been difficult. They proposed that more education and awareness-raising is needed regarding patient portals and the potential benefits associated with their use.

Relevance to CHRP research

CHRP researchers have focused on the adoption and use of patient-facing technologies such as PHRs and patient portals by both patients and health care providers. Early work into providers' knowledge of PHRs and PHR use by their patients revealed that many providers were unaware of PHRs.[5] Further research noted that most standalone PHRs are not designed with the patient end-users in mind, and fail to meet many of the desires of patients.[6] Combined with the findings of the Turvey et al. study, it is clear that while PHRs and patient portals still hold much potential for enhancing patient engagement in their own care, additional health provider, patient, and technology designer education is needed in order to optimize these technologies for meaningful use.

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2. Office of the National Coordinator for Health Information Technology. What is a patient portal? http://www.healthit.gov/providers-professionals/faqs/what-patient-portal.
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5. Fuji KT, Galt KA, Serocca AB. Personal health record use by patients as perceived by ambulatory care physicians in Nebraska and South Dakota: a cross-sectional study. Perspect Health Inf Manag. 2008;5:15.
6. Fuji KT, Abbott AA, Galt KA. Standalone personal health records in the United States: meeting patient desires. Health Technol. 2012;2(3):197-205.

Highlight on Student Research: Dr. Shirley Blanchard

By Shirley Blanchard, Ph.D., A.B.D.A., O.T.L./R., F.A.O.T.A.

CHRP has a continued focus on the value and importance of student research. Dr. Shirley Blanchard, Ph.D., A.B.D.A., O.T.L./R., F.A.O.T.A., is a CHRP faculty member who is dedicated to working with students to ensure that they attain the research skills necessary to enhance their future careers as health care professionals. Here, three of her recent projects with students are highlighted.

Quality of Life Following Bariatric Surgery: Preliminary Results

This project was conducted with Nikki Elsasser, O.T.D., O.T.R./L., Bethany Kleinschmit, O.T.D., O.T.R./L., Kayla Shannon, O.T.D., O.T.R./L., Emily Smith, O.T.D., O.T.R./L., & Brigit N. Khandalavala, M.D. The purpose of this project was to evaluate quality of life for patients who have undergone bariatric surgery. The investigators sought to determine to what extent co-morbidities improved following bariatric surgery, and if patients perceived a change in self-esteem, physical activity, social relationships, job satisfaction, sexual activity, and eating attitude. A survey utilizing both quantitative and qualitative questions was used, with 129 respondents making up the final study sample.

Results of the study supported the premise that quality of life (perceptions in the domains of self-esteem, physical activities, social relationships, job satisfaction, and sexual activity) may improve following bariatric surgery. This increase may be due to patients being highly motivated to follow post-operative recommendations during the two years after surgery which is the honeymoon phase. This initial success is attributed to rapid weight loss. However, this quality of life change is not sustained in all patients beyond two years, and depression continued to be an issue for 33% of respondents following bariatric surgery.

Dance as Weight Management for Adolescent Girls

This project was conducted with Katherine Brummer, O.T.D., O.T.R./L., Miranda Little, O.T.D., O.T.R./L., and Abigail Squire, O.T.D., O.T.R./L. The purpose of this project was to explore how adolescent girls at Girls Inc. in Omaha, Nebraska, perceive dance as: a) a physical activity; and b) a way to manage their weight. The study was conducted in two phases with girls between the ages of eight and 18. In phase I, a focus group was conducted with seven adolescent girls to gain an understanding of how they perceive dance as a form of exercise. Quantitative data were collected through the surveys in phase II. The survey sample included 40 adolescent girls of different ethnicities, including African American, Hispanic, Latino, African, and biracial. In addition, the girls' body mass indexes (BMI) were calculated.

Two major themes developed from the focus group: how participants and family members exercise; and how participants and family members identify healthy and unhealthy lifestyle choices. The survey found that hip-hop dancing was the most popular, and 87% of participants indicated that dance could burn calories and fat and could help a person lose weight; however, the level of health knowledge was inconsistent. Of the girls who participated, 62.5% had a healthy body weight. Trends indicate participants with lower BMI participated in more types of dance. Future interventions focusing on weight management might be more successful by incorporating the most popular forms of dance.

Assessing Transfer Techniques and Patient and Practitioner Injuries among Physical Therapists, Occupational Therapists, and Registered Nurses

This project was conducted with Rae Chael Zabokrtsky O.T.S., Lacie Winther O.T.S., Breanna Caudle, O.T.S., and Kathleen Joyner Wood, O.T.S. The purpose of this project was to examine occupational therapy (OT), physical therapy (PT), and registered nursing (RN) practitioners' perceptions of curricula to determine how and what transfer techniques were taught in each respective profession. This study also specifically aimed to understand the perceived level of risk for injury during transfers. An exploratory mixed methods design was used in which themes from focus groups were used to develop a questionnaire that was completed by 124 participants.

The five themes from the focus groups were: 1) teaching strategies for transfers; 2) determinants influencing transfer techniques; 3) injuries during transfers; 4) prevention of injuries; and 5) follow-up methods post-injury. Findings from the questionnaire revealed a significant difference between OT/PT professionals and nurses for transfer techniques taught, as well as, which transfer technique was used most often. Additionally, the methods of teaching varied between disciplines with a significant difference found between OT and PT professionals and nurses. Overall, 56.5% of facilities offered training in safe patient handling. This study reveals that more time needs to be dedicated to safe patient transfers in OT, PT, and nursing curricula. Facilities should offer trainings, protocols, and competency check-outs in order to decrease injuries during transfers. Following an incident, facilities should also consider measures to prevent further incidences. Additional research should be completed on specific trainings and protocols that would work to reduce patient and practitioner injuries during transfers through uniform patient handling techniques.

Research Journal Club Helps Professors Integrate Research into Teaching

By Kimberly A. Galt, Pharm.D., Ph.D., and Sue Crawford, Ph.D.

Did you ever wonder about the value of participating in journal clubs? For three years, CHRP has offered a monthly journal club series. Two tracks are presented: the research methods track and the research application track. The research methods track focuses on the use of a specific methodology within health services research. The research application track focuses on key research findings from varying disciplines related to the research work of CHRP, such as the science of patient safety.

Members of our CHRP community of faculty volunteer to bring forth important findings from the literature and share these with others. Each member receives advanced copies of the articles to be discussed for the opportunity to review these ahead of time. The faculty presenter prepares a key point summary of each article, responding to three guiding questions, concluding with distilling the relevance of the work to advancing our research, incorporating it into teaching, or advancing practice.

A recent exchange between the authors illustrates the value of participation. In a recent meeting to discuss completion of some joint scholarship, the subject matter of the last journal club of spring 2014 was revisited.

A recent exchange between the authors illustrates the value of participation. In a recent meeting to discuss completion of some joint scholarship, the subject matter of the last journal club of spring 2014 was revisited. Galt presented a critical review and statement of relevance about the paper entitled, "Safety in numbers: the development of Leapfrog's composite patient safety score for U.S. hospitals".[1] After attending this discussion and review of the paper, Crawford incorporated the article into an undergraduate course unit on quality measurement and quality improvement in public and nonprofit management. She spoke of the value of the article in demonstrating the development of a sophisticated method to measure quality with careful attention to established evidence to encourage students to aim for evidence-based quality measures in quality improvement efforts.

More information about CHRP journal club is available on the back page.

References:
1. Austin JM, D'Andrea G, Birkmeyer JD, et al. Safety in numbers: the development of Leapfrog's composite patient safety score for U.S. hospitals. *J Patient Saf.* 2014;10(1):64-71.

CHRP Accomplishments

By Faculty Members of the Creighton Center for Health Services Research and Patient Safety

Kimberly A. Galt, Pharm.D., Ph.D., F.A.S.H.P., F.N.A.P., was the launch Plenary Speaker at the Maine Patient Safety Academy held on September 5, 2014. Galt spoke on the topic of "Interprofessional Patient Safety and Pharmacists." The closing Plenary Speaker was Tejal Gandhi, M.D., M.P.H., C.P.P.S., President of the National Patient Safety Foundation and Lucian Leape Institute with Harvard Medical School. The academy was sponsored by the Maine Center for Disease Control and Prevention Rural Health and Primary Care Program with additional support from University of Southern Maine School of Nursing, University of New England College of Pharmacy, and Maine Health Access Foundation.

Galt was also appointed as one of three 2014-15 national research mentors for the American Association of Colleges of Pharmacy Academic Research Fellows Program (ARFP). The ARFP is a year-long program designed to expand the leadership capabilities of established faculty research scientists and administrators to cultivate collaborative team research and graduate education across institutions. Sixteen participants will gain experience in research-focused leadership development; team building; and the development of innovative research strategies to secure funding from federal and other public and private sources. Participants will also gain insight into the dynamics, management, institutional structures and policies that affect research teams; and have the opportunity to network with successful research leaders and advocacy groups. In addition to sessions in residence, Fellows will participate in a team-based project development. The other national mentors are Jordan L. Cohen, Ph.D., Emeritus Dean, Professor and previously Vice President for Research and Economic Development at the University of Iowa; and Sunny E. Ohia, Ph.D., Provost and Vice President for Academic Affairs and Research, Texas Southern University.

Amy Abbott, Ph.D., R.N., was invited to present at the Iota Tau Honor Society of Nursing's Annual Dinner and Officer Installation Ceremony on July 27 in Omaha, Nebraska. Iota Tau is the Creighton University chapter of the Sigma Theta Tau International Honor Society of Nursing. Abbott's presentation was entitled "Adaptation vs. Adoption: A Qualitative Exploration of Nurse Engagement with Electronic Health Records in an Office-Based Practice."

The Creighton University Center for Health Services Research and Patient Safety was founded to coordinate and support research and training efforts among faculty within an interdisciplinary and collaborative research environment. Faculty and staff serve the research interests of governmental agencies, health care facilities, employers, health care industry companies and educators.

Mission Statement: The Center for Health Services Research and Patient Safety conducts health services research to improve quality, safety and efficiency of patient care through the discovery, translation and dissemination of new knowledge.

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CHRP Journal Club

CHRP will again be conducting its journal club beginning in October. Attendance is open and campus members are encouraged to attend.

Each journal club presents two papers: one paper focused on a research methodology, with the other paper focused on a research application. A five-minute overview of the paper in each track is presented, followed by a 25-minute group discussion.

Past research methods topics have included:
- Combining qualitative methods with randomized, controlled trials
- Secondary data analysis
- Addressing statistical errors
- Development of a composite patient safety score

Past research application topics have included:
- Application of human factors principles to health care quality and patient safety
- The impact of electronic health records and e-prescribing on quality and safety
- Electronic sharing of health information by patients
- Disclosure of adverse events in health care

Journal club is held every 3rd Thursday of the month from 10:00 am to 11:00 am on the Creighton University campus in the Thune Conference Room of the Health Sciences Library. Watch for notices in Creighton Today, JayNet-News and the CHRP website (http://chrp.creighton.edu) for announcements.

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