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Discovering Associations Among Older Adults' Characteristics and Planned Nursing Interventions Using Electronic Health Record Data

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Abstract

Background and Purpose: Little is known about how nursing assessments of strengths and signs/symptoms inform intervention planning in assisted living communities. The purpose of this study was to discover associations among older adults' characteristics and their planned nursing interventions.

Methods: This study employed a data-driven method, latent class analysis, using existing electronic health record data from a senior living community in the Midwest. A convenience sample comprised de-identified data of well-being assessments and care plans for 243 residents. Latent class analysis, descriptive, and inferential statistics were used to group the sample, summarize strengths and problems attributes, nursing interventions, and Knowledge, Behavior, and Status scores, and detect differences.

Results: Three groups presented based on patterns of strengths and signs/symptoms combined with problem concepts: Living Well ($n = 95$) had more strengths and fewer signs/symptoms; Lower Strengths ($n = 99$) had fewer strengths and more signs/symptoms; and Resilient Survivors ($n = 49$) had more strengths and more signs/symptoms. Some associations were found among group characteristics and planned interventions. Living Well had the lowest average number of planned interventions per resident (Mean = 2.7; standard deviation [SD] = 1.7) followed by Lower Strengths (Mean = 3.8; $SD = 2.6$) and Resilient Survivors (Mean = 4.1; $SD = 3.4$).

Implications for Practice: This study offers new knowledge in the use of a strengths-based ontology to facilitate a nursing discourse that leverages use of older adults' strengths to address their problems and support their living a healthier life. It also offers the potential to complement the problem-based infrastructure in clinical practice and documentation.

Keywords

strengths; problems; data-driven research; older adults; the Omaha System

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The aging population is steadily increasing in the United States and around the globe. The U.S. senior population is projected to represent 21% of the country's total population in 2030 (Federal Interagency Forum on Aging-Related Statistics, 2016). The world is also seeing a similar trend of growth (Das, 2015). The aging population and the concomitant increase in the prevalence of chronic illness drive costs in healthcare that account for 75% of annual U.S. healthcare spending (Institute of Medicine, 2012). The primary healthcare information technology model today is deployed around resolution and management of illnesses with institution-focused data in need of a redesign to support promotion and maintenance of health and well-being (AMIA, 2017). As healthcare is being redefined toward a person-centered integrated care, research, wellness, and community ecosystem (AMIA, 2017), new data sources including clinical practice and documentation of individuals' strengths are being utilized to create an innovative approach to healthy aging and healthy living (Monsen, Holland, Fung-Houger, & Vanderboom, 2014; Monsen, Peters, Schlesner, Vanderboom, & Holland, 2015; Monsen, Vanderboom, Olson, Larson, Holland, 2017). Such an approach presents a potential to complement a data gap related to the psychosocial and behavioral domains in problem-based electronic health records (EHRs) (Institute of Medicine, 2014a, b; Gao, Kerr, Lindquist, & Monsen, 2016; Monsen et al., 2015) and support the vision for a person-centered integrated care, research, wellness, and community ecosystem.

The use of an information system is conducive to more complete and accurate documentation by healthcare professionals (Häyrinen, Saranto, & Nykänen, 2008) as the primary knowledge management for healthcare (Agency for Healthcare Research and Quality, 2012). The inclusion of strengths data expands knowledge management built upon the narrow use cases of disease management and provides a whole-person data capture in the facilitation of health promotion and well-being. Strengths refer to health assets that are characterized by skills, capacities, actions, talents, potential, and gifts in each individual, each family member, each team member, the family as a whole, and the community (Miles, Bruns, Osher, & Walker, 2006; Rotegård, Ruland, & Fagermoen, 2011). Findings of emerging strengths-based studies demonstrate a whole-person approach to clinical practice and documentation utilizing formalized strengths attributes captured by the Omaha System (Monsen et al., 2014) in the EHR of a senior living community (Monsen et al., 2015) and care coordination in the community (Monsen, Vanderboom et al., 2017). Standardizing terminology supports nurses to establish care plans from bland statements of intent to unambiguous, prescriptive, and coded actions (Moore & Stonham, 2010). Research also demonstrates that nurses tailor evidence-based interventions differentially by problems based on quality evaluation of nursing care and interventions (Monsen, Swenson, Klotzbach, Mathiason, & Johnson, 2017). Studies also suggest that public health nurses document routine and tailored interventions in EHRs using the Omaha System (Martin, 2005; Monsen & Martin, 2002; Monsen, Radosevich, Kerr, & Fulkerson, 2011). Along with the emerging of whole-person-oriented data sources, including strengths in EHRs, more investigation is needed to explore relationships between nursing assessments and care planning. Furthermore, there is limited knowledge regarding how strengths data contribute to nurses' care planning for interventions.

The purpose of this study is to discover data-driven associations among older adults' characteristics and their planned nursing interventions captured by the Omaha System. This study has two aims: (a) to use a latent class analysis (LCA) model to group older adults by patterns of strengths and signs/symptoms; and (b) to examine group membership associated with interventions by problem addressed, category, and the average number of problem–category–target combinations per resident.

METHODS

Design and Sample

This retrospective, comparative study employs a data-driven model, LCA, using existing EHR nursing data. The population under study is older adults residing in a senior living community of a Midwest metropolitan area. A convenience sample comprises de-identified data for 243 assisted living residents with well-being assessments and nursing care plans in the same year.

This research was reviewed and deemed not human subjects research by the Institutional Review Boards at the University of Minnesota and approved by the leadership of this senior living community. Data were stored within the secure data shelter of the University of Minnesota Academic Health Center and accessed and used for this research following institutional procedures.

Instruments and Measures

The instruments for this study are the Omaha System three components. The Omaha System is a comprehensive standardized language, interface terminology, and measure designed to enhance practice, documentation, and information management across settings (Martin, 2005). It has been used in community care settings to document assessments, interventions, and outcomes of older adults. Multidisciplinary clinicians use Omaha System point-of-care software in the United States and other countries, with a continued growth in the number and type of computer software vendors who offer Omaha System clinical information systems (The Omaha System, 2018). The terminology consists of three components: the Problem Classification Scheme, the Intervention Scheme, and the Problem Rating Scale for Outcomes. The Problem Classification Scheme has 42 standardized problem concepts within Environmental, Psychosocial, Physiological, and Health-related Behaviors Domains to describe nursing assessments for problem-specific strengths and signs/symptoms. The Intervention Scheme is related to the Problem Classification Scheme, and it has 4 standardized categories in action terms and 75 standardized targets to document nursing care plans and services for each identified problem concept. The Problem Rating Scale for Outcomes measures the Problem concepts using three 5-point Likert-type scales pertaining to the severity of Knowledge, Behavior, and Status (KBS) concepts (1 = *lowest* to 5 = *highest*). Each of the KBS rating scales presents a continuous evaluation framework for assessing and evaluating an individual's problem-specific rating over time. The reliability and validity of the Omaha System components have been tested and established in multiple settings in research (Martin, 2005).

Strengths and signs/symptoms of residents, nursing interventions, and residents' KBS scores were described and coded by the Omaha System classification schemata. Strengths and signs/symptoms of residents were operationalized and documented by using the Problem concepts in the Problem Classification Scheme. For example, a strength indicator is *extensive family engagement* related to the Problem concept of Social contact; while a sign/symptom of the Social contact problem is *limited social contact*. Planned nursing interventions were documented for specific Problem concepts using the Intervention Scheme, including the hierarchical levels of categories and targets. KBS scores were recorded by the Problem Rating Scale for Outcomes. The KBS rating scale is related to the Problem Classification Scheme and measures KBS scores related to the Problem concepts defined by the Problem Classification Scheme.

Data Mappings

The Omaha System was already in place in the EHR of this senior community, but the build of the EHR used nonstandard representation of Omaha System terms, which necessitated a data mapping process. Mappings of assessment and care plan data to the Omaha System terminology were performed by the first author. The assessment data were mapped and coded to the Omaha System problem concepts and sign/symptoms as well as strength indicators. The assessment had 35 questions with multiple answers displayed in a total of 282 rows. The care plan data consisted of 1,830 rows of data related to an identified Problem concept and expected KBS outcome for a resident. These nonstandard data were mapped to the Omaha System problem concepts, categories, and targets. An Omaha System expert reviewed 10% of the sampled mappings, with 93% agreement for problem concepts and 100% agreement for strengths indicators and signs/symptoms in well-being assessments and with 100% agreement for problem concepts, 91% agreement for categories, and 99% agreement for targets in care plans. Any differences were further resolved by a third Omaha System expert until consensus was reached.

Data Collection and Analysis

Assessments of residents and planned interventions with KBS scores were conducted by nursing staff at the point of care during routine documentation. After data acquisition following institutional research procedures, the existing de-identified data were formatted and constructed for data analysis according to institutional research protocols.

The LCA model was used to detect hidden patterns of strengths and signs/symptoms in this sample. LCA is a subset of structural equation modeling used to find groups or subtypes of cases in multivariate categorical data (Lanza, Dziak, Huang, Wagner, & Collins, 2015). Because this dataset contained categorical data, LCA was selected as a data-driven model for data analysis. The LCA model was performed on this sample as follows. Problem concepts were included in the model building if 5% or more of residents was presented with strengths and signs/symptoms in a specific problem concept. LCA was subsequently used to separate residents into 3, 4, and 5 classes/groups based on the patterns of their strengths and signs/symptoms combined with problem concepts using Proc LCA from the Methodology Center at Penn State University (Lanza et al., 2015). The Cognition problem was not included in the modeling analysis to avoid having the model only separated based on a

resident's strengths and signs/symptoms in cognition and using this problem concept to predict problems in cognition. Similarly, Bowel function and Urinary function signs/symptoms were also not included in the model building. As a result, 26 different problem concepts out of 33 problem concepts in the well-being assessments were included to model strengths and signs/symptoms, respectively. The selection of three groups was found to be the preferred model based on the lowest Bayesian Information Criterion (BIC) and Consistent Akeike's Information Criterion (CAIC). Descriptive statistics were used to summarize strength and problem attributes, nursing interventions, and baseline KBS scores. The identified groups were then evaluated using the statistical analytics software package R and Microsoft Excel. Statistical tests of Chi-square and analysis of variance (ANOVA) were performed to test for differences in interventions, characteristics, and KBS scores between groups in the statistical analytics software SAS version 9.4.

RESULTS

Total Sample Demographic Characteristics

The average age for this entire sample was 86 years (standard deviation [SD] = 7.8; Table 1). The majority of residents were female and White. Widowed and married were the majority of the marital status of the sample, with widowed at a higher percentage than married.

Aim 1: Grouping by Strengths and Signs/Symptoms

Out of the 42 Omaha System problems, a subset of a total of 34 problems (Table 2) were present in the well-being assessments (33 problem concepts excluding Abuse) and care plans (33 problem terms excluding Neglect). Their definitions are listed in the Appendix.

Based on this LCA model, 26 separate problem concepts were selected to model residents' strengths (Figure 1) and signs/symptoms (Figure 2) out of 33 problems excluding Abuse (Table 2). The LCA model categorized the sample into three groups: Group 1 (Living Well)—a more strengths group with fewer signs/symptoms; Group 2 (Lower Strengths)—a fewer strengths group with more signs/symptoms; and Group 3 (Resilient Survivors)—a more strengths group with more signs/symptoms.

Living Well consisted of residents with more strengths across all four domains: (a) both problem concepts in Environmental; (b) seven concepts in Psychosocial; (c) seven concepts in Physiological; and (d) four concepts in Health-related Behaviors domain. In total, Living Well had more strengths in 20 problem concepts out of 26 included. The top 5 problem concepts in strengths for this group included Social contact, Interpersonal relationship, Residence, Speech and language, and Physical activity.

In contrast, Lower Strengths had fewer strengths in 23 problem concepts out of 26 within four domains. They included both problem concepts in Environmental, all 9 concepts in Psychosocial, 8 concepts in Physiological, and 4 concepts in Health-related Behaviors. The top 5 problem concepts in strengths for this group included: Residence, Interpersonal relationship, Social contact, Nutrition, and Neuromusculoskeletal function.

Resilient Survivors had more strengths in 6 problem concepts including Interpersonal relationship, Sexuality, Speech and language, Pain, Respiration, Sleep and rest patterns. This group also had more strengths in many problem concepts after Living Well. The top 5 problem concepts for this group included Interpersonal relationship, Residence, Speech and language, Social contact, and Neuromusculoskeletal function.

Besides having more strengths in most problem concepts, Living Well also had fewer signs/symptoms in 23 out of 26 concepts within all four domains (Figure 2). The top 5 problems in signs/symptoms for this group were Medication regimen, Personal care, Circulation, Neuromusculoskeletal function, and Income.

Lower Strengths had more signs/symptoms in 11 problem concepts, mostly in Environmental and Psychosocial domains, while Resilient Survivors showed more signs/symptoms in 15 problem concepts, mostly in Physiological and Health-related Behaviors domains. The top 5 problems in signs/symptoms for Lower Strengths were Personal care, Communication with community resources, Speech and language, Medication regimen, and Income. The top 5 problems in signs/symptoms for Resilient Survivors were Personal care, Neuromusculoskeletal function, Physical activity, Pain, and Skin.

Personal care was the leading problem concept, with the most signs/symptoms for Lower Strengths and Resilient Survivors and one of the top problems for Living Well. Living Well did not demonstrate the most signs/symptoms in any problem concept. Some differences were revealed in the domains where problems occurred in these groups.

The three groups were compared on strengths and signs/symptoms for Cognition, Bowel function, and Urinary function (Table 3). All groups had significant differences of numbers of strengths in Cognition, and numbers of signs/symptoms in Cognition, Bowel function, and Urinary function.

Demographic Characteristics by Group and KBS Scores

The sample of 243 EHR records was categorized into three groups separated by the LCA model: Living Well ($n = 95$), Lower Strengths ($n = 99$), and Resilient Survivors ($n = 49$). Their demographic characteristics are described in Table 4. There were no between group differences in age, gender, or race/ethnicity, but there were significant differences in marital status ($p < .001$).

KBS Scores.—There were significant differences in baseline KBS scores by groups (Table 5). Overall, Living Well had the highest mean KBS scores, Lower Strengths had the lowest, and Resilient Survivors' KBS scores fell in between. Living Well had the highest baseline KBS scores, also more strengths and fewer signs/symptoms. Resilient Survivors showed better overall mean baseline KBS scores than Lower Strengths.

In addition to the significant statistical differences, there also appeared some significant clinical differences based on the mean change of at least 0.60 for the effect size in KBS scores (Johnson, McMorris, Raynor, & Monsen, 2013). The mean change in K between Living Well and Lower Strengths is 1.0 and 0.7 between Resilient Survivors and Lower

Strengths, indicating that medium to large effect size (i.e., clinical differences) in Knowledge were seen between these groups. The mean change in B between Living Well and Lower Strengths is 0.8 and the mean change in S between Living Well and Lower Strengths is 0.7, so significant clinical differences in both B and S were shown between these groups.

Aim 2: Associations of Group Membership With Planned Interventions by Problem, Category, Problem – Category – Target Combinations

Overall Findings.—Overall, this study categorized three distinct groups with different strengths and signs/symptoms characteristics, planned nursing interventions, and KBS scores (Figure 3). Living Well had more strengths and fewer signs/symptoms, fewest planned nursing interventions, and highest KBS scores. Lower Strengths had fewer strengths and more signs/symptoms in Environmental and Psychosocial domains, second most planned nursing interventions, and lowest KBS scores. Resilient Survivors had more strengths and more signs/symptoms in Physiological and Health-related Behaviors domains, most planned nursing interventions, and second highest KBS scores.

Planned Interventions by Problem.—More planned interventions by nurses in 27 problem concepts were observed among Lower Strengths and Resilient Survivors (Figure 4). Significant differences were found for Cognition, Neuromusculoskeletal function, Bowel function, Personal care, Oral health, and Urinary function between groups. All the problems belonging to the Physiological domain, except Personal care in the Health-related Behaviors domain, showed significant differences among the three groups. For the rest of the problems, no significant differences were detected.

Planned Interventions by Category and Problem–Category–Target

Combinations.—Planned nursing interventions were further examined based on category and an intervention string created by a problem concept combined with a category and a target. All four Omaha System categories appeared in the three groups: Teaching, Guidance, and Counseling; Treatments and Procedures; Case Management; and Surveillance. A subset of 34 targets out of 75 standardized targets was presented in this study sample (Table 6).

Different patterns in planned interventions were revealed among the three groups (Figure 5) with significant differences for three categories: Teaching, Guidance, and Counseling ($p = .029$); Treatments and Procedures ($p = .005$); and Case Management ($p = .011$). There was no difference for the category of Surveillance between the three groups.

There were significant differences ($p = .001$) in the average numbers of planned interventions when using the intervention combinations of problem–category–target per resident among the three groups. Living Well had the lowest average number of planned interventions per resident (Mean = 2.7; $SD = 1.7$) followed by Lower Strengths (Mean = 3.8; $SD = 2.6$), and Resilient Survivors (Mean = 4.1; $SD = 3.4$).

DISCUSSION

Overall Findings

In this descriptive, comparative study of older adults' characteristics and interventions, different patterns of strengths and signs/symptoms among three data-driven groups were associated with planned nursing interventions and KBS scores. Older adults with more strengths and fewer signs/symptoms had fewer planned nursing care interventions, similar to other findings in that the number of Omaha System strengths concepts per person was positively correlated with patient reported self-care ability (Monsen et al., 2014). This group also demonstrated overall higher KBS scores. In contrast, older adults with fewer strengths showed more signs/symptoms in Psychosocial and Environmental domains as well as the Cognition problem even though they might have fewer signs/symptoms in Physiological and Health-related Behaviors domains.

The demographic features were characterized by advanced age, predominantly female and White, across the whole sample and by group. These characteristics are consistent with the demographics in the senior living population, indicating that advancement in age and being a female may contribute to the likelihood of an older adult moving into a senior living community. Such trends also correspond to the growing life expectancies and the larger proportion of females in the senior population in the United States (Federal Interagency Forum on Aging-Related Statistics, 2016). In moving forward with these demographic changes in the social landscape, it has become more important now to identify needs early so that preventive measures and adequate support could be offered to maintain older adults' health and independence in living.

Aim 1: Group Characteristics

The LCA model identified three distinct groups based on whole-person assessments, including strengths and signs/symptoms. This is the first study of its kind; however, it is widely known that the aging process differs and that individuals need varying levels of care (Wadensten & Carlsson, 2003). Further research is needed to determine whether these groups may be present in other settings.

Interpersonal relationship and Social contact were top strengths in older adults among the three groups. Such a finding aligns with previous study results (Monsen et al., 2014; Monsen et al., 2015) and research that older adults had higher levels of interpersonal strengths (Isaacowitz, Vaillant, & Seligman, 2003). The big differences in strengths that characterize the more strengths groups (Living Well and Resilient Survivors) and fewer strengths group (Lower Strengths) are in Speech and language, Communication with community resources, Mental health, and Grief, which are closely related to communication and psychosocial factors. Strengths in these areas may increase the capacities of older adults' strengths to promote their health and positive outcomes. Physical activity appeared to be a strength that distinguished the most strengths group (Living Well) from the two fewer strengths groups (Lower Strengths and Resilient Survivors). Such a finding is important as previous research associated physical activity with enhanced quality of life (McAuley et al., 2006; Netz, Wu, Becker, & Tenenbaum, 2005).

The Lower Strengths group that had fewer strengths showed more signs/symptoms among these three groups, mostly related to Environmental and Psychosocial domains. Resilient Survivors had more signs/symptoms, mostly related to Physiological and Health-related Behaviors domains. This finding suggests that older adults who have more signs/symptoms related to physiological problems could still possess higher strengths than those with signs/symptoms in Environmental and Psychosocial domains.

Signs/symptoms were mainly from the Physiological Domain across all groups, and the groups differed in their physiological issues. Age-related reduction in muscle strength and cardiovascular function further the declining physical ability with age (Fiatarone-Singh & Mayer, 2002; Rajeski & Mihalko, 2001). Further research is needed to understand how physiological problems relate to strengths and whole-person health, and to define resident groups across jurisdictions and types of residential settings.

Personal care is one of the most common problems in older adults among these groups. This aligns with the literature in that nearly one-half of older adults had difficulty or received help in the last month with daily activities in this country (Freedman & Spillman, 2014) and the need for personal care is likely related to one of the reasons older adults decide to live in residential assisted living communities (Liepelt, 2015).

The finding that there were significant differences among the three groups related to Cognition supports its important role in fostering older adults' strengths, or may accelerate the need for personal care. Another research study also found that individuals with the cognition problem were a separate group from individuals with Physical activity/ Neuromusculoskeletal problems (Monsen et al., 2014). Older adults who maintain cognitive function have a unique profile that differentiates them from those with decline (Yaffe et al., 2009).

Cognition signs/symptoms among the three groups demonstrated similar patterns with Bowel function and Urinary function signs/symptoms. The finding that the group with the highest percentage of residents with Cognition signs/symptoms also had the highest percentage of residents with Bowel function and Urinary function signs/symptoms suggests that Cognition signs/symptoms may be related to the inability to self-manage bowel and bladder functions. These findings align with research that has shown associations of cognitive impairment with an increased risk in functional status decline (Royall et al., 2007; Stuck et al., 1999).

The finding that Living Well had the highest KBS scores and more strengths and Lower Strengths had the lowest KBS scores and fewer strengths further reinforces group differences. Interestingly, Resilient Survivors' KBS scores fell inbetween and their strengths also fell in between these two groups. It illustrates the association of older adults' strengths and problem attributes with their KBS baseline status. In addition, the magnitude of KBS score differences suggests clinical significance in Knowledge between Living Well and Lower Strengths and between Resilient Survivors and Lower Strengths, and in both Behavior and Status between Living Well and Lower Strengths, indicating meaningful and practical differences (Johnson et al., 2013) between these groups.

Aim 2: Group Membership with Planned Interventions

Study results suggest that nurses plan more interventions and activities in care for those older adults who have more signs/symptoms and tailor their care to address their problems. A pattern was noted between the average number of planned interventions per resident and the number of strengths and signs/symptoms. Overall, the group that had more strengths and fewer signs/symptoms also received the least planned interventions per resident. The group that had more signs/symptoms of Physiological and Health-related Behaviors problems had a higher average number of planned interventions. Further investigation is needed to explore whether these problems may require more nursing interventions as suggested in research that nurses adjust their care plans according to the older adults' needs (Monsen, Swenson, et al., 2017). Such a finding also suggests that Physiological and Health-related Behaviors signs/symptoms do not necessarily negatively affect strengths in other domains.

The finding that there was a significant difference in Personal care among the three groups is consistent with other results that define these groups, although all groups have more than 25% of residents requiring Personal care interventions. This finding reinforces the notion that individuals seek out and reside in assisted living because they need personal care and have health challenges requiring interventions (Liepelt, 2015). Personal care had the most signs/symptoms in the entire sample and was also one of the top five problems nurses have addressed in their care plans.

The finding of between-group differences in intervention categories suggests that nursing assessments of strengths and signs/symptoms are associated with the planning of interventions. This first known study to demonstrate intervention tailoring in assisted living aligns with the literature on intervention tailoring in other populations and settings (Martin, 2005; Monsen & Martin, 2002; Monsen et al., 2011; Monsen, Swenson, et al., 2017). Teaching, Guidance, and Counseling is used to delineate nursing activities designed to provide information, encourage action and responsibility for self-care and coping, and assist the individual and family to make decisions and solve problems (Martin, 2005). The Lower Strengths group that had the highest proportion of cognition signs/symptoms also received a higher percentage of planned Teaching, Guidance, and Counseling intervention. Such a finding suggests that older adults with cognition signs/symptoms may need more reminders, prompts, encouragements, and directions to engage in self-care as indicated in the care plans, and therefore need more Teaching, Guidance, and Counseling interventions. Treatments and Procedures are used to describe technical activities such as wound care, specimen collection, resistive exercises, and medication prescriptions designed to prevent, decrease, or alleviate signs/symptoms for an individual (Martin, 2005). The finding that Resilient Survivors had more planned Treatments and Procedures interventions may reflect needs to address a greater number of Physiological signs/symptoms. There was no difference in Surveillance interventions. Such a finding aligns with research in other populations and settings that nurses actively monitor the health and safety of individuals under their care (Harding, Galano, Martin, Huntington, & Schellenbach, 2007; LeCroy & Davis, 2016; Monsen, Swenson, et al., 2017).

IMPLICATIONS FOR NURSING PRACTICE

This study has implications for nursing practice in the United States and around the world. As both the United States and the world face a growing aging population (Das, 2015) with chronic illnesses, there is an increasing need to support older adults so that they can live well in the community. Use of a whole-person assessment and tailored interventions may aid in leveraging the use of older adults' strengths to address their problems and needs; and the interventions may become valuable strategies to support them to live a better and longer life. This study offers new insights and potential in the use of a strengths-based ontology, the Omaha System, to facilitate this process and discourse. Ongoing assessment of a person's strengths and assessment findings by nurses underpin many patient care decisions (Banning, 2008). Nurses are valuable resources in driving a change in clinical documentation as strengths-based data capture is adopted in assessment and management processes to advance whole-person-oriented care. Such a whole-person, strengths-oriented approach can be adopted and utilized where the Omaha System is not available across the healthcare settings in the United States and around the globe, and therefore can benefit and improve the quality of care of older adults.

This research also generates some hypotheses for future research. Based on the study findings, further tests are needed to examine whether for the Living Well group higher KBS, more strengths, and fewer signs/symptoms lead to fewer Treatments and Procedures interventions; whether for the Low Strengths group more Cognition signs/symptoms are associated with more signs/symptoms in the Psychosocial domain, fewer strengths, and lower KBS status; and whether for Resilient Survivors group more signs/symptoms in Physiological problems and Health-related Behaviors lead to more hands-on Treatments and Procedures interventions.

LIMITATIONS

This study has limitations common to all observational data. Since this study uses existing EHR nursing data and a convenience sample, it lacks randomization, manipulation of nursing interventions, and probability sampling. As a result, many confounding factors related to the observational study design cannot be controlled, which could impact both the internal validity and external validity of this study. However, use of a valid standardized terminology may enhance documentation quality (Martin, 2005). Future research including prospective, randomized trials of strengths-based intervention approaches is needed.

CONCLUSIONS

The study has aligned with and extended previous research findings regarding older adults' whole-person health, including strengths and signs/symptoms. In addition, it reveals new knowledge about planned nursing interventions associated with the whole-person assessment. Distinct groups of older adults were identified, and intervention tailoring was demonstrated. Further research is needed to validate the data-driven groups in other settings and to evaluate the impact of implementing whole-person assessments and care planning on healthcare outcomes and well-being across the continuum of care.

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Appendix

Appendix:

Definitions of Omaha System Domains and Problems (Martin 2005)

Omaha System Domain (Definition)	Omaha System Problem	Definition
Environmental (material resources and physical surrounds both inside and outside the living area, neighborhood, and broader community)	Income	Money from wages, pensions, subsidies, interest, dividends, or other sources available for living and healthcare expenses
Residence	Living area	
Neighborhood/workplace safety	Freedom from illness, injury, or loss in the community or place of employment	
Psychosocial (patterns of behavior, emotions, communication, relationships, and development)	Communication with community resources	Interaction between the individual/family/community and social service organizations schools, and businesses in regard to services, information, and goods/supplies
Social contact	Interaction between the individual/family/community and others outside the immediate living area	
Role change	Additions to or removal of a set of expected behavioral characteristics	
Interpersonal relationship	Associations or bonds between the individual/family/community and others	
Spirituality	Beliefs and practices that involve faith, religion, values, the spirit, and/or the soul	
Grief	Suffering and distress associated with loss	
Mental health	Development and use of mental/emotional abilities to adjust to life situations, interact with others, and engage in activities	
Sexuality	Attitudes, feelings, and behaviors related to intimacy and sexual activity	
Neglect	Child or adult deprived of minimally accepted standards of food, shelter, clothing, or care	
Abuse	Child or adult subjected to nonaccidental physical, emotional, or sexual violence or injury	
Physiological (functions and processes that maintain life)	Hearing	Perception of sound by the ears
Vision	Act or power of sensing with the eyes	
Speech and language	Use of articulated vocal sounds, symbols, signs, or gestures for communication	
Cognition	Ability to think and use information	
Pain	Unpleasant sensory and emotional experience associated with actual or potential tissue damage	

Omaha System Domain (Definition)	Omaha System Problem	Definition
Consciousness	Awareness of and responsiveness to stimuli and the surroundings	
Skin	Natural covering of the body	
Neuromusculoskeletal function	Ability of nerves, muscles, and bones to perform or coordinate specific movement, sensation, or regulation	
Respiration	Inhaling and exhaling air into the body and exchanging oxygen	
Circulation	Pumping blood in adequate amounts and pressure throughout the body	
Digestion-hydration	Process of converting food into forms that can be absorbed and assimilated, and maintain fluid balance	
Bowel function	Transporting food through the gastrointestinal tract to eliminate wastes	
Oral health	Condition of the mouth and gums and the number, type, and arrangement of the teeth	
Urinary function	Production and excretion of urine	
Health-related Behaviors (patterns of activities that maintain or promote wellness, promote recovery, and decrease the risk of disease)	Nutrition	Select, consume and use food and fluids for energy, maintenance, growth, and health
Sleep and rest patterns	Periods of suspended motor and sensory activity and periods of inactivity, repose, or mental calm	
Physical activity	State or quality of body movements during daily living	
Personal care	Management of personal cleanliness and dressing	
Substance use	Consumption of medicines, recreational drugs, or other materials likely to cause mood changes and/or psychological/physical dependence, illness, and disease	
Healthcare supervision	Management of the healthcare treatment plan by healthcare providers	
Medication regimen	Use or application of over-the-counter and prescribed/ recommended medications and infusions to meet guidelines for therapeutic action, safety, and schedule	

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Figure 1.

Latent class analysis groups by strengths.

Note. Interpersonal = Interpersonal relationship; NMS function = Neuromusculoskeletal function; Speech = Speech and language; Community resources = Communication with community resources; Health supervision = Healthcare supervision; Sleep = Sleep and rest patterns; Digestion = Digestion-hydration

Figure 2.

Latent class analysis groups by signs/symptoms.

Note. Community resources = Communication with community resources; NMS function = Neuro-musculo-skeletal function; Health supervision = Health care supervision; Speech = Speech and language; Interpersonal = Interpersonal relationship; Digestion = Digestion-hydration

Figure 3.
Overall findings by group.

Figure 4.

Interventions by problem concept for the three groups.

Note. NMS function = Neuromusculoskeletal function; Health supervision = Healthcare supervision; Neighborhood = Neighborhood/workplace safety; Interpersonal = Interpersonal relationship; Sleep = Sleep and rest patterns; Community resources = Communication with community resources; Speech = Speech and language.

*significant statistical differences $p < .05$.

Figure 5.
Planned interventions by categories and by percentage of residents.
*significant statistical difference.

TABLE 1.

Demographics of Total Sample

Total <i>n</i> = 243								
	Mean or <i>n</i>	<i>SD</i> or %		<i>n</i>	%		<i>n</i>	%
Age			Race/Ethnicity			Marital Status		
Mean	86.0	7.8	White	196	80.7%	Married	81	33.3%
Undocumented	0	0%	Undocumented	47	19.3%	Divorced	11	4.5%
Gender						Widowed	100	41.2%
Female	153	63.0%				Single	18	7.4%
Male	88	36.2%				Significant	1	0.4%
Undocumented	2	0.8%				other Undocumented	32	13.2%

Note. *SD* = standard deviation.

TABLE 2.**Domains and Corresponding Problems**

Domains	Problems
Environmental Domain	Income; Residence; Neighborhood/workplace safety
Psychosocial Domain	Communication with community resources; Social contact; Role change; Interpersonal relationship; Spirituality; Grief; Mental health; Sexuality; Neglect; Abuse
Physiological Domain	Hearing; Vision; Speech and language; Oral health; Cognition; Pain; Consciousness; Skin; Neuromusculoskeletal function; Respiration; Circulation; Digestion-hydration; Bowel function; Urinary function
Health-related Behaviors Domain	Nutrition; Sleep and rest patterns; Physical activity; Personal care; Substance use; Healthcare supervision; Medication regimen

TABLE 3.

Strengths and Signs/Symptoms in Cognition, Bowel Function, or Urinary Function by Group

	Living Well <i>n</i> = 95		Lower Strengths <i>n</i> = 99		Resilient Survivors <i>n</i> = 49		χ^2	<i>p</i> value
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%		
Strengths								
Cognition	62	65%	5	5%	26	53%	80.1	<.001
Signs/Symptoms								
Cognition	40	42%	80	81%	27	55%	41.1	<.001
Bowel function	6	6%	28	28%	12	24%	16.5	<.001
Urinary function	22	23%	51	52%	25	51%	19.1	<.001

TABLE 4.

Demographics by Group

	Living Well <i>n</i> = 95		Lower Strengths <i>n</i> = 99		Resilient Survivors <i>n</i> = 49	
	Mean or <i>n</i>	<i>SD</i> or %	Mean or <i>n</i>	<i>SD</i> or %	Mean or <i>n</i>	<i>SD</i> or %
Age						
Mean	85.8	7.8	86.1	7.7	86.3	8.2
Race/Ethnicity						
White	75	78.9%	84	84.8%	37	75.5%
Undocumented	20	21.1%	15	15.2%	12	24.5%
Marital Status						
Married	20	21.1%	45	45.5%	16	32.7%
Widowed	48	50.5%	39	39.4%	13	26.5%
Other or Undocumented	27	29%	15	15%	20	41%
Gender						
Female	66	69.5%	54	54.5%	33	67.3%
Male	29	30.5%	44	44.4%	15	30.6%
Undocumented	0	0%	1	1.0%	1	2.0%

Note. *SD* = standard deviation.

TABLE 5.

Baseline Mean KBS by Group

	Living Well <i>n</i> = 95		Lower Strengths <i>n</i> = 99		Resilient Survivors <i>n</i> = 49		<i>F</i> Statistic	<i>p</i> Value
	Mean	<i>SD</i>	Mean	<i>SD</i>	Mean	<i>SD</i>		
Mean K	3.3 ^a	0.8	2.3 ^{a,b}	0.7	3.0 ^b	0.8	34.4	<.001
Mean B	4.0 ^{a,b}	0.7	3.2 ^a	0.8	3.6 ^a	0.8	29.1	<.001
Mean S	3.9 ^b	0.7	3.2 ^{a,c}	0.7	3.4 ^{a,b}	0.7	16.8	<.001

Note. *SD* = standard deviation.

^a different from Living Well group.

^b different from Lower Strength group.

^c different from Resilient Survivors.

TABLE 6.**Targets**

Bladder care	Medication action/side effects	Transportation
Bowel care	Medication administration	Wellness
Cardiac care	Medication setup	Continuity of care
Dressing change/wound care	Mobility/transfers	Dietary management
Durable medical equipment	Ostomy care	Homemaking/housekeeping
End-of-life care	Personal hygiene	Medication coordination/ordering
Exercises	Relaxation/breathing techniques	Nursing care
Finances	Respiratory care	Occupational therapy care
Interaction	Safety	Physical therapy care
Laboratory findings	Sickness/injury care	Speech and language pathology care
Medical/dental care	Signs/symptoms—mental/emotional	
	Signs/symptoms—physical	
	Support group	