

Letter from the Director

Summer is a restorative time for faculty members – an opportunity to take a much-needed vacation with friends and family to recharge. At CHRP, summer has been a time of high productivity with faculty working on research projects focused on the digital divide in patients with type 2 diabetes; the impact of a personal health record on clinical and social cognitive outcomes of patients with type 2 diabetes; the impact of electronic health record (EHR) use by rural ambulatory clinics on various aspects of safety and quality; and the provision of medication therapy management and chronic disease management services by community pharmacies.

As CHRP researchers prepare to disseminate their research findings, our featured article by Kimberly Galt presents important considerations for data visualization, and reminds us to be vigilant about both presenting findings and interpreting the findings of others. We continue to highlight lessons learned from our student research assistants; present work being done to modify EHRs in order to enhance clinical workflow, which sets the stage for the presentation of future CHRP research findings; and introduce our newest CHRP member, Dr. Drew Roberts.

Enjoy this issue, and best wishes for a fruitful fall!

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

Visual Display of Data – A Critical Dissemination Tool

By Kimberly A. Galt, Pharm.D., Ph.D., F.A.S.H.P., N.A.P.

We focus our efforts in research on ultimately finding the answer to a burning question, often satisfying a deep curiosity within ourselves. How do we communicate this finding so that the meaning is accurately shared with others? Accuracy means when any number of us receives this communication, that our understanding of the information is the same as the author of the information, resulting in our shared understanding of the author's meaning of this knowledge between all of us. This, as it turns out, has proven to be one of the more difficult aspects of disseminating knowledge.

One approach is to present data using visual displays. Visual techniques used in the display of our data influence the perceptions we have about what the data says and how we feel about what it shows us.¹

“Our thinking is filled with assessments of quantity, an approximate or exact sense of number, amount, size, scale. In scientific work, both order-of-magnitude reasoning and precise measurements are pervasive. How are such quantities represented in visual expressions of ideas, experience, and evidence? How are moving images, photographs, diagrams, maps and charts to be scaled and labeled? And what makes images quantitatively elegant?”

Recently the Harvard Business Review made the point about how important accurate data representation is in a short communication displaying examples of misleading visual displays of data.²

Figure 1 (on Page 2) shows how color distribution on a map chart influences our conclusions about what political party dominates amongst voters in an election. In this chart, about 80% of this map is red, suggesting that the majority of the population cast a vote favoring the Republican presidential candidate John McCain in the 2008 election. This map was prepared by coloring in the geographic areas where the population resides. However, only 40% of the votes cast were for John McCain.

The next map (Figure 2) on Page 2 uses bubbles of representative sizes to create a more accurate depiction of the number of votes in a geographic location, not a whole geographic territory boundary. When bubbles sized proportionally to population are overlaid on the map, blue becomes more dominant. The map displays accurately the distribution and magnitude of votes.

There are far too many examples of misleading visual displays. While some are intentional, most likely result from poor planning and design.

Designing visual displays of data has advanced in the last couple of centuries as an integral part of the conduct and communication of research and inquiry. While several sophisticated approaches are now known, the basic foundation for accurate data display continues to serve as underpinnings to our work.

Carr and Harrington (2011) provide a pragmatic approach to using visual design of tables and charts to communicate information. They suggest approaching the design by following three overarching guidelines: 1) organizing the data; 2) highlighting the data; and 3) showing the data.³ Within each of these guidelines, you make decisions that eventually guide you to a good visual representation.

Within organizing the data, there are two possibilities, either data is in tables or it is in charts. Tables are advantageous because they make it easy to look up exact values, compare individual values, and make data accessible when precise values are required. Tables are best when the data is sparse. Charts facilitate when you want the message to be seen in a pattern, when you want to reveal relationships among multiple values, or if you have highly dense data.

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Comparison of Presidential Candidate Election
Senator Barack Obama vs. Senator John McCain, 2008, By County

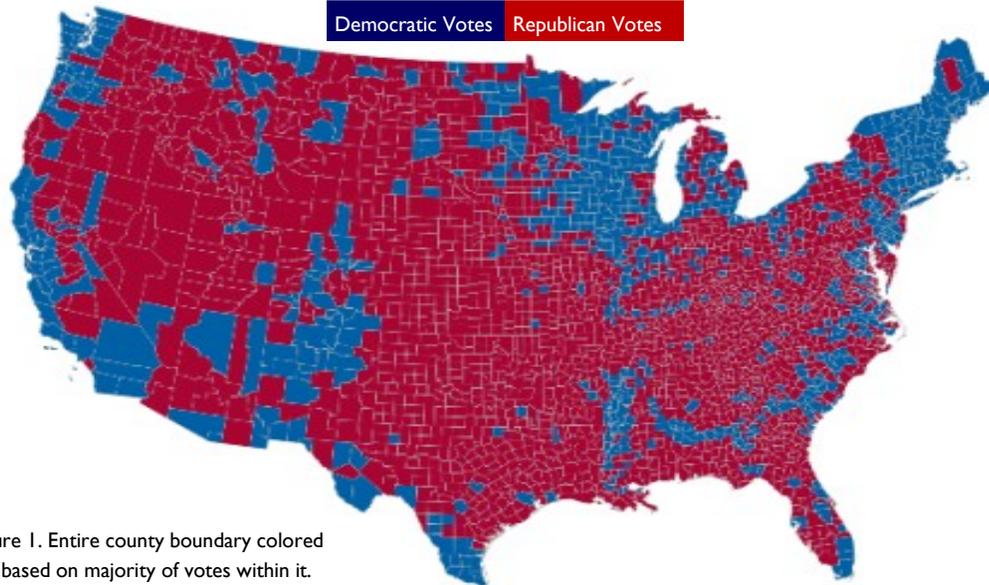


Figure 1. Entire county boundary colored in based on majority of votes within it.

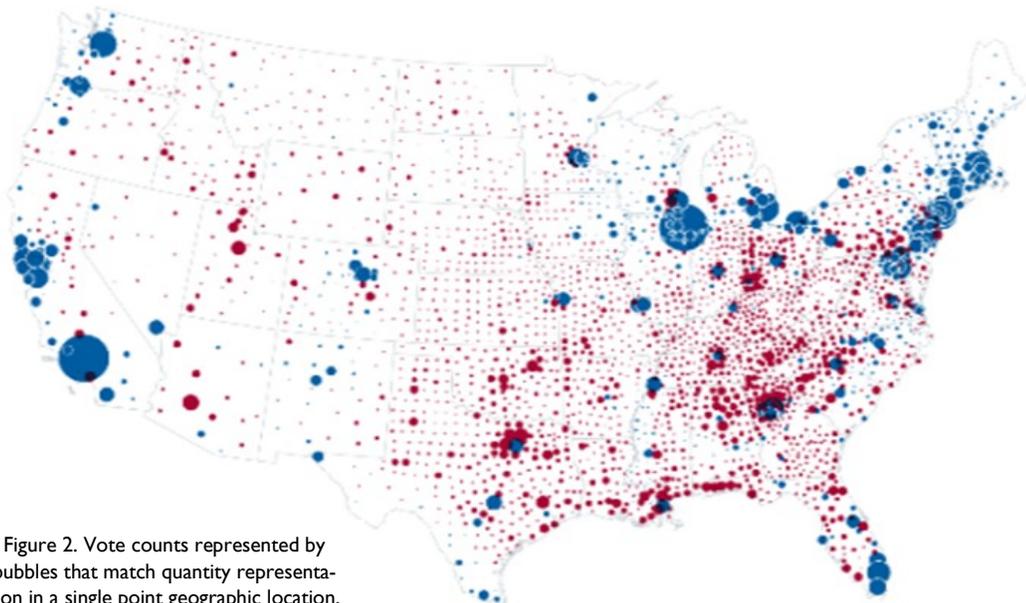


Figure 2. Vote counts represented by bubbles that match quantity representation in a single point geographic location.

Highlighting the data involves making meaningful choices between using black and white or color, and meaningful color choices. Color selection should match your purpose and your data. The example of the election graphs above illustrates a meaningful use of color by selecting colors associated with the political party affiliation of candidates. If you are working

on financial data, using black and red for “being in the black” (positive financial balance) or “red” (negative financial balance) might be good choices. Highlighting information can be done with bright colors.

Showing the data means to make the data display central to the visual design. Do not

decorate the data with interesting photos that distract from seeing the clear message of the data itself. While three dimensional charts are interesting, they cause us to distort the way we interpret the data. They are best not used. Minimize or eliminate grids, axes, and legends if it is already self-explanatory with the existing labels. Our purpose is

to communicate a clear message with the data – not interesting artifacts related to it. The display of data should be as simple as possible without being oversimplified.

After all of your work has been completed on the visual, take a step back and look at the final version. Does it accurately represent the meaning you want

(Continued from page 2)

to disseminate to others? This is the ultimate goal of producing a visual to clearly show your data.

Kelleher and Wagener (2011) have offered guidelines for effective data visualization.⁴ Their contributions both duplicate and compliment further those provided by Carr and Harrington (2011).³ Ten key points they offer us are shown in Table 1.

The data you have can be shared with others in many ways. You have your best opportunity to get your message clearly shared with others by considering who you want to communicate with and what the message is you want to highlight for them.

References:

1. Tufte E. Visual Explanations: Images and Quantities, Evidence and Narrative. Cheshire, CT: Graphics Press; 1997.
2. Vision statement: how to lie with charts. *Harvard Business Review*. December 2014.
3. Carr C, Harrington M. Effective communication through visual design: tables and charts. <http://aaude.org/system/files/documents/public/strategy-institute-handout-final.pdf>.
4. Kelleher C, Wagener T. Ten guidelines for effective data visualization in scientific publications. *Environ Modell Softw*. 2011;26(6):822-827.

Table 1. Guidelines for effective data visualization

1.	Create the simplest graph that conveys the information you want to convey.
2.	Consider the type of encoding object and attribute used to create a plot.
3.	Focus on visualizing patterns or on visualizing details, depending on the purpose of the plot.
4.	Select meaningful axis ranges.
5.	Data transformations and carefully chosen graph aspect ratios can be used to emphasize rates of change for time-series data.
6.	Plot overlapping points in a way that density differences become apparent in scatter plots.
7.	Use lines when connecting sequential data in time-series plots.
8.	Aggregate larger data sets in meaningful ways.
9.	Keep axis ranges as similar as possible to compare variables.
10.	Select an appropriate color scheme based on the type of data.

CHRP Welcomes Dr. Drew Roberts

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

I am pleased to welcome Drew Roberts, Pharm.D., Ph.D. as our newest CHRP member. Drew joined Creighton University in July 2015 as an assistant professor in the Department of Pharmacy Sciences.

Drew comes to us from the University of North Carolina at Chapel Hill where he recently completed his Ph.D. in Pharmaceutical Outcomes and Policy at the UNC Eshelman School of Pharmacy. He also completed a National Research Service Award (NRSA) T32 Postdoctoral Fellowship at the Cecil G. Sheps Center for Health Services Research at UNC. Prior to this, Drew earned his Pharm.D. from the

Drake University College of Pharmacy and Health Sciences.

Drew is trained as a health services researcher, applying large database analytic methods to evaluate the effectiveness of medications and prescription drug policies at the population level. In his dissertation research, Drew used claims and prescription drug monitoring program data to examine the impact of a prescription drug abuse prevention policy on controlled substance use behaviors in North Carolina Medicaid. In addition to claims data, he also has experience working with national survey data, electronic medical record

data, and cost-effectiveness analysis models.

Drew has published his work in various pharmacy-specific and health services research journals. He is an active member of AcademyHealth and the American Pharmacists Association and often presents his research findings at their national meetings.

Drew and his wife, Randall, can often be found indoors cooking and burning through their Netflix queue, occasionally emerging to walk their dog or go for a run. They are happy to live among Midwesterners again.

Drew is located in Hixson-

Lied Room 166 and can be reached at DrewRoberts1@creighton.edu and 402-280-2605.



Hot Topics in HSR: Enhancing the EHR to Support Clinical Workflow

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

This issue's Hot Topics in Health Services Research presents lessons learned from the implementation of human factors-based workflow recommendations into a Veteran's Health Administration (VHA) software prototype.¹

This software prototype interfaces with the VHA's Computerized Patient Record System (CPRS). Recommendations from reports sponsored by the National Institute of Standards and Technology and the Agency for Healthcare Research and Quality were used to implement changes in the software prototype.^{2,3} Both reports used a human factors framework to provide recommendations for EHR functionalities that could enhance clinical workflow in ambulatory care settings. A total of 12 recommendations were implemented to impact four phases of clinical workflow: 1) before the patient visit; 2) during the patient visit; 3) discharge; and 4) visit documentation.¹

Before the patient visit

Information that needs to be acted on by the clinician is grouped together and linked to appropriate pieces of information (e.g. medication lists with corresponding laboratory values). Having this information readily available prior to a patient's visit allows clinicians to prioritize the visit time, while complex patients can be provided longer visit times.

During the patient visit

Five recommendations were implemented to enhance

workflow during the patient visit: 1) the ability to build patient stories that highlight time-critical information for providers; 2) customized order sets that are specific to an individual patient's situation, and that can be easily edited by providers during the visit as information changes or additional information is gathered; 3) documentation to support team-based care – for example, allowing a physician to view changes made to a patient's medication list by a nurse during medication reconciliation in a track-changes type of format; 4) problem-oriented templates that more clearly match the clinical reasoning and decision-making process of providers, allowing for differentiation between established diagnoses, working diagnoses, and newly-identified problems that have yet to yield a diagnosis; and 5) unique templates to accommodate documentation for signs and symptoms that may be unclear; new diagnoses; and follow-up for established diagnoses.

Discharge

Patient narratives can be generated and customized for various needs, decreasing the incidence of extraneous or irrelevant patient information. Additionally, in order to support the use of the EHR by different stakeholders, displays can be tailored based on the user (e.g. health care provider vs. patient vs. patient educator).

Visit Documentation

Four recommendations were implemented to enhance visit documentation. First,

providers are given a dedicated, scenario-specific display that is unique from the display presented in the patient exam room. This scenario-specific display has an editing screen that allows the user to make informal notes, check marks, and other markings that are converted to editable text. This display can also be edited via typing or voice transcription. The patient narrative that is produced can be tailored to the user's role and the patient's situation. For example, a primary care physician will be provided with a different narrative compared to a specialist, and a patient who is seen weekly will have a different narrative compared to a patient who is seen annually. In order to minimize problems resulting from copying-and-pasting of information, data is labeled as either "copied text" or "fresh text". Finally, specialists are fully integrated during the documentation process and have complete access to the patient narrative, supporting coordination of care and completeness of information.

Conclusion

There are various ways that EHR functionality can be enhanced to support actual clinical workflow. This study provides a step toward moving from an EHR that primarily supports documentation for the purposes of coding and billing, to an EHR that primarily supports clinical workflow and patient-provider interaction.

Relevance to CHRP research

CHRP researchers are currently conducting a survey

study to better understand both EHR safety and quality benefits and unintended consequences from the perspectives of rural ambulatory clinic members (providers, clinical and support staff, administrators).^{4,5} Findings from this study will be shared in upcoming issues of the CHRP newsletter.

References:

1. Patterson ES, Lowry SZ, Ramaiah M, et al. Improving clinical workflow in ambulatory care: implemented recommendations in an innovation prototype for the Veteran's Health Administration. *eGEMS*. 2015;3(2):Article 11.
2. Lowry SZ, Ramaiah M, Patterson ES, et al. Integrating Electronic Health Records into Clinical Workflow: An Application of Human Factors Modeling Methods to Ambulatory Care. http://www.nist.gov/customcf/get_pdf.cfm?pub_id=915403.
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4. Bramble JD, Abbott AA, Fuji KT, et al. Patient safety perspectives of providers and nurses: the experience of a rural ambulatory care practice using an EHR with e-prescribing. *J Rural Health*. 2013;29(4):383-391.
5. Abbott AA, Fuji KT, Galt KA. A qualitative case study exploring nurse engagement with electronic health records and e-prescribing. *West J Nurs Res*. 2015;37(7):935-951.

Health Services Research and Policy Development: A Student Perspective

By Jack Anderson

As I departed my internship at the U.S. Centers for Disease Control and Prevention (CDC) in Washington, D.C., and returned to Omaha in mid-May, I was unsure what to expect of my newly-accepted position as a research assistant to Kimberly Galt, Pharm.D., Ph.D., in the Creighton University Center for Health Services Research and Patient Safety (CHRP). Prior to this position, my experiences related to the field had typically been focused on program development and policy analysis, so I was eager to develop a new set of skills related to academic research in health systems and patient outcomes.

During my time with CHRP, I have established a greater understanding of healthcare delivery, the role of state government in promoting health services, and how to conduct research projects utilizing a variety of research methods. This summer I have had the opportunity to work on several rewarding projects:

Nebraska Community Pharmacy Demographics 2015: Medication Therapy Management and Chronic Disease Management

The majority of my work with CHRP has been focused on an assessment of Nebraska's community pharmacists and corporate managers in providing medication therapy management (MTM) and direct patient care services, particularly to patients with chronic disease conditions, in pharmacies throughout the

state. Working extensively with Dr. Galt, I have established a comprehensive view of the research process from survey development to report writing.

Particularly unique was my responsibility of interviewing corporate pharmacy representatives regarding their business approach to offering MTM and direct patient care services within pharmacy locations. These qualitative interviews allowed me to learn about the role of a major entity within the healthcare spectrum—corporations—and their approach to health delivery.

I had the honor of developing a significant component of our report to the Nebraska Department of Health and Human Services, and I thoroughly enjoyed presenting our work to the State of Nebraska in Lincoln with Dr. Galt and other CHRP members.

This specific project was a very enriching experience. While some aspects of the work were particularly challenging, I was able to develop a greater understanding of research methods, an emerging practice area that has tremendous ability to improve patient outcomes, and opportunities available to the healthcare sector in better integrating pharmacists in patient care.

Electronic Health Records (EHRs) in Rural Primary Care Clinics

Additionally, I assisted on a project directed by Kevin Fuji, Pharm.D., M.A. studying

the safety and quality of EHR use in rural clinics throughout Nebraska. Work on this project included survey packet assembly, data entry, and literature reviews regarding EHR user demographics. It has been refreshing to work on another project related to an emerging area in the healthcare sector.

EHRs host an unprecedented ability to improve patient outcomes, establish greater knowledge through health data and research opportunities, and enhance health system delivery methods. With the continuously evolving area of health technology, it is vital to ensure patient safety and proper use of such records, and I am grateful to be able to be involved with Dr. Fuji's project which seeks to explore the progress and utilization of EHRs in rural Nebraska.

CHRP has opened my eyes to the exciting possibilities the world of health services research offers. I am truly grateful for this unique experience as I have been able to connect my work with CHRP to lessons learned in coursework at Creighton and professional experiences in the field.

Undoubtedly, health research is a vital activity in today's rapidly evolving healthcare sector. From my experience in Washington, D.C., to the state of Nebraska, it has become clear to me the basis of sound policy development at all levels of government solely depends on the in-depth exploration and

unbiased evidence the academic research field provides. I am honored to be part of this work in expanding our knowledge of health services and ensuring health systems are accessible to our most vulnerable populations. I am fully confident this experience will provide me an advantage moving forward as I will be able to pair my experiences in health policy with my newly-developed skills in health services research.

I would like to extend my great appreciation to Dr. Galt, Dr. Fuji, Ted Kaufman, Nicole Schopen, and Haley Sturges for their continuous support and guidance during my time with CHRP. I also would like to thank my academic advisor Dr. Sue Crawford for her inspiration and for connecting me with CHRP for this research assistantship opportunity. Without question, I have grown significantly because of this experience, and I am more excited than ever to enter the field of community health and health systems planning.

Jack Anderson will graduate from Creighton University in May 2016 with a major in Health Administration & Policy and minors in Public Health and Public Policy. He intends to begin a career in community health and development before continuing his professional education with a master's degree in public health.

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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 Faculty Accomplishments

Research Funding

- Alsharif NZ, **Abbott AA**, **Blanchard SA**, **Paschal KA**, **Siracuse MV**, Budesheim TL. Development and Validation of a Survey Tool to Measure Healthcare Provider Bias in Providing Services to Diverse Patient Populations. The Dr. George F. Haddix President's Faculty Research Fund. March 2015 – February 2016, \$15,000.

Poster Presentations

- **Clark BE**, **Siracuse MV**. Development of Pharmacy Students' Professionalism. American Association of Colleges of Pharmacy Annual Meeting, National Harbor, MD, July 13, 2015.
- **Siracuse MV**, **Clark BE**. Factors Influencing Career Aspirations of Third-Year Pharmacy Students. American Association of Colleges of Pharmacy Annual Meeting, National Harbor, MD, July 13, 2015.

Peer-Reviewed Publications

- **Fuji KT**, **Galt KA**. An online health informatics elective course for Doctor of Pharmacy Students. *American Journal of Pharmaceutical Education*. 2015;79(3):Article 41.
- **Sandstrom R**, Schmaltz A. Need factors associated with the intensity of outpatient therapy in the Medicare population. *Physical and Occupational Therapy in Geriatrics*. 2015;33(3):233-249.

Research Service

- **Kevin Fuji** was named to the editorial board of *Research in Social and Administrative Pharmacy*.
- **Kimberly Galt** served as a grant reviewer for the Agency for Healthcare Research and Quality Health Care Research and Training Study Section in Washington, DC on June 17-19, 2015.

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