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

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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 hours 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.

Keywords

Mental health; Workflow Elements Model; Alzheimer's Disease; dementia; work system analysis; field research

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Introduction

The application of human factors/ergonomics (HFE) in healthcare has greatly accelerated since the turn of the century (Hignett, Carayon, Buckle, & Catchpole, 2013; Reviews of Human Factors and Ergonomics, 2013; Xie & 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 and colleagues (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 & 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 ("2017Alzheimer'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, Bianchi, Lau, & Scilingo, 2010; VanDenBerg, 1993). Furthermore, mental healthcare is surrounded by stigmatization (Lauber, Nordt, Braunschweig, & Rössler, 2006) and treatment involves community and social resources in addition to medical ones (Evans, Wells, & Moch, 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, Scherder, Goossens, & Sonneveld, 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, Forcella, Di Fabio, Figà Talamanca, & Boscolo, 2012; Stubbs & Paterson, 2011);

- HFE research on technological interventions to relieve the stress and psychosocial burden of informal (family) caregivers (Czaja, Lee, & Schulz, 2012);

- considerations for HFE measurement instruments (e.g., NASA-TLX for mental workload) in rehabilitation for traumatic brain injury (Heiden & Caldwell, 2014, 2015); and

- HFE considerations for technology and environmental support for older adults, who are at risk for cognitive impairment (Morrow & Rogers, 2008; Stronge, Rogers, & Fisk, 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 and colleagues (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, Wolf, Taylor, & Griffiths, 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 & Nestor, 1991) and occupational studies examining the effect of psychosocial symptoms (Skipper, Jung, & Coffey, 1990). Lastly, experts in human-computer interaction have examined phenomena such as the effect of Internet use on depression (e.g., Bessière, Pressman, Kiesler, & Kraut, 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 mid-life 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.

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 & 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, Austin, Brach, & Wagner, 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, Carayon, et al., 2013; Karsh, Holden, Alper, & Or, 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 & Sinclair, 2005).

A secondary motivation for the study was related to planned changes in the ABC program. These planned changes including 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, Novak, Johnson, & Lorenzi, 2010) to guide data collection and analysis. The Workflow

Elements Model attends to the core elements of Actors, Artifacts, Actions, Outcomes, and the connections between these elements. It is therefore well suited to understand a complex, adaptive, interacting work system. The specific aims of our investigation were to:

1. Identify and describe the core work system elements (actors, artifacts, actions, outcomes) of the ABC geriatric dementia and depression care program.

2. Assess barriers to and facilitators for work performance within the ABC program.

3. Develop recommendations for the planned expansion and redesign of the ABC program, based on systematic assessment of work system elements.

Methods

The study design was repeated observation of natural activities of ABC program staff, supplemented by informal meetings and interviews with the program manager and staff. Data collection lasting nearly 60 hours and subsequent analyses were guided by the Workflow Elements Model (Unertl et al., 2010). The Workflow Elements Model is a framework for assessing work system structure and process (Figure 1). The model parallels other HFE systems models routinely used to study performance, workflow, and performance shaping factors in healthcare (Carayon et al., 2012; Carayon et al., 2006; Holden, Carayon, et al., 2013; Karsh et al., 2006). We chose the Workflow Elements Model over the others because with only four core elements it is slightly more parsimonious. Further, the linear logic of the model is easier to explain to practitioners than systems models characterized by interactions and configurations (Holden, Carayon, et al., 2013). The focus of data collection and analysis was on the core elements of the model: actors, artifacts, actions and outcomes. We acknowledge the importance of the peripheral components of the model, temporality, aggregation, and context, but did not perform the separate macroergonomic analysis required to fully understand these (Holden, Valdez, Schubert, Thompson, & Hundt, 2017). The study was performed May to December 2015 and was approved by the Indiana University Institutional Review Board and the studied health system.

Setting and ABC program history

The study took place in community and clinical settings where the ABC program is operational. ABC is integrated within Eskenazi Health, a large, urban safety net hospital system in Indianapolis, Indiana serving a racially and ethnically diverse population of vulnerable adults. During the study, the ABC program served approximately 1,500 community-dwelling persons aged 65 and older diagnosed with dementia, depression or both. Most of the observations in the community were performed at the place of residence of a patient or informal caregiver. Clinical observations were performed in the Healthy Aging Brain Center (HABC), an outpatient memory care center located within the Eskenazi Health medical center, in the office space housing ABC clinical staff and in transit to and from the care recipients' residences.

The ABC program began as a pilot program in 2009, served 200 patients, and was administered by a geriatrician and nurse practitioner who used the "mobile office" approach

to deliver care primarily through visits to patient homes. In subsequent years, federal funding enabled the program to grow to deliver care to more than 2000 patients within the Eskenazi Health system. During the expansion, ABC transitioned from clinic-based case management to a population health model supported by a web-based electronic medical records (EMR) system, called eMRABC. eMR-ABC was designed "in-house" to facilitate care coordination as well as monitor the health outcomes of the entire population. At the time of the study, a small percentage of patients in the program were seen in the HABC clinic, but the majority of patient contact occurred through clinician visits to patient homes and, to a lesser extent, phone calls or meetings with patients in the community, primary care clinics, hospitals, emergency rooms, and other settings. During the study period, the program was planning another major expansion but had not yet begun to make changes; the program expressed interest in using study findings as part of its expansion planning. Additional description of the ABC program and studies on its clinical and financial outcomes are available elsewhere (Boustani et al., 2011; French et al., 2014; LaMantia et al., 2015).

Participants

Participants were clinical staff from the ABC program. They included: four care coordinators (CCs)—either social workers or registered nurses—and nine care coordinator assistants (CCAs). Participation was voluntary and unpaid; 100% of clinical staff employed at the time voluntarily participated in the study. As the focus was on work, not workers, participant demographics were not formally collected. However, staffing records indicate that 92% were female, 54% were Black/African American, and were employed by ABC for a mean of 2.12 years (SD = 1.05).

Procedure

Three researchers trained in HFE and/or human-computer interaction were trained to perform observations in which they were to attend to workflow elements and related work system constructs such as context and problem-solving. They extemporaneously recorded free-text notes. Researchers also logged their research experiences, including challenges encountered during observations. Data were collected in two overlapping phases over a total of six months. In the first, researchers accompanied clinical staff on scheduled home visits and observed pre-, during, and post-visit activities. Our visits were based on the schedule availability of researchers and clinical staff and participants' willingness to have a researcher present. This convenience sample was driven by the clinical staff, but researchers asked staff to make no exclusions on types of patients or times of day. Each staff member did one to three visits daily and researchers attended one or more of these visits. In the second phase, researchers observed staff office work and team meetings. Researchers were instructed to follow a strict policy of non-interference with clinical work but recorded any explanations or comments spontaneously volunteered by staff.

Researchers also asked clinical staff questions to clarify what they observed or to explain some aspect of their work, when an opportunity arose, for example, during a shared car ride to or from the home visit. Clinical staff provided one-time informed consent to participate in

the study. During home visits, patients and informal caregivers signed the health system's staff-administered waiver and release form before observations began.

In addition to observations, the program manager and a subset of staff served as key informants on program-level factors such as the history and management model of the program. This occurred both spontaneously and when program management and staff attended research team meetings (approximately 1-2 times per month during the study period). During these meetings, the research team described formative observations and attendees from the program provided validation of findings, explanations, and corrections. After all data were collected, program staff in turn used the research team's findings as input into ongoing program improvements. In this and other ways, including the shared goal of improving program performance, the study resembled community-based participatory research (Minkler & Wallerstein, 2011) or action research (Lundin & Wirdenius, 1990; Reason & Bradbury, 2001).

Measures

Researchers were trained to record the four core elements of actors, artifacts, actions, and outcomes, as well as important performance factors such as context (environment) and problem-solving behavior (adaptation), but did not use a structured observation form. Observations were recorded on paper per clinical staff recommendations. Granular task timing data were not required to address study aims and timestamps were not recorded. Unstructured observation notes were recorded contemporaneously and typed up, corrected, and expanded following each set of observations. Clinician comments were written verbatim or paraphrased. Documents were collected or photographed during or between observations. Meeting notes with clinic management and staff were recorded on a whiteboard and photographed.

Analyses

The overall analysis approach was qualitative descriptive content analysis (Graneheim & Lundman, 2004; Hsieh & Shannon, 2005) within pre-existing Workflow Element Model categories, followed by cross-category thematic analysis (Boyatzis, 1998) to inductively identify barriers and facilitators. For content analysis, the high-level categories were constrained to those of the *a priori* Workflow Elements Model but within these, subcategories were free to emerge, consistent with other uses of the Workflow Elements Model (Mickelson, Unertl, & Holden, 2016). A multiple coder approach was used, with each of the three field researchers independently analyzing the cumulative set of typed field notes. As our aim was to identify the full set of relevant workflow elements, a multiple coder approach provided the highest likelihood of completeness. We used two techniques to balance multiple coders' unique perspectives with the need for analytic convergence: Coding Discussions and Single-Coder Synthesis. For Coding Discussions (Berends & Johnston, 2005), analysts met to discuss coding before (to set criteria), during (to refine criteria), and after analysis, using consensus as the criterion for decision making. For the Single-Coder Synthesis, author and senior coder SMH synthesized the coding of all three analysts, combining duplicate codes and resolving discrepancies based on Coding Discussions. The Single-Coder Synthesis was reviewed and agreed upon by the original set of analysts. Senior

researcher RJH provided the final review of the coding, resulting in only minor changes made by consensus with SMH. Lastly, ABC program management reviewed the results for accuracy and completeness.

Data related to the home visit process were also used to create process maps, which were verified by a quality management expert within the ABC program.

Results

Observations totaled 59.3 hours. Field researchers observed 23 home visits with CCs (10.8 hours), 28 home visits with CCAs (28.7 hours), and 13 office work sessions or meetings with CCs and CCAs (19.8 hours). The overall home-visit process is illustrated in Figure 2; minor variances in the process were rarely observed, but when observed they were primarily in response to unusual home environments (e.g., visitors in the home) or uncommon patient needs.

Work system elements

Actors—The primary actors in the system were CCs, CCAs, Informal Caregivers (CGs), and Patients. Table 1 provides a description of each actor; summarizes actors' training, abilities, limitations, and hours; and notes other actor characteristics.

From Table 1, it is important to highlight the limited clinical training and abilities for most actors, with CCs being the exception, and the variable abilities of patients and informal caregivers. Informal caregivers also varied considerably in their time commitments, which could range from one-hour visits per week, to daily assistance. All of the actors – CCs, CCAs, informal caregivers, and patients – interacted with each other, as well as with physicians, program administrators, and external actors such as a meal delivery service. These interactions are illustrated in Figure 3.

Actions—CCs and CCAs implemented a protocol designed by the program's physician specialists and program manager. Table 2 describes ten actions in five categories through which the protocols were implemented and the associated specific tasks, as well as the frequency, criticality, and timing (before, during, or after a home visit) of the actions. Frequency and criticality were determined by consensus of the researchers and program leaders. Three actions (Understand the patient's environment; Understand the patient; Formal health assessment) involved data collection from patients; the rest focused on environmental assessment and service delivery. In addition, many tasks could only be properly performed when the CC or CCA had established a trusting relationship with the patient or informal caregiver(s), highlighting the importance of high-frequency and ubiquitous Action category 1, Relationship management. Indeed, several categories of action were not technical or clinical but rather could be classified as "articulation work," i.e., secondary work performed in order to make core work possible (Suchman, 1994).

Artifacts—We observed the use of 37 artifacts. The accuracy and completeness of the artifact list were verified by the program manager for internal validity. All artifacts are listed in Appendix A and key artifacts, i.e., those most commonly used, are described below and

shown in Figure 4. Artifacts varied in medium (digital, analog, or both), content, and origin. Key artifacts were usually ones used during home visits. Many artifacts, such as the Patient Health Questionnaire (PHQ-9), originated from outside the program, whereas other artifacts such as the internally developed specialty electronic medical records system, eMR-ABC (Frame, LaMantia, Reddy Bynagari, Dexter, & Boustani, 2013), and the HABC Monitor (Monahan, Alder, Khan, Stump, & Boustani, 2014; Monahan et al., 2012), were created and validated specifically for the ABC program.

Assessment instruments: Four key artifacts were used for health assessment: 1) *Mini-Mental State Examination (MMSE)*, assessing cognitive functioning and impairment; 2) *PHQ-9*, a nine-item depression screening tool; 3) *HABC Monitor - Self-Report monitor (SRM)*, internally-developed tool to identify and monitor dementia symptoms over time; and 4) *HABC Monitor -Caregiver monitor (CGM)*, a monitoring instrument completed by informal caregivers. Most instruments were used for every visit and administered by clinical staff. Staff were often observed to deviate from the standard instrument administration procedure, for example, modifying the survey question order, in an attempt to increase the accuracy of answers and preserve a conversational tone.

Documentation tools: Five key artifacts were used for documentation: 1) *eMR-ABC*, an EMR system developed for the ABC program; 2) *G3*, a hospital-wide EMR system; 3) *Laptop*, Windows-based business laptops used to access the EMR systems and complete forms and the Team Sheet; 4) *Handheld scanner*, a portable document scanner used by some CCs and CCAs to scan patient forms into the EMR while at the patient's home; and 5) *Medication lists* in the eMRABC, which were compared to personal lists or actual prescription and nonprescription medications taken by the patient; discrepancies resulted in updates to the eMR-ABC medication list. In addition, data collected using assessment instruments were manually documented in the two EMR systems. Multiple challenges were observed with the usability and functioning of the eMR-ABC, exacerbated by insufficient technical support and delays in fixing software bugs. Further, the presence of two independent EMR systems resulted in redundant documentation. Furthermore, laptops were intended for efficient data collection during home visits, but clinical staff generally avoided bringing laptops to home visits due to concerns about safety and theft, loss of eye contact related to use of the laptop, and unreliable Internet connection in people's homes.

Forms: Several forms were required for consent and contact information, namely: 1) *HIPAA Authorization Form*, which permitted ABC to use and disclose patient information per the HIPAA Privacy Policy; 2) *Eskenazi Health Consent form*, permitting ABC staff to visit the patient's residence; and 3) forms with contact information such as the *Family Communication Form*, listing patients' family member information. Most of these forms were completed only once.

Visit kit: Beyond the necessary forms and assessment instruments, CCs and CCAs usually brought six key artifacts to home visits: 1) *Patient abstract*, a summary of patient information and medication list; 2) *Medical records print-out*, printed from the G3 EMR system and containing data on hospital visits, lab and test results, and upcoming appointments; 3) *CCA*

records print-out, printed from eMR-ABC and containing the patient's past assessment scores; 4) *Identification badge*, which had to be worn during home visits; 5) *Team Sheet*; and 6) *CCA folder*, a container for materials also used as a writing surface. Combined, these documents provided comprehensive and historical context about each visited patient and guided staff activity during visits.

Education and Aid: Educational artifacts included: 1) the *ABC Informational folder*, a paper folder provided to patients and informal caregivers containing basic program information and highlights of available resources and services; 2) a *Contact card* with CC/CCA contact information; 3) the *"Next Appointment" reminder card*; 4) *Handouts*, i.e., educational handouts for informal caregivers; 5) *Anticholinergic drug list*, a brochure of prescription and nonprescription medications to avoid; and 6) *Patient "Wish List,"* a patient's advance care directives and post-mortem plans. Contact and "Next Appointment" reminder cards were seen as particularly useful for patients with memory deficits.

Artifacts for finding and receiving aid included: 1) *Transportation aid form* and *taxi vouchers*, used to assist with transportation to and from medical appointments; 2) *Meal menus and brochures* for area meal-delivery services; and 3) *Insight*, a software from the local Area Agency on Aging listing available social resources and used by social worker CCs affiliated with the agency. Transportation support was critical for individuals with dementia who could no longer drive themselves.

Scheduling: Six artifacts were used for scheduling and logistics, including: 1) a *Digital calendar* to track meetings and home visits; 2) *Paper calendar*, often a print-out of the digital calendar; 3) the health system's visit *Scheduling system;* 4) *Smart phone*, mobile work phone used to schedule or confirm appointments; and 5) a *Laptop*, with access to scheduling, calendar, and medical records systems. These artifacts were used by CCs and CCAs to schedules their own home visits and work meetings. Paper calendars were used when technology was deemed inappropriate, for example, in "unsafe" homes or neighborhoods.

Travel: During travel, staff used: 1) *Smart phones*; 2) *GPS tools* for navigating, including smartphone applications; and 3) *Mileage Tracking Sheet*, a paper document tracking mileage on home visits. The Mileage Tracking Sheet was described as burdensome due to frequent use and having to manually transcribe entries into a separate software.

Outcomes for Patient care and Work

This study was not designed to directly measure outcomes, but potential outcomes were identified from observation. Some of these outcomes were mentioned by staff and program leaders as having been found in prior studies, for example fewer hospital visits (French et al., 2014). A number of papers have been published assessing clinical outcomes of the ABC program (LaMantia et al., 2015). Patient care outcomes were mentioned by clinical staff and to some extent observed. They are listed and illustrated in Table 3a. There were also work-related outcomes, primarily for CCs and CCAs (Table 3b). These included staff feeling engaged in their work and motivated to spend more time directly interacting with patients and informal caregivers. However, staff also mentioned and were observed to experience

several inefficiencies and distractions from their primary patient care goals. Future studies are needed to validate these outcomes.

Barriers and facilitators to performing work in the ABC program

Five cross-cutting themes were identified about performance barriers and facilitators in the ABC program.

Relationship building—CCs and CCAs considered building relationships with patients and caregivers to be the most critical facilitators of their work. They perceived interpersonal trust as a prerequisite for patients to participate in the program and provide honest information. Consequently, patients and caregivers were assigned a single CC and CCA. Furthermore, initial home visits with patients aimed to build trust, with most visits beginning with a general personal conversation described by staff as intentional trust building. CCs and CCAs wore hospital badges to establish expert identities and often used humor to lessen patients' anxiety about being visited at home. Some patients and caregivers who were initially guarded with CCs and CCAs, became trusting and welcoming with increasing interactions with their CCs and CCAs. Some CCAs stated that patients were more forthcoming with personal issues during home visits than via phone conversations. Observed staff described that a challenge related to relationship building was knowing how much confided information to formally document at the risk of violating the patient's trust.

Adaptive workarounds—Staff in the program deviated from normative procedures, though often in the interest of accomplishing work-related goals. Workarounds included the use of paper, including print-outs from electronic systems, rather than laptops or smartphones. The use of paper was perceived to facilitate flexibility and interpersonal communication with patients and caregivers, whereas electronic systems were deemed impersonal and a liability in "dangerous" neighborhoods. Another common workaround was observed during administration of standardized assessment instruments, with clinical staff rewording or changing the order of instrument items. Although not technically a workaround, staff at times spent additional time with patients and informal caregivers in an attempt to build relationships, at the expense of efficiency.

Duplicate work—There were several redundant artifacts, such as paper records and two EMR systems. Because the EMR systems were not fully interoperable, staff performed double data entry. In addition, handwritten notes and data collected on paper artifacts, including travel logs, had to be manually entered into electronic systems. Duplicate data entry was a commonly voiced source of frustration for program staff.

Travel and scheduling challenges—Travel was the most obvious non-value-added activity for the goal of providing care. While travel was necessary to the function of the work system, it comprised several time-consuming tasks, including operating the GPS system and completing the Mileage Sheet. Additionally, CCs and CCAs did not have access to "optimum route" applications for making multiple visits and were often assigned visit locations distant from one another. Despite operating in a mobile office model, most staff were required to travel to clinical headquarters for meetings, desk work, and to clock in and

out of their shift. Each staff member was responsible for reaching out to the patient to schedule home visits, which often took multiple attempts to reach and secure a visit. Staff also had to make contact on the day before or day of the visit for confirmation; and patients sometimes cancelled. Scheduling was further complicated by variation in patients' home visit timing preferences about and restrictions on the time of day some homes were visited due to safety concerns in that area. Furthermore, appointments could not be scheduled too close together because earlier appointments could run over time or travel times could vary depending on traffic and distance.

Communication factors—Communication barriers during home visits included loud background noise (e.g. television, visitors, pets), lack of cognitive capacity in dementia patients, and interacting with hearing-impaired and non-English speaking patients and caregivers. Staff could not anticipate the presence of an English or sign language interpreter. Staff also had to verify the accuracy of information reported by cognitively impaired individuals by cross-checking with an informal caregiver or reviewing medical records. Moreover, patients often socialized during visits, rather than focusing on clinical tasks such as assessments. In contrast, many of the artifacts and activities supporting the ABC program were designed to enhance team communication among CCAs and between CCs and CCAs. Program roles and procedures were designed with open communication in mind and staff reported teamwork as one of the more satisfying and effective aspects of their job.

Discussion

This study was to our knowledge the first investigation of the work structures and processes of a mental healthcare delivery program, as well as one of the few to perform a work system analysis of a community-based care program. The study identified four main actors, ten actions, and 37 unique artifacts across seven major types, all contributing to 21 possible patient care and work outcomes. Like other HFE studies of home- and community-based care (Henriksen, Joseph, & Zayas-Cabán, 2009; Mickelson et al., 2016; Or et al., 2011; Or et al., 2009), we found work system factors both common and unique factors compared to hospital- and clinic-based care. The broad categories of the Workflow Elements Model seen in prior work with, for example, hospitals, emergency rooms, and ambulatory care clinics (Unertl, Johnson, & Lorenzi, 2012; Unertl et al., 2010; Zheng, Ciemins, Lanham, Lindberg, & Man, 2015), were equally applicable to the community-based mental healthcare domain. However, we note several domain-specific and potentially unique attributes when applying the model in our study:

- New *actors*: Informal caregivers and patients themselves appear to play a key role in home-and community-based settings. However, these individuals may not have adequate capacity, training, procedures, tools, or other elements of system design to perform the role. This suggests that additional research is needed to understand the work of patients and informal caregivers, the topic of recent research in the area of patient-engaged or patient-oriented human factors (Holden, Carayon, et al., 2013). These studies include using HFE methods to study, for example: patient and caregiver work systems, barriers, and performance-shaping factors (Holden, Schubert, Eiland, et al., 2015; Holden,

Schubert, & Mickelson, 2015); information work (Valdez & Brennan, 2015); artifacts (Mickelson, Willis, & Holden, 2015); safety behaviors and resilience (Mickelson & Holden, in press); and workflow (Mickelson et al., 2016).

- In this study, no physician actors were directly involved in home-based care delivery. On one hand, this demonstrates the use of a *flexible and cost-effective workforce* (Callahan et al., 2011; French et al., 2014). On the other, there may be greater need for supervision, leadership, teamwork, demarcation of roles, and training. Further HFE investigations could examine the specific work and worker-related issues inherent with the technical work (Barley & Orr, 1997) performed by CCAs, who have no formal health professional training, as well as the way in which interprofessional collaborative practice (Gittell, Godfrey, & Thistlethwaite, 2013) is performed by distributed teams of professionals and non-professionals.

- Technical and nontechnical *actions*: Although many of the observed action categories and specific tasks in the program were protocol-driven and technical, the most important actions may have been of the *articulation* variety (Suchman, 1994), i.e., those *enabling* technical work to be accomplished. Chief among these was relationship building. This seemingly nontechnical activity may be the most critical, especially when working with people with mental illness in an underserved community. Relationship building as a work goal has been seen in other research, such as fostering team familiarity and stability in operating rooms (Wiegmann, Eggman, ElBardissi, Parker, & Sundt, 2010). It may be especially important in the context of clinician-patient interactions in mental health services, as described in the literature on the therapeutic alliance between client and therapist (Martin, Garske, & Davis, 2000). Logistical tasks, which were among the most inefficient and frustrating, were also highly important to actual care delivery. Although other HFE research has identified the importance of nontechnical skills such as communication and teamwork (Flin, O'Connor, & Crichton, 2008), our study implies that in healthcare work directly implicating patients and informal caregivers, there may be a set of social and empathetic tasks which require additional attention in HFE research. This additional set of nontechnical skills appears to include careful listening, showing compassion, using humor, and scaffolding trust by providing assistance.

- A multitude of *artifacts*: While analyses in healthcare domains such as surgery find the use of multiple tools or artifacts (Wiegmann et al., 2010; Xiao, 2005), this study identified an assemblage (DeLanda, 2006) of artifacts, pieced together from various sources. Much like a recent study of artifacts used for cross-setting management of chronic heart failure (Mickelson et al., 2015), we found that artifacts provided both a bridge and a roadblock between settings. For example, laptops provided a means for staff to transmit data from home to electronic medical records, but were not as flexible as paper for use in people's homes; however, using paper contributed to duplicate data entry. In cases when artifacts blocked performance, clinical staff performed workarounds (e.g., printing documents), a phenomenon seen in other healthcare studies (Holden, Rivera-

Rodriguez, Faye, Scanlon, & Karsh, 2013; Novak, Holden, Anders, Hong, & Karsh, 2013; Saleem et al., 2011).

- Mixed *outcomes*: Consistent with other analyses of the ABC program, we observed potential benefits to patient care arising from staff interactions with patients and informal caregivers. However, we also identified working conditions producing inefficiencies, frustration, and worker stress. The joint goal of HFE in improving performance and worker well-being (Dul et al., 2012) means HFE studies in healthcare should examine and attempt to optimize both patient care and worker outcomes (Holden, Carayon, et al., 2013). In the case of the ABC program, examining work-related outcomes yielded several implications for the redesign of a program which had otherwise achieved improvements in clinical care.

- Another interesting element of ABC was the use of *adaptive workarounds*. These could be interpreted as correctable deviations from protocol or as behaviors necessary to accomplish work goals (Dekker, 2016; Holden, Rivera-Rodriguez, et al., 2013). When professionals work around a policy, procedure, or technology, this may be a sign that a work system is not optimized for performance. Rather than attempting to enforce policy compliance through training or reprimand, an alternative option is to relax the constraints placed on workers (Novak et al., 2013).

Implication for redesign

Our analyses of actors, actions, artifacts, and outcomes as well as performance barriers and facilitators produce a number of practical implications for the redesign of the ABC program and others like it (Table 4). We note that because of the ongoing partnership between the research team and leaders of the ABC program, several of the redesign suggestions in Table 4 were implemented following data collection.

Methodological considerations

Several limitations of the study must be noted. First, the study was performed on a single site of a unique clinical program, serving a single population. Both the setting and patient population are somewhat unique as well as limited in size. Thus, despite a 100% staff participation rate in the study, the study may not be generalizable to other settings or populations. Future research is recommended applying similar methods in diverse settings, including clinical programs for younger patients and for individuals with other mental health needs (e.g., suicide prevention, traumatic brain injury, schizophrenia). Certain measures were outside the scope of this study, including objective assessments of program outcomes and quantitative workflow assessments. Furthermore, despite the use of two techniques to reduce the limitations of a multiple-coder approach, this study did not formally assess the extent to which multiple analysts agree on the analysis and interpretation of data. However, findings were presented to program representatives, lending some validity to our interpretations through the process of "triangulation" or "member checking" (Cho & Trent, 2006).

Strengths of the study included combining the perspectives of multiple analysts working in coordination, a 100% participation rate, partnering with clinical program leaders to ensure an appropriate study focus and interpretation of findings, the use of a clear but flexible conceptual framework, and implementing our observation methods in front-line clinical and home settings. Together, our study methods allowed a rich and comprehensive understanding of the work structures and processes of the ABC program.

Finally, in prior work we noted the challenge of performing HFE field research in organizational (Holden, Or, Alper, Rivera, & Karsh, 2008) and especially community-based settings (Holden, McDougald Scott, Hoonakker, Hundt, & Carayon, 2015). As healthcare HFE research is increasingly performed in home and community based settings, it is important to both recognize the specific challenges to research in these settings and to implement strategies to protect the goals of researchers, participants, and study sponsors (Valdez & Holden, 2016). As part of this recognition, we encourage explicit reporting of difficulties faced by field researchers and any strategies used to manage them. In this study, our main challenges were related to:

1. Buy-in, including recruiting staff to participate given staff concern about, as one participant told us, having findings "used against us." These concerns were addressed through clear and open communication about the study team's role.

2. Working with the underserved and racial minorities, which required careful attention to appropriate (non-intimidating) dress code and inclusive language.

3. Managing expectations, which in our case meant maintaining noninterference during contact with patients (researchers received permission to study clinical staff, not patients) without seeming aloof or disinterested. Staff assisted with setting expectations.

4. Environmental hazards, which in this study included pets and wild animals in the household, recreational drug use.

Conclusion

While several major efforts such as the ABC and REACH II (Czaja, Loewenstein, Schulz, Nair, & Perdomo, 2013) programs have partnered with HFE experts to improve care for older adults with mental illness and their informal caregivers, such partnerships are rare. We contend that mental health and mental healthcare are two of the most universally important modern day domains where HFE can make a difference. Having made minimal contributions to these domains in the 35 years since Johnson et al. (1981) called for an "increased effort" by HFE professionals, we ask: what role will HFE play in mental health and healthcare over the next 35?

Acknowledgments

Appendix A: Summary of Aging Brain Care (ABC) program artifacts

A total of 37 artifacts were observed in this study

Artifact	Content or description
eMR-ABC	Electronic medical record (EMR) system developed for the Aging Brain Center (ABC)
G3	Hospital-wide EMR system
eClinical Works	Computerized scheduling system for physicians; CCs and CCAs can access this system to check patients' appointments.
Patient abstract	Includes identification information (name, date of birth, address, phone, email), patient's personal medication list
Doctor records print-out	Located in eMR-ABC; includes hospital visits, lab and test results, list of upcoming appointments
CCA records print-out	MMSE, PHQ9, and SRM scores from past visit (see below for detail on these assessment instruments)
Mini-Mental State Examination (MMSE)	Cognitive functioning assessment tool; measures cognitive impairment
Patient Health Questionnaire 9 (PHQ9)	Nine-item depression screening tool; English and Spanish versions
Self-Report Monitor (SRM)	Assessment tool to identify and monitor dementia symptoms over time; Developed by the Healthy Aging Brain Center (HABC); English only version
Caregiver monitor (CGM)	Caregiver stress assessment tool
Insight	CICOA-specific software that shows CICOA's available social resources for customers (Note: CICOA is a regional, non-profit corporation that provides aging and in-home, often in partnership with other care providers and care locations.)
Pathway Healthcare Service	Electronic system containing patient records, including past clinic visits and if they require any transportation
Outlook calendar	CCs and CCAs use this calendar to keep track of their appointments
CCA paper calendar	CCA carries with this calendar on visits so they can reference their schedule when scheduling next appointments with the patient
SmartPhone	iPhones provided to CCs and CCAs for business; used for navigation (see GPS tool), placing work calls, accessing and sending emails, and accessing calendar (see Outlook calendar); Includes jetpack (hotspot)
GPS tool	Used to help CCs and CCAs navigate to patients' homes; usually an application on company or personal SmartPhone
Miles Sheet	Paper sheet used by CCs and CCAs to track their mileage from traveling to visit patients
Laptop	PC-based laptops provided to the CCs and CCAs for business; used to fill application forms for the patients. Laptops usually are used with the jetpack (hotspot) to connect to the internet.
Eskenazi badge	Identification badge; ABC-Home representatives must wear these when making home visits
Team Sheet	Hand-written sheet that each CCA fills out weekly; used as a communication tool between CCs and CCAs; referred to during weekly team meetings
CCA folder	Plastic, box-style folder used by CCs and CCAs to store and carry relevant documents to patients' homes; the box also acts as a writing surface if required
ABC Med Home Informational folder	Includes information about the ABC Med Home program (such as the process and benefits), highlights of resources and services available, and CC and CCA contact information; provided to patient and/or caregiver during the first home visit
Eskenazi Health Consent form	Form in which patient confirms her/his consent for Eskenazi Health representatives to come to her/his home

Artifact	Content or description
Healthcare Representative Form	Lists the name(s) and contact information of the person(s) the patient has identified as her/his healthcare representative; patient must sign-off
HIPAA Authorization form	Permits ABC Med Home to use and disclose patient information per the HIPAA Privacy Policy; completed by first time patients or patients whose information has changed
Family Communication form	Collects name and contact information about relevant family members; patient must sign-off to allow ABC-Home to contact the family
"Next Appointment" reminder card	Card with date, time, and location information about the patient's next appointment
Home Safety Sheet	Sheet used by CCs and CCAs to evaluate the safety of the patient's home; Sheet is usually completed by CC/CCA based on observations, but some clarifying questions may be asked of the patient
Transportation aid form	Used to put in a request on behalf of the patient for transportation aid to a medical appointment
Contact Card	Includes name and business contact information about the ABC-Home representative
Patient "Wish Lists"	The patient's advance care directives and post-mortem plans
Anticholinergic drug list	List of medications that have been shown to have negative effects on cognitive health, and should be avoided if possible; Anticholinergic Cognitive Burden (ABC) Scoring of Drugs
Handouts	Educational handouts; Titles are: *Activities to Encourage; Activities to Avoid; Communicating with your loved one; Suggestions for Communication; Understanding Nonverbal Messages; Depression, Guidelines for Coping; For the Caregiver*
Medications	Medications that the patient takes, which may or may not be prescribed
Handheld scanner	Portable document scanner provided by the hospital to the CCs; allows CCs to scan documents at the patient's home
Taxi voucher	Certificate provided to patients for free use of a taxi; limited amounts
Meal menus	Menus of home-delivered meal programs (e.g. Meals on Wheels)

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- Care coordination staff, informal caregivers, and patients played key work roles

- Actors performed seven categories of action critical to providing coordinated care

- Thirty-seven artifacts supported activity in the clinical program

- Twenty-one system outcomes were observed and included patient care and worker effects

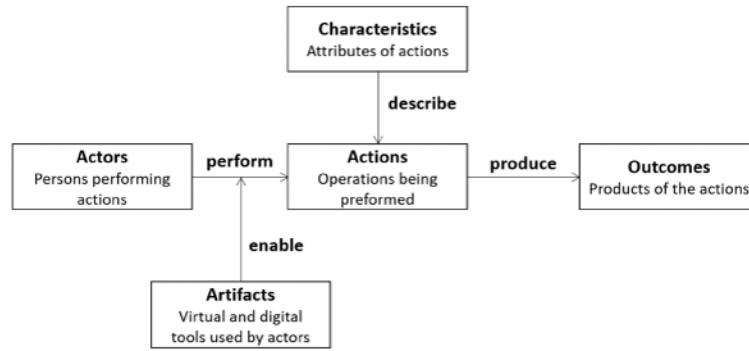- Program leaders used study findings to guide program improvement and redesign

Figure 1. Core elements of Workflow Elements Model and their definitions

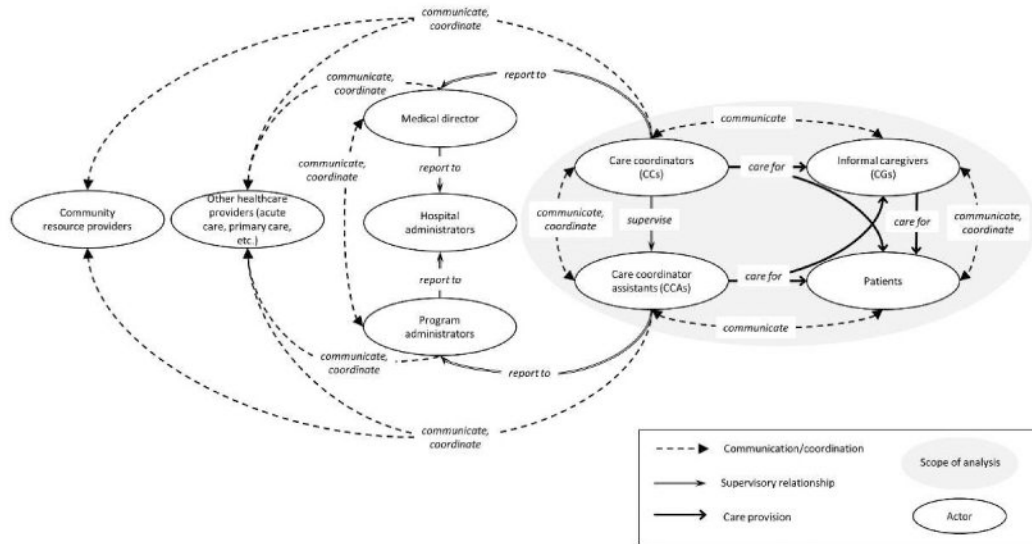**Figure 2. Process map of Aging Brain Care (ABC) home visit**

Figure 3.
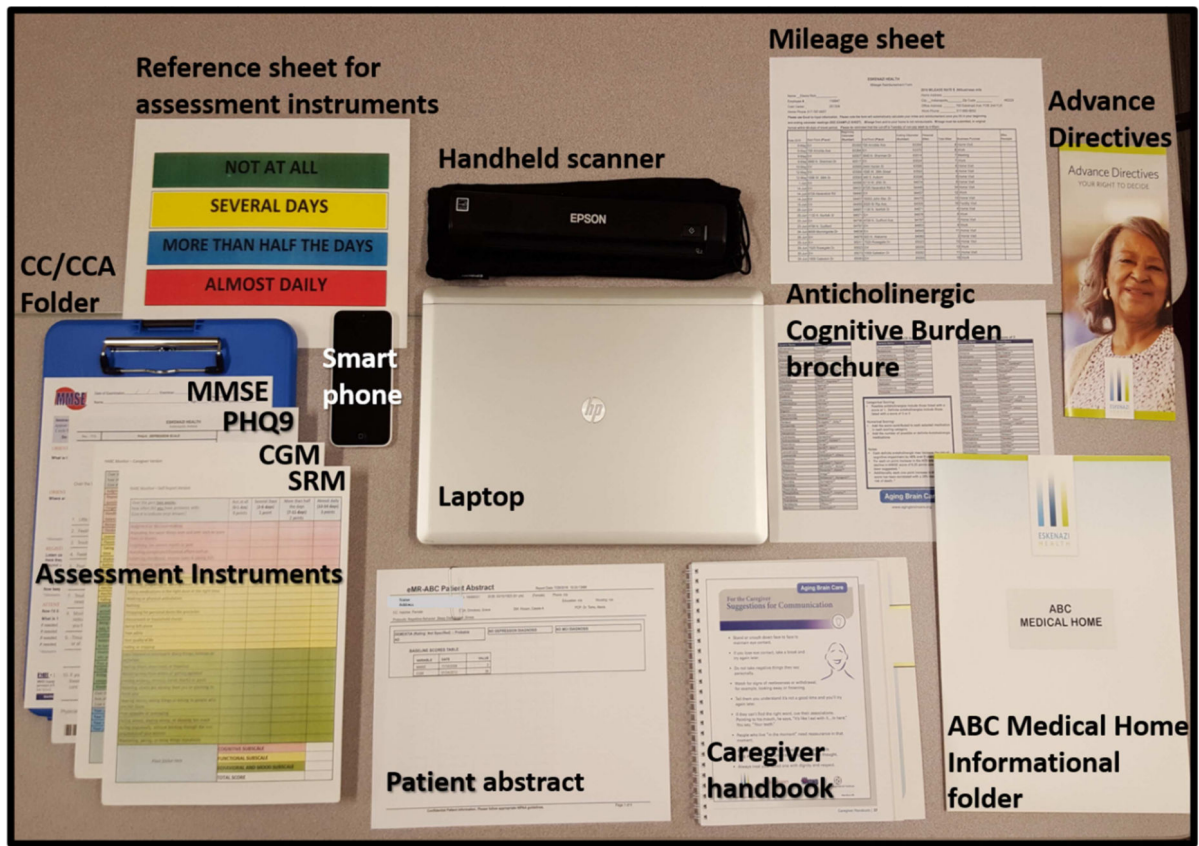System diagram of Aging Brain Care (ABC) program actors and their interactions.

Figure 4.
Commonly used artifacts of the Aging Brain Care (ABC) program. See text for description.

Table 1

Work system Actors and their characteristics

Actor and description	Care-related roles	Other characteristics
Care Coordinators (CCs). Nurses or social workers, trained in the dementia and depression care models delivered by the program, the standard operating procedures of the program and the IMPACT model of depression. *Full-time role.*	• Supervise team of CCAs. • Collect and document patient data. • Provide and document direct care. • Develop and implement plan of care for each patient and caregiver. • Revise and optimize care plans as needed. • Answer CCAs' questions and provide direction as needed. • Coordinate care with other healthcare providers and community resources. • Adjust allocation of resources as required by population health data.	• Specialized knowledge (e.g., of medication, therapy, local resources) • Few in number.
Care Coordinator Assistants (CCAs). Workers with at least high school degree trained in the dementia and depression care models delivered by the program, the standard operating procedures of the program and the specific tasks required of the CCA role. *Full- or part-time role.*	• Primary point of contact for patients. • Conduct home visits. • Collect and document patient data. • Provide and document direct care. • Coordinate with CCs on development and implementation of optimal plan of care for each patient and caregiver. • Coordinate care with other health care providers and community resources. • Assist CCs as requested.	• Knowledge of local social services, resources. • Deep knowledge of each patient. • No medical training required. • Some worked part-time.
Informal Caregivers (CGs). People providing informal care, assistance, and support to patient, whether living with patient or not. Some are family members, some are not. *Full- or part-time role, ranging from one visit per week to daily assistance.*	• Provide informal care. • Provide social and emotional support. • Provide support for activities of daily living.	• Deep knowledge of the patient. • Devotion to and concern for the patient. • Desire to find joy and meaning in the caregiver role. • Lack of medical training. • Variable knowledge of social services, resources. • Time limitation. • May have own medical conditions, including stress-related.
Patients. Care recipients and, when able, performers of self-management. Suffer depression, dementia, or both. *Full-time role.*	• Communicate with CC, CCA, CG. • Self-management, if able.	• Variable knowledge and ability, depending on functional status, including impaired cognition and activities of daily living. • Lack of medical training.

Actor and description	Care-related roles	Other characteristics
		• Desire to maintain independence, relationships with others and the ability to meaningfully participate in life.

Table 2

Actions performed by care coordinators (CC), care coordinator assistants (CCAs), patients, and informal caregivers (CGs) in five categories

1. Relationship management		
1a. Build personal relationships		
Frequency: <u>High</u>.	Criticality: <u>High</u>.	Performed <u>before</u> / <u>during</u> / <u>after</u> home visits.
CC / CCA: Introduce self; build rapport; compliment and praise patient's health, home, family; use humor; provide encouragement; comfort; listen to patient's personal stories and feelings; accompany patient to clinic visits as appropriate and feasible; provide business card and brochures; explain why they are doing a particular task, ensure transparency. **Patient / Caregiver**: Accept CC/CCA in home; share personal conversations, stories, and photographs; state values, experiences, opinions; show their craft projects; show documents of recent home services, installations.		
1b. Manage family dynamics		
Frequency: <u>Low</u>.	Criticality: <u>Medium</u>.	Performed <u>during</u> home visits.
CC / CCA: Manage differing family member expectations; facilitate discussion about patient's diagnosis and prognosis among the family. **Patient / Caregiver**: Share family issues; express needs and concerns.		
2. Problem solve / counsel		
Frequency: <u>High</u>.	Criticality: <u>High</u>.	Performed <u>before</u> / <u>during</u> / <u>after</u> home visits.
CC / CCA: Address comorbidities such as diabetes; address basic needs (housing, food, etc.); help patient complete applications for senior facilities; check/validate patient claims; respond to voicemail and email requests from patients; explain insurance; help with transportation issues (e.g., suggest cheaper bus passes); explain Medicaid; help patient file for Medicaid; address safety issues in patient's home (e.g., advise grab-bar for shower/bath); help patient with medication management issues (e.g., suggest pill box, explain its advantages; education on medications); call services on behalf of patient; change patient's primary care provider if requested; provide caregiver counseling (e.g., teach stress management); provide free tools or devices for self-care (e.g., paper calendars, shower chairs); suggest medical equipment to address an identified need.		
3. Logistics		
3a. Administrative tasks/updates		
Frequency: <u>High</u>.	Criticality: <u>High</u>.	Performed <u>before</u> / <u>during</u> / <u>after</u> home visits.
CC / CCA: Collect administrative data on patient (demographics, home and family communication information); chart patient information; prepare for home visits (review past clinical notes, print documents); complete Team Sheet (a hand-written form filled out weekly by the CCAs to communicate about patients during weekly team meetings); attend and participate in team meetings; ask and answer care-related questions.		
3b. Scheduling / appointment management		
Frequency: <u>High</u>.	Criticality: <u>High</u>.	Performed <u>before</u> / <u>during</u> / <u>after</u> home visits.
CC / CCA: Schedule home visits; reschedule cancelled visits; call day before a visit to confirm and remind; help patient schedule appointments; reply to voicemail/email requests for appointments and services; update calendars with patient's visits; correct scheduling system errors.		
3c. Travel		
Frequency: <u>High</u>.	Criticality: <u>Medium</u>.	Performed <u>before</u> /<u>after</u> home visits.
CC / CCA: Track mileage; look up directions (GPS); travel to and from destination; self-assess personal safety related to home/community visits (and potential subsequent scheduling adjustment).		
4. Data collection		

1. Relationship management
4a. Understand patient's environment
Frequency: <u>Medium</u>.　　Criticality: <u>High</u>.　　Performed <u>during</u> home visits.
CC / CCA: Ask questions to reveal relevant or challenging aspects of patient's and caregiver's lives; assess financial status; assess living arrangements; assess transportation needs; inquire about home delivery meals; evaluate home safety and cleanliness (problem-solve, if necessary); review medications and equipment; identify distractions (e.g., TV, visitors).
4b. Understand the patient
Frequency: <u>High</u>.　　Criticality: <u>High</u>.　　Performed <u>during</u> home visits.
CC / CCA: Ask general questions about health and status (e.g., How have you been? How often do you visit the doctor? How have you been eating?); assess patient's ability (e.g., hearing, alertness, literacy), and adapt as needed (e.g., speak louder, repeat instructions, read written materials); review medication needs and changes; assess patient's mobility; take notes about patient's requests and concerns; check on treatment/therapy progress.
4c. Formal health assessment
Frequency: <u>High</u>.　　Criticality: <u>High</u>.　　Performed <u>during</u> home visits.
CC / CCA: Administer formal assessment instruments (in-person or by phone). **Patient / Caregiver**: Provide and explain responses to assessment instruments.
5. Educate patients and caregivers
Frequency: <u>Medium</u>.　　Criticality: <u>Medium</u>.　　Performed <u>during</u> home visits.
CC / CCA: Provide education (e.g., sleeping better); distribute handouts; discuss importance of follow-up clinical visits; instruct caregiver to take care of themselves. **Patient / Caregiver**: Attend to and practice educational content.

Table 3

Patient care and work outcomes of the Aging Brain Care (ABC) program

a. Patient care outcome	Example
Improved quality of life	Reduction in symptoms of depression and dementia for patients and reduction of caregiver stress for informal caregivers.
Unscheduled acute care avoided	Hospitalization or emergency room visit avoided due to change in medication.
Improved mental health (mood, anxiety) for patient and informal caregiver	Mood improves over time as patient and caregiver receive counseling and social interaction during visits.
Improved access to transportation	Staff enrolled patient in transportation service.
Improved medical coverage	Staff helped patient apply for Medicaid.
Improved mobility	Staff provided patient a mobility aid through a community service.
Basic needs (e.g. feeding, washing, housing) addressed	Staff collectively identified alternative housing options to present to patient.
Improved home safety	Staff assessed home for safety and provided shower chair.
Improved access to healthcare	Staff helped patient reschedule an appointment based on the patient's schedule and transportation needs.
Decrease in medication errors	Staff provided patient with a pill organizer (pillbox).
b. Work outcome	
Variability	Staff used different scheduling and documentation methods.
Travel inefficiencies	Staff performed unnecessary travel when assigned patients who were not geographically clustered.
Delays	Staff were late to a visit due to being delayed by a talkative patient.
Distractions from direct care	Self-scheduling visits took staff away from direct care.
Duplicate work	Staff entered same patient/visit data into multiple EMR applications.
Frustration	Staff experienced difficulties with eMR-ABC and missing information in the system.
Emotional demands	A patient in the care of a staff member died.
Job satisfaction, fulfillment	Staff felt trusted and valued by patients and informal caregivers, allowing staff to make a difference in their lives, especially with problem solving.
Job satisfaction, working conditions	Staff enjoyed being in the community, not confined to an office.
Safety risks	Staff feel uncomfortable traveling alone to a potentially dangerous home or location.
Improved teamwork	Staff perceived and demonstrated mutual respect for teammates and team-based problem solving.

Table 4

Key study findings and their implications for ABC program redesign

Finding	Implication for redesign	Change implemented
Building relationships	Maintain trust as the ABC program moves towards more computer-based interactions.	ABC technology development and procurement focused on personalizing software applications and customer relations management.
Duplicate work	Use interoperable EMR systems for patient data entry, or consolidate to one EMR. Automate tasks when possible.	ABC performed a study of documentation consistency across EMRs and examined available electronic mileage tracking and reporting applications.
Scheduling challenges	Designate one scheduler for all home visits.	ABC created and filled a dedicated scheduler position.
Communication barriers	Design protocols for variety of patient health literacy, ability, and languages.	ABC included ability and literacy in technology and written material design and testing.
Adaptive workarounds	Focus on protocols to effectively and efficiently care for a larger amount of patients per CC/CCA.	ABC staff self-facilitated a special training session on setting healthy boundaries with patients/CGs in order to have time for all patients.