Assessing Vulnerability and Healthcare Utilization in Older Adults

in Primary Care

By

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A capstone project proposal submitted to the
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DNP Capstone Project Approval Form

This is to certify that Kaylee Zaffuto
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successfully defended his/her Capstone project entitled:
Assessing Vulnerability and Healthcare Utilization in Older Adults in Primary Care

on April 20, 2018.
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Abstract

**Purpose**: The purpose of this capstone project was to evaluate the feasibility of using the Vulnerable Elders Survey (VES-13) to identify vulnerable patients during primary care office visits and to determine the impact of vulnerability on healthcare utilization.

**Background**: Functional decline in older adults can lead to higher healthcare utilization, increased costs, and increased morbidity and mortality.

**Methods**: Dependent variables included the number of emergency department, inpatient, and office visits in the past 12 months. The independent variables included the VES-13 score, number of chronic comorbidities, Medicaid status, age, and sex. A weighted score for utilization was created and the analytic strategy was to compare variables using independent t-tests and correlations.

**Results**: Fifty-two participants were included in this study. The VES-13 score and utilization were both normally distributed. The relationship between the number of chronic comorbidities and VES-13 score was statistically significant. VES-13 scores, comorbidities, and age were not significantly related to weighted utilization, and weighted utilization did not differ significantly by sex or Medicaid status.

**Conclusions and Implications**: Factors related to healthcare utilization include women, Medicaid users, and a higher VES-13 score. This tool can identify those at risk for hospitalization to better target interventions toward this population.
Functional decline and disability is very common in older adults. The number of chronically disabled Americans over 65 years old currently exceeds 7 million. This is significant because it can lead to mortality and adverse outcomes and can also place a burden on health care resources (Gill et al., 2002). It is also important to note that the population of individuals age 65 years and older is expected to increase in upcoming years. By 2050, it is estimated that the population of 65 years and older will double the 43.1 million in 2012 to 86.2 million (Ortman, Velkoff, & Hogan, 2014). Due to their functional decline and disability, many older adults may be considered vulnerable. Although life expectancy has increased, older adults are not necessarily healthier and may present with multiple comorbidities, cognitive impairment, sensory impairment, poor hygiene, malnutrition, and impairment in activities of daily living. They may also be living alone, lack a social network, and have limited finances or be living in poverty, all of which are external factors contributing to vulnerability (Culo, 2011). Older adults who are vulnerable may have cognitive, psychosocial, or physical problems requiring thorough clinical assessment.

Background

Vulnerable populations are defined as social groups with an increased susceptibility for health-related problems (different patterns of morbidity, mortality, and life expectancy) related to fewer resources (Flaskerud & Winslow, 2010). Older adults may be vulnerable due to various internal and external factors, such as functional decline and impairment in activities of daily living and instrumental activities of daily living. Activities of Daily Living (ADLs) include self-care such as using the toilet, eating, dressing, and bathing, whereas instrumental activities of daily living (IADLs) are functions needed to live independently such as managing finances,
taking medications, and doing housework. Deficits in ADLs and IADLs can signify need for evaluation of socio-environmental circumstances and assistance in the elderly patient (Elsawy & Higgins, 2011). Functional decline is associated with vulnerability and an increased risk of health-related problems, such as increased morbidity and mortality.

Functional decline can lead to increased rates of hospitalization, admission to a nursing home, and overall use of health care services in older adults (Gill et al., 2002). Older adults have higher rates of healthcare utilization compared to younger adults. They have a greater level of urgency when presenting for emergency services, have longer stays in the emergency department (ED), and are more likely to be admitted or have repeat visits to the ED (McCusker & Verdon, 2006). It is no surprise that these patients are especially at risk when transitioning between levels of care, and a lack of coordination can lead to fragmentation of care. Primary care is important in providing continuity of care to these patients including careful assessment and referral to community services (McCusker & Verdon, 2006). Greater integration with primary care and targeting interventions towards higher risk patients may reduce ED utilization. In turn, this could reduce low-value care, which is defined as services that provide no benefit to patients or can even cause harm (de Vries, Struijs, Heijink, Hendrikx, & Baan, 2016). The reduction in low value care can help contain costs and increase efficiency without harming health outcomes, with an allocation of resources to high-value services.

There are many tools that can be used to assess functional decline and factors that contribute to vulnerability in older adults. The Barthel Index is commonly used to assess functional ability, as are the Lawton IADL scale and Katz ADL scale. However, each of these tools have limitations and advanced practice nurses are continuously faced with the challenge of conducting a full, comprehensive assessment in the geriatric population with multiple
comorbidities (Roedl, Wilson, & Fine, 2016). A complete geriatric assessment, consisting of a multidimensional, multidisciplinary assessment to evaluate functional ability, physical and mental health, and socio-environmental circumstances is often not completed in the primary care setting (Elsawy & Higgins, 2011). Comprehensive geriatric assessment can emphasize functional capacity and quality of life and can identify medical, functional, as well as psychosocial problems that differs from a standard medical evaluation in primary care. Due to the demands of busy primary care offices, many geriatric assessments are problem-directed and less comprehensive (Elsawy & Higgins, 2011).

Advanced Practice Nurses (APNs) and other providers must assess geriatric patients for signs of functional decline in order to prevent negative healthcare outcomes and increased costs (Roedl et al., 2016). The increasing number of elderly, community-dwelling individuals indicates a need for assessment and intervention when necessary, consisting of physical therapy, meal services, and exercise programs to reduce functional decline. Often providers do not routinely assess functional status in the primary care setting. Patients are frequently seen in the office for an acute problem, but once the immediate concern is addressed, subtle changes in ADLs and IADLs may go unnoticed. This is a significant problem with the growing geriatric population at risk for functional decline and increased vulnerability. Not all primary care offices routinely assess for functional decline and a standardized tool to assess functional ability is often not built into the electronic medical record.

The Vulnerable Elders Survey-13 (VES-13) is a brief screening instrument that could be easily implemented in the primary care setting and has the potential to improve care (Min et al., 2009). This tool can identify those at risk for functional decline and death by assessing vulnerability. It can be administered by non-medical personnel and takes approximately 4
minutes. The scores range from 0 to 10, with a score of 3 or greater indicating vulnerability. This tool has the potential to treat and prevent further disability by targeting older at-risk populations (Min et al., 2009).

Functional status assessment in the primary care office has the potential to improve health outcomes and reduce healthcare costs (Roedl et al., 2016). It is clear that older adults are frequent users of the emergency department and other forms of health services. This tool can identify vulnerable, older adults and guide interventions to keep patients from utilizing low-value care. For example, if an elderly patient has difficulty walking across the room (as measured by the VES-13) and falls in their home, they may utilize the ED and will be more likely to get admitted. The patient may develop complications because of other comorbidities, have a prolonged hospitalization, and require rehabilitation or placement upon discharge. By assessing functional ability in the community setting, patients can be closely monitored based on vulnerability and presented with options such as physical therapy, assisted living placement, and other interventions to decrease resource utilization and prevent avoidable hospitalization.

**Purpose**

The purpose of this capstone project is to evaluate the feasibility of using the Vulnerable Elders Survey (VES-13) to identify vulnerable patients during primary care office visits who may require additional screening and services to remain in the community. A secondary purpose is to determine the impact of vulnerability on healthcare utilization. The project aims to reduce low-value care and improve coordination of care by assessing function in the geriatric population to promote outpatient interventions. The long-term goal of assessing the impact of vulnerability on healthcare utilization will be to improve coordination of care and promote increased safety
and quality of life based on a vulnerability assessment that takes functional status into consideration. The research question will explore the impact of vulnerability on healthcare utilization. The population of interest will be individuals over age 65 who are visiting the primary care practice for routine care. We will measure vulnerability using the VES-13 and examine hospital (IP or ED) utilization. We hypothesize that high vulnerability will be associated with greater low-value utilization as evidenced by IP and ED utilization. Specifically, this study will compare characteristics (number of chronic diagnoses, age, gender, and socioeconomic status) of vulnerable elders (high VES-13 score versus low scoring elders) in a primary care practice to determine the potential impact of VES-13 in identifying those at risk for preventable hospitalization (IP and ED).

**Review of the Literature**

The research regarding the VES-13 appears to be limited since it is a fairly new tool developed in 2001. It is clear that there may be a link between the VES-13 score and risk of death and functional decline over time (Min, Elliott, Wenger, & Saliba, 2006; Min et al., 2009). The tool may also predict health service utilization based on score, but it is not completely clear if this is generalizable to a U.S. population or possible without examining other risk factors. More vulnerable patients may utilize healthcare services more frequently and the tool performs nearly as well as the Comprehensive Geriatric Assessment, which can be time consuming for the provider to administer (Mohile et al., 2007). The tool can easily be used across settings and there is a need for future research using this tool.

The VES-13 has been found to predict risk of death and decline over time. Min and colleagues (2006, 2009) studied the VES-13 as a tool to predict health deterioration over a mean
follow up of both 11 months and 5 years. Higher VES-13 scores predicted greater risk of death and functional decline over a mean follow up of 11 months and the risk rose with VES-13 score. The risk increased from 23% for older people with a VES-13 score of 3 to 60% for those with a score of 10, therefore differentiating scores higher than 3 can prove useful in guiding intervention, especially when administering the tool in the primary care setting (Min et al., 2006). Another longitudinal study with a mean follow up of 4.5 years demonstrated the utility in making longer-term prognostic estimates of functional status and survival in older ambulatory care patients (Min et al., 2009). Increasing scores were linearly related to death and functional decline, further demonstrating the value of the tool. A main limitation of this study was the inclusion criteria of three baseline conditions (falls or fear of falling, memory issues, and bothersome urinary incontinence) and older age (75 years and older), potentially causing overall poorer health of the sample. Nonetheless, the survey can be administered in 4 minutes, does not require knowledge of medical diagnoses, and can help guide clinical decisions (Min et al., 2009).

The VES-13 has the potential to identify vulnerable older people and found those identified as vulnerable visit their primary care physician more frequently, have more home-based public health nurse visits, and were more likely to have the influenza vaccine (McGee et al., 2007). These vulnerable patients also were more likely to have used the emergency department, inpatient, and outpatient hospital services. By assessing those identified as vulnerable and their use of healthcare, it is possible to evaluate quality of care for this population. Vulnerable adults were significantly more likely to have visited their family physicians at least once in the previous year as well as receive home-delivered services. Those with high VES scores who had zero or one family physician visit in the previous year were more likely than those with a low VES to be female, widowed, or depressed, and therefore may be the
best group to target. A limitation of this study is that although the proportion scoring as vulnerable was identical to the U.S. sample, the study evaluated the screening tool in older Irish people (McGee et al., 2007). It is important to understand whether there is a relationship between higher VES-13 scores and higher emergency department and inpatient hospitalizations in a U.S. population.

Although there may be a correlation between vulnerability and high ED utilization and other healthcare services, the VES-13 was not a useful predictor of mortality or emergency admission in a study by Wallace and colleagues. The study indicated that poorer functioning in community-dwelling older adults does not determine emergency admission risk (Wallace, McDowell, Bennett, Fahey, & Smith, 2017). Out of 862 participants, 326 (38%) were vulnerable at baseline. Twenty-nine percent (29%, 246/862) were admitted to the emergency at least once during the 2-year follow up. Eighteen percent were admitted once, 7% were admitted twice, and 4% were admitted 3 or more times (Wallace, et al., 2017). When combined with other predictors and risk factors, such as prior hospitalization and multimorbidity, the predictive ability may improve. The VES-13 does not determine emergency admission risk in this study, however, vulnerability and frailty measures may have a role in predicting emergency admission in conjunction with other risks.

A study examined frailty transitions, which are changes in levels of frailty over time, using the VES-13 and their relationship to utilization of health services (Bentur, Sternberg, & Shuldiner, 2016). The effect of frailty on death was assessed using Cox proportional hazards analysis, and it showed that 86% of non-frail in 2008 were alive and that 52% of the frail were alive 6 years later. Any change from the non-frail state towards developing frailty increased the risk of health service utilization. The participants were divided into four groups to assess frailty
transitions – non-frail (those who were and remained non-frail in 2014), transition (those who were non-frail and became frail in 2014), frail (those who were frail and scores stayed the same or improved in 2014), and more frail (those frail in 2008 and scores worsened in 2014). The more frail group had more emergency room visits and the non-frail group had fewer hospitalizations, and fewer reported use of home care and caregivers. The frail group had the most impaired functional ability demonstrated with a higher percentage of falls, cognitive impairment, and needing help at home. Any transition towards frailty was associated with greater healthcare utilization, and it is suggested that identifying frailty in older people can be used for clinical decision making. The VES-13 can identify early transitions to prevent and treat it using interventions and guide clinical practice (Bentur, Sternberg, & Shuldiner, 2016).

The VES-13 can also be used in identifying disability in older patients with prostate cancer receiving androgen ablation. A pilot study comparing the Comprehensive Geriatric Assessment (CGA) to the VES-13 indicated that the brief VES-13 performed nearly as well as the CGA in detecting geriatric impairment in this population (Mohile et al., 2007). Providers have been reluctant to adopt the CGA because of lack of resources and difficulty interpreting results and implementing interventions (Mohile et al., 2007). Fifty patients completed the survey and 50% of this population scored as impaired (score greater than or equal to 3). Using the CGA, 60% of the prostate cancer population was impaired, with deficits in greater than or equal to 2 tests. The VES-13 performed nearly as well as the CGA and has many advantages including short time to administer and predictive ability for functional decline and death (Mohile et al., 2007). Further research is needed to integrate this tool into practice due to its advantages and ability to identify vulnerable elders in a timely manner.
A longitudinal study by Saliba and colleagues (2001) determined that self-reported diagnoses and conditions did not enhance the predictive ability of the VES-13 and that the tool can be easily used across care settings. A score of 3 or greater classified 32% of the sample as vulnerable with a 4.2 times risk of death or functional decline over a 2-year period compared to those less than 2. A scoring system using age, function, and self-reported diagnoses did not enhance predictive ability of the VES-13 (Saliba et al., 2001). Although the study linked vulnerability to death and functional decline, the link between vulnerability and future resource use (hospitalizations of medical expenditures) has yet to be established. This capstone aims to look at vulnerability and health care utilization as well as other associated factors such as socioeconomic status, age, gender, and chronic comorbidities.

In conclusion, the VES-13 has the ability to predict death and functional decline in the elderly population. There may also be a link between vulnerability identified by the VES-13 score and healthcare utilization (McGee et al., 2007), however, the tool was not found to be a useful predictor of mortality and emergency admission in the study by Wallace and colleagues (2017) without other risk factors. It was also apparent that the most frail individuals had more falls, cognitive impairment, needed help at home, and overall transitions toward frailty were associated with more healthcare utilization (Bentur, Sternberg, & Shuldiner, 2016). The VES-13 is quick and easy to administer, and performs nearly as well as the Comprehensive Geriatric Assessment (Mohile, et al., 2007). Although using age, function, and self-reported diagnoses were not found to enhance the predictive ability of the VES-13 in one study (Saliba et al., 2001), looking at various other factors may enhance predictive ability of the tool with emergency department, inpatient, and office visits. When administered regularly, by a primary care office for example, providers can see changes in patients over time.
Theoretical Framework

The theory used to support my research is a conceptual model for vulnerable populations, which relates resource availability and relative risk to health status (Flaskerud & Winslow, 1998). The model has a population-based focus and defines vulnerable populations as social groups with limited resources and consequent high relative risk for morbidity and mortality. This conceptual framework links resource availability, relative risk, and health status (see Figure 1). Examples of resource availability include socioeconomic and environmental resources. Relative risk is the risk of poor health in those who do not receive resources and are exposed to risk factors compared to those with resources exposed to risk factors (Flaskerud & Winslow, 1998). Health status is morbidity and mortality. There are relationships that exist between these three concepts.

One of the relationships in the model is that a lack of resources increases relative risk. Another relationship is that exposure to risk factors leads to increased morbidity and mortality in a population group and that morbidity and mortality also exacerbate risk factors. Lastly, there is a relationship between health status and resource availability. The morbidity and mortality in a community can theoretically further deplete resources available in a community setting (Flaskerud & Winslow, 1998). By intervening and addressing the vulnerable population, nursing research can impact resources, relative risk, and health status of the population.

For the purpose of this capstone project, the relative risk will be the vulnerable or non-vulnerable status identified by the VES-13 survey tool. Relative risk and associated risk factors also include age, sex, and multiple comorbidities, which will also be studied. The health status will be utilization of healthcare resources, identified by the ED, IP, and office visits. Those with increased chronic conditions and morbidity are more likely to use healthcare services. The final
A connection between resource availability and vulnerability will be studied by collecting socioeconomic status by determining Medicaid status. Relative risk including age, comorbidities, and overall VES-13 score can lead to utilization of healthcare. The lack of resources and low socioeconomic status may also increase relative risk and impact vulnerability. The last relationship is that a lack of societal and environmental resources may lead to increased utilization of healthcare services and poorer health status. The increased utilization of services related to morbidity and mortality can further deplete resources available on a community level. This correlates with the idea that older adults may be utilizing low value care with an increased vulnerability status and this further decreases societal resources. Based on this model, interventions can seek to increase resource availability, decrease relative risk, and improve health status of this vulnerable population.

Resource Availability: Decreased Socioeconomic Resources (Medicaid eligibility)

Relative Risk: Increased Risk Factors (VES-13 score, age, gender, count chronic conditions)

Health Status: utilization of healthcare services (weighted total IP, ED, OP visits)

*Figure 1. Vulnerable Populations Conceptual Model adapted from Flaskerud & Winslow (1998)*
Methodology

The study was a cross-sectional design using an interview and retrospective chart review. The VES-13 was administered to patients 65 years and older coming into the primary care office for routine medical care. Data was collected from the patient medical records and HEALTHeLINK to determine age, sex, socioeconomic status, number of chronic conditions, and healthcare utilization (inpatient (IP), emergency department (ED), and office visits).

Variables

The dependent variables we are interested in are the number of inpatient hospitalizations, the number of ED visits, and the number of office visits in the past 12 months. The healthcare utilization was totaled using a scoring system of 1 point for office visits, 5 points for ED visits, and 10 points for inpatient hospitalizations. Each patient had at least 1 point for the current visit. These variables are interval level.

The independent variables include the age and sex of the individuals, the number of chronic comorbidities, and socioeconomic status. Another independent variable is the VES-13 score, 0-10, with 10 being the highest score. Socioeconomic status was measured by Medicaid status yes/no and is nominal in nature. Patients 65 years and older with Medicaid were also dual eligible for Medicare. Sex is also nominal and the chronic comorbidities, age, and VES-13 scores are interval in nature.

Setting

The setting was a primary care office in Buffalo, NY. The inclusion criteria included those 65 years and older presenting to the office. Exclusion criteria included non-English
speaking patients and those unable to provide informed consent. Spanish speaking patients were not uncommon in this office but were excluded in the study. The practice is a teaching facility with doctors, residents, and a nurse practitioner. There was also a podiatrist that presents to the office weekly to see Medicaid patients that are patients at this clinic for podiatry related issues.

Tools

The VES-13 is a tool that can identify vulnerable elders in the community and used free of charge by researchers, health care providers, and provider organizations with proper citation and RAND as rights owner. One study found that the sensitivity and specificity of the VES-13 were 87% and 62%, respectively (Luciani et al., 2010). The VES-13 was found to be highly sensitive and predictive in identifying impaired functional status. Another study found the VES-13 to have a 72.7% sensitivity and 85.7% sensitivity and the reliability to be 0.92 (Pearson’s correlation coefficient) (Mohile et al., 2007).

Data Sources

As already mentioned, HEALTHeLINK was a source of data. It is a collaboration amongst physician, hospital, and insurance organizations to share information to enhance delivery of patient care. HEALTHeLINK, a non-profit organization, includes various members of Western New York such as Kaleida Health, Erie County Medical Center, and the Catholic Health System of Buffalo. It is a network that can share information between a primary care office and hospital emergency room. For the purpose of this capstone, only data regarding patient admission to the emergency and inpatient hospitalization was collected through the electronic health information exchange at the primary care office (HEALTHeLINK, n.d.). Another source
of data was the patient’s chart to determine office visits, the number of chronic conditions, Medicaid status, age, and sex. The number of office visits was obtained from the patient medical record and the number of emergency and inpatient visits were found in HEALTHeLINK.

Statistical Analysis

An independent t-test was utilized to analyze the resource availability (socioeconomic status as evidenced by Medicaid) and the relationship between health status and utilization of healthcare services. The Medicaid status is a yes/no variable and therefore nominal in nature and will be compared to the interval level data. Another independent t-test will be used to analyze the impact of sex on the utilization of healthcare services with the weighted inpatient, ED, and outpatient visits. Lastly, Pearson correlation coefficient was used to evaluate the effect of VES-13 score, age, and number of chronic conditions on the health status and utilization of healthcare services.

With the independent t-tests, there is an assumption that there will be a normal distribution. If there is not a normal distribution, a Mann-Whitney test will be used. To make the data more robust, a correlation will also be done between age and gender to the VES-13 score. With this data, it will become apparent whether male or female patients have a higher score or a correlation between age and vulnerability. We can better predict who may have a higher VES-13 score and therefore hypothesized increased utilization of low value care. This information can guide interventions to keep patients in the community setting.
Ethics

Informed consent was obtained for this capstone project. The VES-13 score is a self-reported questionnaire and there is no risk to the patient. The primary risk during data collection is that protected health information may be released, however, no names were attached to the data. The patient was coded by storing the medical record on a separate sheet with a patient code from 001-052. This sheet was not stored with the data. Only information required for this study will be collected while completing the chart review. IRB approval was obtained for this study.

Results

The research was conducted during a two-week period in February. Inclusion criteria was patients presenting to the office for routine care age 65 years and older and a sample size of 52 participants was obtained. After data collection was complete, the nominal level variables including Medicaid status and gender were analyzed using independent t-tests. Pearson’s correlations were used to analyze interval level data such as the number of VES-13 score, number of chronic comorbidities, and age in relationship to weighted healthcare utilization.

Descriptive Statistics

The protocol for data collection included case identification, a brief interview, and then a chart review. During the process, the researcher was given access to the electronic health record (EHR) to identify when the patients 65 years and older checked into the office. Once checked in, the EHR would display what room they were in and whether they were seen by the nurse. Once seen by the nurse, informed consent was obtained by the researcher and the questionnaire was delivered in an interview format in the private exam room. The data from the EHR and
HEALTHeLINK was collected either between patients or at the end of the day. During this time, 52 patients who came into the primary care clinic participated in this study.

The study examined three types of utilization (IP, ED, & OP) and these were transformed into the dependent variable, weighted utilization. Independent variables included age, sex, Medicaid status, number of comorbidities and VES-13 scores.

**Weighted utilization.** The dependent variable is utilization. Each type of utilization is measured separately and then a weighted utilization score was created by adding 1 point for an office visit, 5 points for emergency department, and 10 points for inpatient hospitalizations. The weighted total ranged from 2 to 72 and the mean was 14 (Figure 2). The number of office visits in the past year ranged from 1-24 office visits in the past 12 months (including the current visit) and the mean was 5 (Figure 3). The highest percentage of office visits was 4 visits in the past year, and this accounted for 19% of the population. The mean ED visits in the past 12 months was 1 and ranged from 0-14 in the participants (Figure 4) and mean inpatient visits was < 1 visit.
and ranged from 0-3 visits (Figure 5).

Figure 2. Histogram of weighted utilization (N=52)
Figure 3. Histogram of number of office visits in the past 12 months

Mean = 5.33
Std. Dev. = 3.513
N = 52
Figure 4. Histogram of number of emergency visits in the past 12 months

Mean = 1.06  
Std. Dev. = 2.191  
N = 52
Age, gender, and Medicaid status. The age ranged from 65 years old to 93 years old. The average age was 74 years old. Figure 6 is a histogram with the patient ages. There were 24 male participants and 28 female participants. Socioeconomic status was measured by Medicaid status (yes or no). This information was determined looking in the medical chart and patient demographics. Twenty-four participants had Medicaid and 28 did not. Table 1 shows the demographic characteristics of the population.
Figure 6. Patient ages presenting to the primary care office (N=52)

Table 1.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Medicaid</th>
<th>No Medicaid</th>
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<tr>
<td>Male</td>
<td>12</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Female</td>
<td>12</td>
<td>16</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>24</td>
<td>28</td>
<td>52</td>
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VES-13 score. The Vulnerable Elders Survey (VES-13) score ranges from 0-10, with 10 being the highest. A score of 3 of greater indicates vulnerability. Figure 7 shows the distribution of VES-13 scores. The scores ranged from 0-9. The most frequent score was 0, indicating low vulnerability. No patients scored a 5 and this could be due to the nature of the VES-13 tool and way the score is calculated.

The VES-score was recoded into two groups of score less than 5 and score greater than 5. Patients scoring 0-4 were grouped into the low category and 6-10 grouped into high vulnerability. The low group had 34 subjects and the high group had 18. The final analysis used the actual VES-13 score.

Figure 7. Vulnerability score in persons over age 65 presenting to the primary care office (N=52)
Chronic comorbidities. Chronic comorbidities were an independent variable collected from the EHR, using 19 common chronic diseases as defined by the Centers for Medicare and Medicaid Services. This included diagnoses such as hypertension, hyperlipidemia, depression, arthritis, and other chronic illnesses (Centers for Medicare and Medicaid Services [CMS], 2017). The number of chronic conditions ranged from 0 to 8 diagnoses and the average number of comorbidities was 4. Figure 3 is a histogram showing the number of comorbidities.

*Figure 8.* Number of chronic comorbidities in persons over age 65 presenting to the primary care office (N=52)
**Relationships Between Variables**

**Gender.** The average number of chronic comorbidities was similar for both men (3.84) and women (4.04). Women had between 1-8 chronic comorbidities with 5 being the most frequent number of comorbidities and men ranged from 0-8, with 5 also being the most frequent. The difference between gender and chronic comorbidities was not statistically significant using an independent t-test. The mean VES-13 score only differed slightly based on gender with a mean score of 3.71 in the men and 3.32 in the women. The difference between VES-13 score and gender was also not statistically significant using an independent t-test.

The weighted utilization was calculated using the number of office, emergency, and inpatient visits in the past 12 months. The weighted utilization mean for women was 16 (range 2-72) and for men was 12 (range 3-36). The mean weighted utilization was higher in the female category. It should also be noted that the outlier with a weighted utilization score of 16 was in the female group. The boxplot in Figure 9 demonstrates this and the higher utilization for women versus men. The difference between gender and the weighted utilization was not statistically significant using an independent t-test, but the mean weighted utilization was higher in the female category.
Figure 9. Boxplot demonstrating relationship between gender and weighted utilization (N=52)

**Medicaid status.** Medicaid status was determined using a chart review. The mean weighted utilization in Medicaid users was 17 (range 2-72) and the mean for non-Medicaid users was 11 (range 2-41). There was a slightly higher weighted utilization by those on Medicaid as shown in Figure 10. The highest value of utilization was also a patient with Medicaid. The relationship between Medicaid status and utilization was not statistically significant using independent t-tests. The mean VES-13 score was similar for both Medicaid (3.25) and non-Medicaid users (3.71). Lastly, the mean number of chronic comorbidities was very similar in both Medicaid (4.13) and non-Medicaid users (3.79). There was no statistical significance
between both VES-13 scores and Medicaid status and the number of chronic comorbidities and Medicaid status using independent t-tests.

Figure 10. Boxplot demonstrating relationship between Medicaid status and weighted utilization (N=52)

**Vulnerability and utilization.** The mean weighted utilization in those scoring 0-4 on the VES-13 tool was 12 and the mean weighted utilization in the group scoring 6-10 was 17. The group weighted utilization mean is higher in the group with scores 0-4 than the group with a score of 6-10 (Figure 11). In the low vulnerability level group, the whiskers are lower indicating a lower range of utilization. The median is also lower, indicating that those with lower vulnerability tend to have a lower weighted utilization than those with moderate vulnerability.
VULNERABILITY AND HEALTHCARE UTILIZATION

scores. When examining the difference between grouped vulnerability levels and weighted utilization, there is no statistical significance using independent t-tests.

![Boxplot demonstrating relationship between vulnerability level and weighted utilization (N=52)](image)

The mean age between the two groups were very similar, 73.79 in the lower vulnerability group and 73.11 in the higher vulnerability group. The difference between patient age and vulnerability level (with grouping less than 5 and greater than 5) was not statistically significant.

**Correlations.** Correlations were completed between interval level variables of VES-13 score, age, number of chronic comorbidities, types of utilization, and weighted utilization (Table 2). The VES-13 score was significantly correlated to the number of chronic comorbidities at the
p < 0.01 level and the number of inpatient visits in the last year at the p < 0.05 level. The relationship was not significantly related to the office visits or emergency visits in the last year, however.

Age was not statistically significant to weighted utilization. There were no correlations found between age and any of the variables including VES-13 score, number of chronic comorbidities, and office, emergency, and inpatient visits in the past 12 months.

The number of chronic comorbidities was also significantly correlated to the number of office visits in the past year. Those with a higher VES-13 score may have more chronic comorbidities and also follow up in the office more frequently. As expected, inpatient, emergency, and outpatient utilization was significantly correlated with weighted utilization.

Table 2

Correlations Between Interval-level Variables

<table>
<thead>
<tr>
<th></th>
<th>VES-13 Score</th>
<th>Age</th>
<th>Number of chronic comorbidities</th>
<th>Office Visits in the Past Year</th>
<th>ER Visits in the Past Year</th>
<th>Inpatient Visits in the Past Year</th>
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</thead>
<tbody>
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<td>Age</td>
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<td>.455**</td>
<td>.001</td>
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</tr>
<tr>
<td>Number of chronic comorbidities</td>
<td></td>
<td>.256</td>
<td>-.205</td>
<td>.336*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office Visits in the Past Year</td>
<td></td>
<td>-.088</td>
<td>-.110</td>
<td>.111</td>
<td>.112</td>
<td></td>
</tr>
<tr>
<td>ER Visits in the Past Year</td>
<td>.340*</td>
<td>.182</td>
<td>.046</td>
<td>.064</td>
<td>.042</td>
<td></td>
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<tr>
<td>Inpatient Visits in the Past Year</td>
<td></td>
<td></td>
<td></td>
<td>.372**</td>
<td>.839**</td>
<td>.517**</td>
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** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
Qualitative observations. While at the primary care clinic, the VES-13 tool helped guide discussion with patients and engage in conversation. The questions touch on functional activities such as bathing or showering, doing housework, walking across the room, and shopping for items. If a patient was unable to shop for personal items or walk across the room, they often explained why this was the case when answering no to the question. In the practice, it became apparent that this was a valuable tool to better understand unmet needs. For example, many patients who cannot lift over 10 pounds would explain why. Many times, it was because of an injury. Physical therapy treatment could prevent further injury and improve quality of life. Interventions related to therapy could also help the patient remain strong and active in the community.

Summary of Results

For this capstone project, it was hypothesized that high vulnerability would be associated with greater low-value utilization as evidenced by inpatient and emergency department utilization. In terms of weighted utilization (calculated utilization based on office, emergency, and inpatient visits), there were no significant relationships between utilization, vulnerability, age, gender, number of chronic comorbidities, or Medicaid status. It was predicted that those with higher VES-13 scores would also have high healthcare utilization.

We also aimed to identify patient characteristics associated with those most vulnerable coming into a primary care office for care. In terms of vulnerability, the average VES-13 score was very similar between men and women, with women having a slightly higher mean score. The same goes for the VES-13 score and Medicaid status with a very slight difference and non-Medicaid users having a higher mean VES-13 score. Both of these differences were not
significant. These differences were unexpected and can be helpful to aim interventions at individuals that are more frequently coming to the office.

**Discussion**

In this small grab-bag sample of patients presenting to the Hertel-Elmwood Internal Medicine office, patient characteristics, VES-13 scores, and healthcare utilization was analyzed. The study aimed to determine whether high vulnerability using this tool would be linked to greater use of healthcare services, including emergency and inpatient admission. Although we did not determine this relationship to be statistically significant, it was apparent that those with higher vulnerability did have a higher mean weighted utilization.

The relationship between the VES-13 score and the number of chronic comorbidities was statistically significant. This can help guide interventions towards those presenting to the office with multiple comorbidities. Women and Medicaid users also showed higher levels of healthcare utilization in this study. This data can help us to better target characteristics of those utilizing high value care, such as women and Medicaid users presenting to the primary care office as well as those with multiple chronic comorbidities. The relationship between VES-13 scores was significant to inpatient visits at the $p < 0.05$ level and although not significant to office or emergency visits, this is noteworthy because inpatient admissions are costlier. By targeting patients with high VES-13 scores and aiming to reduce inpatient visits, we can work on decreasing low-value care and increasing efficiency.

Another purpose of this capstone study was to evaluate the feasibility of using the Vulnerable Elders Survey (VES-13) to identify vulnerable patients during primary care office visits who may require additional screening and services to remain in the community. It was
noted that while at the office there was no vulnerability or functional screening done on a routine basis. The patients coming in for their Medicare Annual Assessment did receive more nurse screening and questionnaire associated with the visit, however, functional status was not routinely assessed in the elderly.

Mathematic Policy Research recently published a systematic review and found that the VES-13 was useful in targeting high risk populations. Many patients with complex health care needs are considered “high-need, high-cost” patients and population segmentation is needed to target resources to the high risk and costly patients to improve care and resource utilization (Jean-Baptiste, O’Malley, 2017). The VES-13 was mentioned as a useful tool to do so.

**Limitations**

Potential limitations include the small sample size and generalizability. Fifty-two participants were included in this study over a period of two weeks. This small study included a sample of patients 65 years and older presenting to a primary care clinic in Buffalo, NY. Findings may not be generalizable to a broader population. Seasonality and differences due to the time of year and flu-season also could not be controlled. Some patients may have gone to other primary care offices as well as emergency rooms and inpatient hospitalizations not participating in HEALTHeLINK in the previous 12 months or it was their first visit to the office.

**Implications for Practice**

The VES-13 was quick and easy to use. It was administered in 5 minutes or less and the questions were easy to answer. In most instances, the questionnaire was administered right after the nurse put the patient in the room and took the vital signs and before the doctor or nurse
practitioner entered the room. It would therefore be extremely easy to add this tool onto the already established nurse routine to identify those that are most vulnerable. There was a social worker present in the office that met with some of the patients for various needs and referral to services. The recommendations based on vulnerability score would be to identify if the patient has established contact with the social worker and what can be done to improve care.

It should be noted that some of the questions asked in the survey helped to prompt additional conversation and responses. For example, one of the question asks whether the patient has difficulty showering or bathing and if so, whether it is because of their health or physical condition. One of the patients pointed out that her shower was broken and water had pooled so much that it had an odor and was not sanitary. She was too embarrassed to tell the doctor that she had not showered in weeks, so she confided in me and told me that I could let him know. The social worker was alerted to the situation and consequently spent an hour speaking with the patient after her normal appointment.

All in all, administering this tool to patients 65 years and older was quick and beneficial. It stimulated conversation and, if used routinely, could help alert nurses to patients that could benefit from social work. Other interventions could include increased follow up to the primary care office and/or physical therapy referral.

**Implications for Research**

This study demonstrated feasibility of the VES-13 tool in the primary care office. Future studies with a larger sample size can be utilized to look over a longer period of time to determine if the VES-13 is helpful in proactively identifying those at risk of high value healthcare
utilization. The tool, especially when routinely implemented, can help with prospective risk identification.

Although the VES-13 appeared to be feasible in the primary care setting, future studies should aim to compare the VES-13 to other standardized functional assessment tools in primary care. Studies should also look at interventions based on higher scores to improve patient care. This study provides a foundation for understanding the typical patient 65 years and older coming into the clinic and which variables tend to be associated with a higher weighted utilization. The research gives insight to whether the tool could be realistically implemented and although the relationship between the score and weighted utilization was not statistically significant, there was higher utilization seen in the more vulnerable patients.

The research may be expanded upon with a larger sample size and by comparing the VES-13 to other functional assessment tools in a variety of settings. Along with a bigger sample size, research could be conducted in the summer months. This would help address differences due to seasonality and flu-season. People over age 65 years and older may go on vacation for extended periods of times certain times of the year. Healthier individuals may score less on the VES-13 and they may travel during winter months. Flu season can also cause results to look a lot different in summer months and seasonality can’t be controlled for. Further research can be done to try to control these limitations.

The significant relationship between the VES-13 score and the number of chronic comorbidities was not expected but can also be useful in predicting healthcare utilization. The mean number of chronic comorbidities was slightly higher in those that have had one or more emergency visits in the past 12 months, so further studies can focus on the potential benefit of using the number of comorbidities to predict healthcare utilization. It is also important to focus
on the implementation of this tool across healthcare settings. For example, it may be necessary to incorporate this tool into the electronic medical record to provide ease of use and make it a part of routine care.

Role of the Advanced Practice Nurse

The advanced practice nurse has the opportunity to use the Vulnerable Elders Survey to transform practice in the primary care setting. This tool could be incorporated into an assessment to create a more comprehensive plan of care and to stimulate important conversation between the provider and patient. This builds rapport and a trusting, more patient centered relationship. By inquiring about functional activities of daily living, the advanced practice nurse becomes more interested in that individual and takes on a more whole approach.

The VES-13 can be quickly utilized and as mentioned, is an easy and nonthreatening way to stimulate conversation. Instead of asking patients invasive questions, the questionnaire can help touch on difficult situations when a patient is unable to meet their functional needs. As mentioned, this tool is very feasible and could be incorporated into an electronic medical record for better use. The advanced practice nurse can enhance care and address social determinants of health by leading practice change and improving care through use of this tool.

Conclusion

The VES-13 was found to be beneficial when implementing in the primary care clinic. This tool helped prompt valuable conversation with patients and was quick and easy to administer. Those with higher vulnerability scores did have a higher mean weighted utilization which indicates a potential to prevent unnecessary emergency and inpatient visits. Based on the
patient score, interventions can be implemented. Possibly more important than the actual VES-13 score was the valuable outcome associated with the potential for improved patient-provider relationships. The advanced practice nurse can use this tool to learn more about the patient, educate them, and enhance the way care is delivered. This addresses some of the social determinants of health that are responsible for inequality in healthcare.
References


doi:10.1080/15210358.2010.510628


doi:10.1056/NEJMoaa020423
VULNERABILITY AND HEALTHCARE UTILIZATION


January 25, 2018

Dear Kaylee Zaffuto:

On 1/25/2018, the IRB reviewed the following submission:

<table>
<thead>
<tr>
<th>Type of Review:</th>
<th>Initial Study</th>
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<tr>
<td>Title of Study:</td>
<td>Assessing Vulnerability and Healthcare Utilization in Older Adults in Primary Care</td>
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<tr>
<td>Investigator:</td>
<td>Kaylee Zaffuto</td>
</tr>
<tr>
<td>IRB ID:</td>
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<tr>
<td>Funding:</td>
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<td>Documents Reviewed:</td>
<td>• Data Collection Case Identifier .docx, Category: Other; • HRP-502 Version 2 Informed Consent KZ.pdf, Category: Consent Form; • Vulnerable Elders Survey (VES-13), Category: Surveys/Questionnaires; • Capstone Proposal, Category: Other; • Data Collection Form, Category: Other; • HRP-503 Kaylee Zaffuto Version 8.docx, Category: IRB Protocol;</td>
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The IRB approved the study from 1/25/2018 to 1/24/2019 inclusive. The Initial study materials for the project referenced above were reviewed and approved by the SUNY University at Buffalo IRB (UBIRB) by Non-committee Review. Before 1/24/2019 or within 30 days of study closure, whichever is earlier, you are to submit a continuing review application with required explanations. You can submit a continuing review application by navigating to the active study in Click IRB and selecting ‘Create Modification / CR’. Studies cannot be conducted beyond the expiration date without re-approval by the UBIRB.

In conducting this study, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.
HIPAA Authorization combined with consent document

The consent form document includes the HIPAA authorization for use/disclosure of personal health information and has met the required elements of the federal regulations of HIPAA.

UBIRB approval is given with the understanding that the most recently approved procedures will be followed and the most recently approved consent documents will be used. If modifications are needed, those changes may not be initiated until such modifications have been submitted to the UBIRB for review and have been granted approval.

As principal investigator for this study involving human participants, you have responsibilities to the SUNY University at Buffalo IRB (UBIRB) as follows:

1. Ensuring that no subjects are enrolled prior to the IRB approval date.
2. Ensuring that the study is not conducted beyond the expiration date without re-approval by the UBIRB.
3. Ensuring that the UBIRB is notified of:
   - All reportable information in accordance with the New Information SOP (HRP-024).
   - Project closure/completion by submitting a Continuing Review/Modification submission.
4. Ensuring that the protocol is followed as approved by UBIRB unless a protocol amendment is prospectively approved.
5. Ensuring that changes in research procedures, recruitment or consent processes are not initiated without prior UBIRB review and approval, except where necessary to eliminate apparent immediate hazards to subjects.
6. Ensuring that the study is conducted in compliance with all UBIRB decisions, conditions, and requirements.
7. Bearing responsibility for all actions of the staff and sub-investigators with regard to the protocol.
8. Bearing responsibility for securing any other required approvals before research begins.
If you have any questions, please contact the UBIRB at 716-888-4888 or ub-irb@buffalo.edu. Please include the project title and number in all correspondence with the UBIRB.
**Introduction**

Functional decline in older adults can lead to higher healthcare utilization, increased costs, and increased morbidity and mortality. The purpose of this capstone project was to evaluate the feasibility of using the Vulnerable Elders Survey (VES-13) to identify vulnerable patients during primary care office visits and to determine the impact of vulnerability on healthcare utilization.

**Methods**

The VES-13 was administered by an interview followed by a chart review in a grab-bag sample of individuals 65 years and older who presented to the primary care office for routine medical care.

The dependent variable, healthcare utilization, was a weighted total of 10 points for inpatient (IP), 5 points for emergency (ED), and 1 point for outpatient visits in the past year for each case.

The independent variables included the age and sex of the individuals, the number of chronic comorbidities, the socioeconomic status, and the VES-13 score (0-10). Selected questions from the VES-13 are shown in Figure 1.

The analytic strategy was to compare variables using independent t-tests and correlations.

**Results**

Fifty-two patients with ages ranging from 65 years to 93 years old participated. The average age was 74 years old. Figure 1 displays the histogram of vulnerability (VES-13) scores. Fifty-four percent (54%) of participants were female and 46% were on Medicaid. Weighted utilization ranged from 2 to 72 with a mean value of 14.

**Vulnerability and Weighted Utilization**

Individuals with high VES-13 scores (6-10) had higher weighted utilization (Figure 3), but the result is not statistically significant (t-test).

**Healthcare Utilization Based on Gender and Medicaid Status**

The mean weighted utilization was higher for women (mean 16) than men (mean 12). See Figure 4. The mean weighted utilization was slightly higher for Medicaid users (Figure 5).

Neither results were statistically significant using independent t-tests.

**Relationship between Variables**

The VES-13 score was significantly related to the number of chronic comorbidities (p = 0.01) and the number of inpatient visits in the past 12 months (p = 0.05) using Pearson’s Correlation Coefficient. The number of chronic comorbidities was also significantly related to the number of office visits in the past year.

**Summary**

Factors related to healthcare utilization include women, Medicaid users, multiple comorbidities, and a higher VES-13 score.

Limitations include a small sample size and influences due to seasonality.

**Role of the Advanced Practice Nurse**

During this study, unmet needs were identified using the VES-13. The survey questions touch on functional activities such as bathing or showering, doing housework, walking across the room, and shopping for items. Many patients would explain why they were unable to do a task. The tool uncovered sensitive topics in a non-threatening approach.

The Advanced Practice Nurse has the opportunity to transform practice through the use of this tool by incorporating it into routine assessment. It was shown to stimulate conversation between the provider and patient and create a more patient-centered relationship.

**Conclusion**

The study demonstrated the utility of the VES-13 tool in the primary care setting. The tool was quick and easy to use, helped prompt valuable conversation, and identified those with high vulnerability scores that may have higher healthcare utilization. When implemented by an advanced practice nurse, it can enhance care and address social determinants of health.

**References**


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