Applied Ergonomics 64 (2017) 27–40

Contents lists available at ScienceDirect

Applied Ergonomics

journal homepage: www.elsevier.com/locate/apergo

Human factors in mental healthcare: A work system analysis of a community-based program for older adults with depression and dementia

Siobhan M. Heiden [a], Richard J. Holden, PhD [b, c, *], Catherine A. Alder, JD, MSW [c, d], Kunal Bodke, MS [c, d], Malaz Boustani, MD, MPH [c, d, e]

[a] School of Industrial Engineering, Purdue University, West Lafayette, IN, USA
[b] Department of BioHealth Informatics, Indiana University School of Informatics and Computing, Indianapolis, IN, USA
[c] Indiana University Center for Aging Research (IU CAR), Indianapolis, IN, USA
[d] Regenstrief Institute, Indianapolis, IN, USA
[e] Eskenazi Health, Indianapolis, IN, USA

ARTICLE INFO

Article history:
Received 20 October 2016
Received in revised form
16 March 2017
Accepted 3 May 2017

Keywords:
Mental health
Workflow Elements Model
Alzheimer's Disease
Dementia
Work system analysis
Field research

ABSTRACT

Mental healthcare is a critical but largely unexplored application domain for human factors/ergonomics. This paper reports on a work system evaluation of a home-based dementia and depression care program for older adults, the Aging Brain Care program. The Workflow Elements Model was used to guide data collection and analysis of 59 h of observation, supplemented by key informant input. We identified four actors, 37 artifacts across seven types, ten action categories, and ten outcomes including improved health and safety. Five themes emerged regarding barriers and facilitators to care delivery in the program: the centrality of relationship building; the use of adaptive workarounds; performance of duplicate work; travel and scheduling challenges; and communication-related factors. Findings offer new insight into how mental healthcare services are delivered in a community-based program and key work-related factors shaping program outcomes.

1. Introduction

The application of human factors/ergonomics (HFE) in healthcare has greatly accelerated since the turn of the century (Hignett et al., 2013; Reviews of Human Factors and Ergonomics, 2013; Xie and Carayon, 2015). Over the past decade, HFE has spread to multiple healthcare domains and settings: from hospital to outpatient clinic; from assisted living facilities to the patient's home; from pediatrics to geriatrics; from surgery to cardiology (Carayon et al., 2014). However, there is a noticeable lack of application of HFE in the domain of mental healthcare, despite several calls to action. As long ago as the early 1980s, Johnson et al. (1981) observed the need for HFE in mental healthcare. After reviewing the potential benefit of HFE knowledge and methods concerning human-computer interaction in an increasingly computerized field of mental healthcare, they concluded, "increased effort is needed to apply research in human factors [engineering] to computer usage in mental health" (p.428). More recently, DeLucia and Harold (2011), urged more HFE work in mental healthcare, stating, "… we cannot afford to wait until mental health service providers seek our help."

Mental health is a significant public health challenge in the U.S., especially among older adults (MentalHealth.gov, 2015). Approximately 20% of adults 55 years or older experience a mental health issue, with the most common issues including anxiety and cognitive impairment (CDC and Directors, 2008). Further, 5.5 million Americans are living with Alzheimer's Disease, a disease with profoundly distressing effects on both the patients and their informal caregivers (2017 Alzheimer's Disease Facts and Figures, 2017). Mental health is a challenging domain because symptoms are difficult to measure objectively, patients experience and respond to symptoms in varying ways, and as a result treatments are often highly personalized (Paradiso et al., 2010; VanDenBerg, 1993). Furthermore, mental healthcare is surrounded by

* Corresponding author. Walker Plaza – WK317, 719 Indiana Avenue, Indianapolis, IN 46202, USA.
E-mail address: rjholden@iupui.edu (R.J. Holden).

http://dx.doi.org/10.1016/j.apergo.2017.05.002
0003-6870/

stigmatization (Lauber et al., 2006) and treatment involves community and social resources in addition to medical ones (Evans et al., 2003; Glisson et al., 2007; Tew et al., 2012).

Several prior intersections of HFE and mental health or mental healthcare are worth noting, including:

- a review of how nursing home physical environments influence the physical activity of persons with dementia (Anderiesen et al., 2014);
- the use of HFE or human-computer interaction (HCI) methods such as user-centered design or usability testing for technology products such as smartphone applications for people with schizophrenia (Ben-Zeev et al., 2013) or tablet technology for older adults with dementia or depression (Holden et al., 2016);
- ergonomic evaluations of challenges in application and/or reduction of physical restraints in mental healthcare facilities (Salerno et al., 2012; Stubbs and Paterson, 2011);
- HFE research on technological interventions to relieve the stress and psychosocial burden of informal (family) caregivers (Czaja et al., 2012);
- considerations for HFE measurement instruments (e.g., NASA-TLX for mental workload) in rehabilitation for traumatic brain injury (Heiden and Caldwell, 2014, 2015); and
- HFE considerations for technology and environmental support for older adults, who are at risk for cognitive impairment (Morrow and Rogers, 2008; Stronge et al., 2007).

Other HFE studies in health and healthcare have identified issues related to mental health, even when this was not the study's focus. In a study of home care providers (nurses and nursing assistants), Beer et al. (2014) reported provider work challenges related to patients' depression, anxiety, and cognitive impairment. A recent HFE study on falls in hospitals was compelled to consider dementia and delirium as factors in a patient's fall risk (Hignett et al., 2015). Furthermore, several HFE studies have studied populations with or at risk for mental health disorders, though not in the context of health or healthcare; common examples include studies of driving performance among older adults and persons with Alzheimer's disease (e.g., Parasuraman and Nestor, 1991) and occupational studies examining the effect of psychosocial symptoms (Skipper et al., 1990). Lastly, experts in human-computer interaction have examined phenomena such as the effect of Internet use on depression (e.g., Bessière et al., 2010), although these studies do not use HFE theories, tools, or methods.

We note several limitations of the HFE literature in mental health and healthcare. First, to our knowledge, there are not many instances of conference panels, position statements, interest groups, or other organized efforts around mental health in the HFE scientific or practice communities. Second, more empirical studies are needed in addition to early conceptual work. These empirical studies should use HFE methods and theories to bring unique value to the fields of mental health and mental healthcare. Third, performed studies have been restricted in the range of targeted populations, settings, approaches, and applications. Pediatric and midlife mental health, certain types of disorders (e.g., depression, anxiety, psychosis, substance abuse), mental health services and formal caregiving, interventions concerning models of mental and behavioral care, and disease-prevention or health-promotion approaches, have not received as much attention as geriatric mental health, neurocognitive disorders (e.g., dementia), informal caregiving and self-care, technological interventions, and disease-treatment approaches. Fourth, we know of no frameworks specifically for HFE in mental health, and therefore no specific vocabularies, categories of mental health domains, or HFE research priorities in this area. Although this kind of specialization may not be necessary, given many robust HFE frameworks for healthcare, we contend that mental health and healthcare have unique characteristics and research needs that are not fully satisfied by broader efforts in healthcare HFE. In turn, the study of mental healthcare may extend existing HFE knowledge and methods.

1.1. Work system analysis of a mental healthcare program

> "…to improve safety, quality, performance, and comfort, a good place to start is by analyzing the involved system" (Karsh and Alper, 2005, p.337)

To add to and stimulate further scientific literature on HFE in mental health and healthcare, we performed an empirical study of a community-based collaborative care program for older adults with depression and dementia in the Midwest US. The program, called Aging Brain Care (ABC), delivers population health management and case management services to older adults suffering from mental illness and their informal caregivers (family members and friends), using a collaborative care model progressively developed and tested since 2008 (Austrom et al., 2015; Boustani et al., 2011; Callahan et al., 2011; French et al., 2014; LaMantia et al., 2015). ABC is operational in one of the largest safety net health systems in the US, providing inpatient, outpatient, and mental healthcare to over a million people, including a large proportion of low-income, low-literacy, underinsured, and uninsured patients. Our study focused primarily on ABC's home care in which patients who have been diagnosed with depression or dementia receive regular home visits for monitoring their mental health and providing interventions as necessary, with the goals of reducing symptoms, decreasing costs and unnecessary acute care utilization, supporting patients' informal caregivers (e.g. spouses), and keeping patients in their homes as long as possible. Services include medical tasks such as mediation reconciliation as well as management of social services.

The ABC program and others like it (Claiborne, 2006; Coleman et al., 2009; Norris et al., 2002) have been evaluated for outcomes such as clinical efficacy, effectiveness, and economic impact (French et al., 2014; LaMantia et al., 2015). However, there have been few systematic evaluations of how such programs are implemented in practice (Pearson et al., 2005) and those evaluations have not examined how daily *work* is performed in these programs. In other words, there is a dearth of knowledge regarding the ABC program's or similar initiatives' work system structures and processes, performance-shaping factors, workflow, and other work-related HFE constructs. Several HFE scholars note that work structures and performance processes are the input to important healthcare outcomes, and therefore must be carefully studied (Carayon et al., 2006; Holden et al., 2013a; Karsh et al., 2006). In general, a prevailing principle in HFE is that to improve a domain requires a thorough understanding of the work in that domain (Carayon et al., 2012; Cook, 2005; Siemieniuch and Sinclair, 2005).

A secondary motivation for the study was related to planned changes in the ABC program. These planned changes included expanding the program in size and scope, integrating new technologies, and redesigning the organization of work to a mission-control type, analytics-driven model. It was therefore important to capture a baseline record of how work was performed to: a) understand how the change would impact work and b) provide prospective guidance to ABC program stakeholders on designing their change efforts, based on identified inefficiencies, workload imbalances, and other issues.

Our work system analysis of the ABC program used the Workflow Elements Model (Unertl et al., 2010) to guide data collection