Identification of Social Determinates Leading to the Diminished Utilization of Vascular Care in the Setting of Chronic Limb Threatening Ischemia Resulting in Limb Loss

Specific Aims:

Limb loss secondary to peripheral arterial disease(PAD) is an escalating health problem in the United States. In 2005 there were 1.6 million people with a major amputation and it is estimated that by 2050, 2.3 million people will have undergone a major amputation due to PAD.[1] Amputations are costly due to hospitalizations, rehabilitation, loss of wages, and medical equipment. In the first year, expenses range from $40,000-$70,000, and up to $500,000 in a patient's lifetime.[2,3] Limb loss in vascular patients is associated with exceedingly low rates of ambulation[4], poor quality of life[5,6], and high rates of depression and mortality. Medicare estimates 1 and 3 year mortality rates to be 48% and 71%, respectively.[7] Multiple studies utilizing Medicare and National Inpatient Sample data have demonstrated that African American(AA) patients with Chronic Limb Threatening Ischemia(CLTI) undergo significantly less attempts at limb salvage with revascularization compared to their white counterparts and are at 2-4 fold increased risk of major amputation, even when controlling for baseline comorbidities.[8-12] This racial disparity with regard to limb loss is further amplified in the Southeastern region of the United States, with multiple counties in South Carolina having ***the highest rates*** of limb loss in the entire country.[13]

South Carolina is one of the fastest growing states, with an 11% population increase in the past decade. It has one of the highest percentages of AA residences comprising 26% of the South Carolina population, compared to 12% nationally. South Carolina is one of the most impoverished states in the country, with an annual per capita income of less than $28,000 and a 15% poverty rate.[14] The mechanisms by which disadvantaged patient populations are placed at high risk of limb loss is **complex and multifactorial**. Previous data suggests racial and socioeconomic disparities related to limb loss may be associated diminished access and low rates of preventative care, however, this is derived from older, sampled data. Moreover, there is a paucity of investigation into the interplay of race, spatial socioeconomic and cultural factors associated with a patient's environment leading to diminished utilization of vascular care.

To that end, it is imperative that we first determine what the contemporary rates of major to understand the full extent of this health crisis. The South Carolina All Payer Database provides information on all inpatient, hospital-based and free-standing outpatient procedures and emergency room visits in South Carolina, thereby capturing all procedures regardless of age or insurance status, which has not been investigated previously. ***Only once the scope of the problem is accurately defined can we determine how the racial, socioeconomic and geographic factors influence access to vascular care, leading to limb loss.*** As such, the following aims are proposed:

Aim 1: Quantify contemporary rates and geographic distribution of major amputations associated with PAD in South Carolina
Aim 2: Determine the utilization rates of vascular interventions prior to major amputation
Aim 3: Determine the racial, cultural, socioeconomic, and geographic accessibility factors associated with the *lowest* utilization of vascular interventions prior to major amputation

Public Health Relevance:

This research study will provide an unprecedented, in-depth delineation and analysis of the racial, cultural, socioeconomic, and geographic accessibility factors contributing to the disparities of vascular interventions resulting in the drastic, disproportionate rates of limb loss. This will be achieved by utilizing an all-inclusive, all payer database, multiple socioeconomic databases and local community sources for geospatial analysis of barriers to vascular care access. These findings will allow for the characterization of the contemporary patient *and* environment phenotypes at highest risk of decreased access to vascular interventions and limb salvage. These results will inform the development of outreach programs based on the identified barriers to early, high quality vascular care. These targeted interventions will then be applied to geographic "hot spots" in South Carolina determined from this study. As such, the results of this study have a direct impact on the community and will lay the foundation for a larger, prospective study to determine the feasibility and efficacy of targeted outreach programs including educational programs, screening programs, and fast track programs using patient navigators to increase access of disadvantaged patient populations to high quality vascular care and reduce the rate of limb loss.

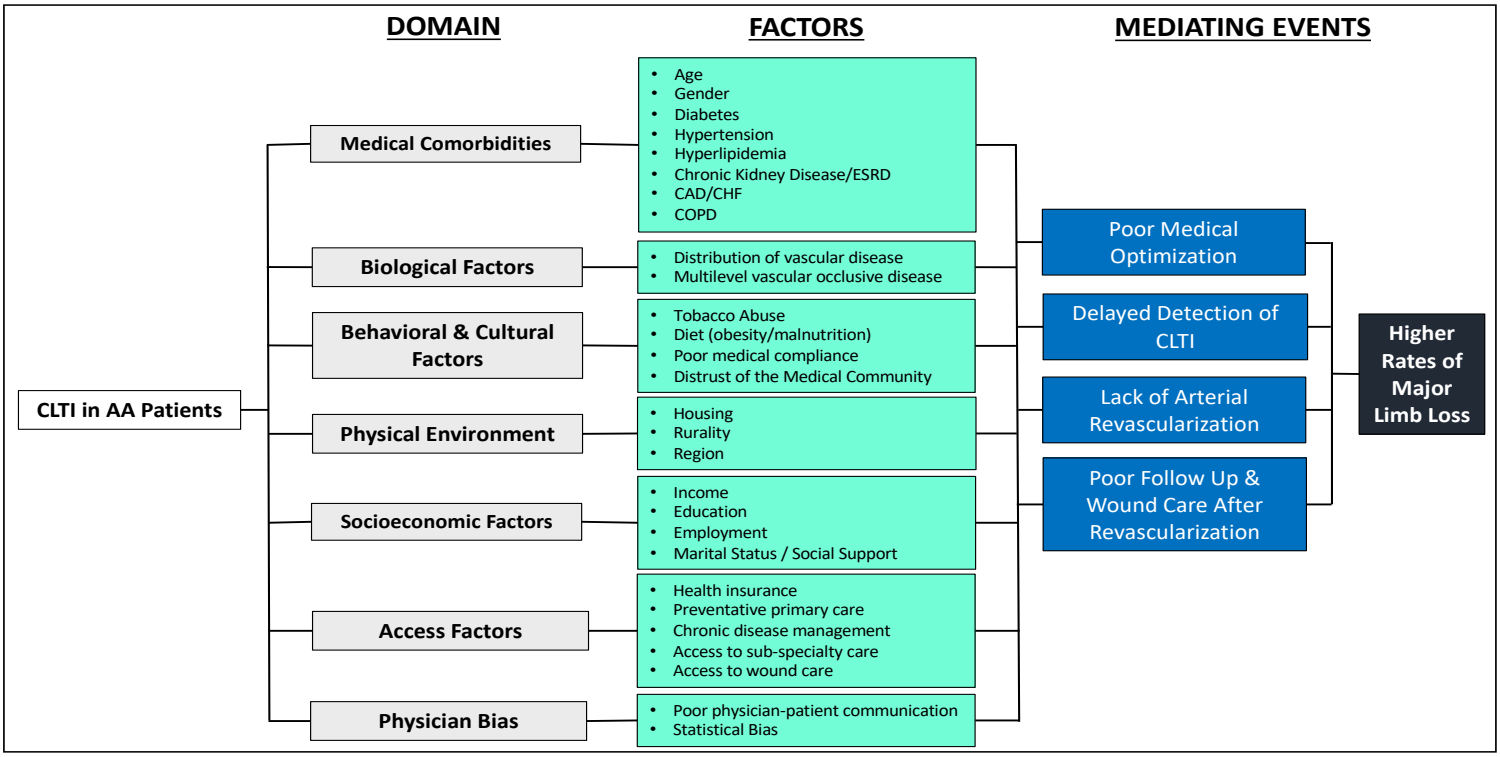
RESEARCH PLAN

Significance and Innovation:

Limb loss in the setting of chronic limb threatening ischemia (CLTI) is a growing epidemic in the United States, with the increasing prevalence of comorbid cardiovascular disease in an aging patient population.[1,3] As suggested by older studies, this health crisis is particularly prevalent in the southeastern United States, with the impoverished, African American (AA) patient population being disproportionately impacted by this end-stage of vascular disease. The current published literature provides a somewhat limited and superficial analysis of socioeconomic risk factors for limb loss due to nature of national databases having sampled, older data, with limited in-depth knowledge about the communities of the amputated patient population. The South Carolina All Payer Claims database provides a unique opportunity to capture all inpatient and outpatient procedures performed in the state of South Carolina, in a longitudinal manner, thereby providing the opportunity to establish the most accurate and contemporary assessment of limb loss in the setting of CLTI. A meaningful and concerted effort to implement aggressive interventions to improve limb salvage rates cannot be initiated until we accurately define the extent of the problem and determine which patient populations are at the highest risk.

It is our hypothesis that there is a disproportionally increasing rate of limb loss in South Carolina that is excessively affecting the socioeconomically disadvantaged, AA patient populations. It is our main objective to identify the medical, racial, social, cultural, economic and environmental factors impeding access to healthcare and diminished utilization of vascular resources leading to major amputations. Previous studies have demonstrated that the AA patient population is 2-3 times more likely to undergo a major amputation compared to their white counterparts in the setting of vascular disease, even when controlling for comorbid medical conditions.[9,13,15,16] AA patients are less likely to have attempted revascularization for limb salvage prior to their major amputation. [8,9,11,15] Moreover, when AA patients undergo a major amputation, they are more likely to have an above knee amputation as opposed to a below knee amputation.[11,16] Medical optimization, access to high-level vascular care and interventions, utilization of these resources is a complex problem associated with more than just race and income level. ***It is imperative that we develop a new way of approaching disparities in vascular care access.*** Diminished access to vascular interventions is a complex interplay between multiple domains, as seen below in Figure 1. There are a variety of medical, social, cultural, and

Figure 1. Conceptual Model



economic factors that may influence and mediate diminished utilization of preventative healthcare, delay in diagnosis and lack of aggressive peripheral revascularization attempts in the AA patient population.

Factors that predispose the AA patient population to diminished health care access have been rudimentarily investigated. Data suggests that higher rates of amputation occur in impoverished areas and in patients with a lack of health insurance.[12,16] Moreover, major amputations are more likely to occur at low-volume institutions and when vascular interventions are performed by non-vascular surgeons.[9,17] The proposed study, utilizing zip code level data from the South Carolina All Payer Claims Database will delve deeper into this investigation by identifying contemporary education levels, cultural and housing environments, income levels, distribution of health insurance, and proximity to various levels of preventative and vascular care, and large community networks that enhance patient engagement in the healthcare community across South Carolina in conjunction with patients' predisposing medical comorbidities. These can be spatially analyzed to determine locations in South Carolina at the highest risk. The use of spatial analysis to determine accessibility to health care is not unprecedented,[29] however, research on the use of spatial methods to determine communities at risk for limb amputation is scarce, especially when it comes to rural areas.[30] This study will be the first one of its kind to incorporate multiple levels indicators of decreased vascular care access to understand the spatial distribution of limb loss in relation to other possible risk factors such as medical comorbidities, health care accessibility, socioeconomic status, and environmental characteristics.

Through this study, we have the unique ability to utilize an all payer database to longitudinally follow *all* patients in South Carolina to most accurately quantify this major health crisis. This will inform us of the specific geographical regions, patient phenotype and community settings in the state at highest risk of diminished access to vascular care and highest risk of limb loss. Through these findings, *which have yet to be determine for the vascular surgery patient population*, we will lay the foundation for R01 level funding application to implement appropriately targeted patient education, preventative healthcare, and screening increase access to these elucidated subsets of patients who are at an exceedingly high risk of limb loss.

Preliminary Data:

We have performed a preliminary investigation of the national trends of major amputations in CLTI patients utilizing the Society of Vascular Surgery's prospective, multi-institutional database, the Vascular Quality Initiative (VQI) registry. This database captures the details of vascular procedures performed at over 500 centers in the United States and Canada. All data is prospectively and electively input by each institution. We identified 15,724 patients who underwent a major amputation between 2012-2020; 57.8% of patients were white, 42.2% of patients were non-white, and 35.6% were AA. We evaluated the impact of race and socioeconomic status on the level of major amputation and attempts at limb salvage prior to limb loss. Socioeconomic status was described using the Distressed Community Index (DCI). The DCI provides a gradated assessment of the economic well-being of a community based on seven metrics including education level, poverty rate, unemployment rate, change in employment, house vacancy rate, median household income and change in business establishments.

Figure 2. Outcomes by Race

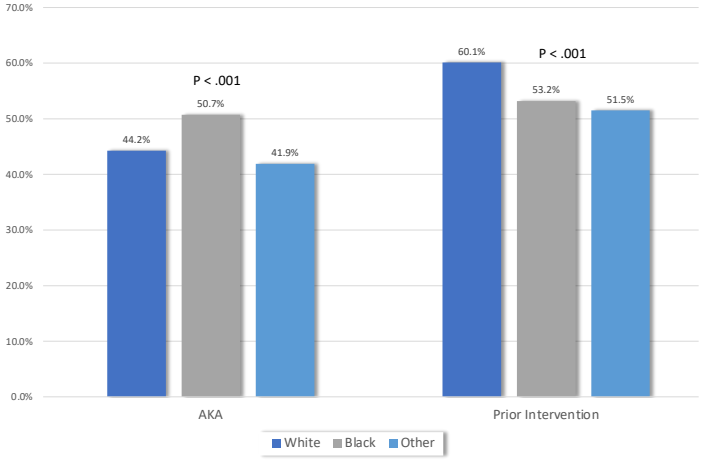
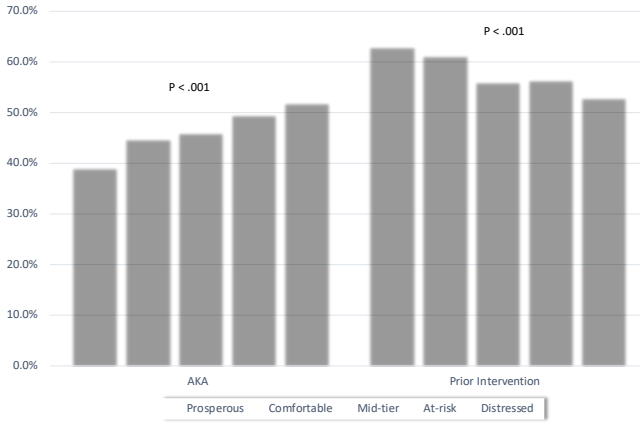


Figure 3. Outcomes by DCI Tier



As shown in Figure 2, AA patients were significantly more likely to receive an above the knee amputation compared to white patients and less likely to receive any type of vascular intervention, either open surgical or endovascular, prior to their amputation. When analyzing the risk of above the knee amputation compared to a below the knee amputation, and rate of vascular intervention prior to limb loss, based on socioeconomic status, patients living distressed

communities had significantly worse access to vascular intervention and outcomes, shown in Figure 3. When evaluated in a multivariable model, both race and socioeconomic status were independent predictors of decreased access and higher rates of above the knee amputation.

While this data, which is currently under review at the *Journal of Vascular Surgery*, provides insight into the recent trends of limb loss in vascular patients suffering from CLTI, there are limitations to this study, due to the nature of the VQI database. This is sampled data from across the country and institutions that typically engage and report to VQI are large, often academic, centers. Therefore, this data does not capture the most disenfranchised patients who receive major amputations at smaller, local hospitals with limited, if any, vascular capabilities. Moreover, information on the geographic and cultural environment in these distressed communities is missing, limiting our understanding about actionable interventions to improve early access to vascular specialty care. While our study is the most contemporary report of limb loss due to vascular disease in the current literature, this is a rudimentary investigation into health disparities in vascular surgery based on race and DCI alone and does not provide in-depth analysis to develop targeted interventions. *The proposed project, utilizing a large volume, state level, all payer database, will allow for a comprehensive and in-depth analysis of the environmental and accessibility factors associated with the disadvantaged patients' diminished access to early vascular interventions*.

Research Design:

Aim 1: Quantify contemporary rates and geographic distribution of major amputations associated with peripheral arterial disease in South Carolina

This aim will be achieved by performing a retrospective cohort analysis of the South Carolina All Payers Claims database from 2015-2020. The South Carolina All Payers Claims Database provides information on all inpatient, hospital-based and free-standing outpatient procedures and emergency room visits in South Carolina. Aim 1 will be achieved through the following:

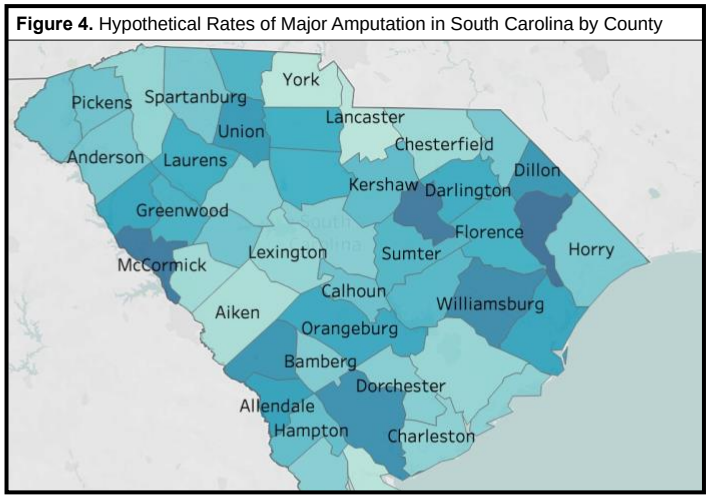


Figure 4. Hypothetical Rates of Major Amputation in South Carolina by County

a. Determine the incidence of major amputations, including above the knee (AKA), through the knee (TKA) and below the knee amputations (BKA), in all adult patients with peripheral arterial disease in South Carolina utilizing the South Carolina All Payer Database from 2015 through 2020. Patients with major amputations secondary to malignancy, trauma or diabetic infection alone will be excluded.
b. Utilizing zip code and county level data, we will perform a geographic spatial analysis of the rates of major amputation to identify regions of the state with consistently the highest rates of limb loss, as depicted in Figure 4. Clustering of the highest rates of limb loss will be determined by identifying counties with the highest quintile of amputation rates.
c. Temporal analysis of major amputation rates over the 6-year timespan will also be performed to identify any regions with significantly rising incidence of limb loss over time.

Hypothesis: This aim will establish the most accurate, contemporary incidence of major amputations secondary to peripheral arterial disease as a benchmark to evaluate success of future interventions. Clustering or "hot spots" will identify the geographic regions to be targeted for future outreach interventions.

Aim 2: Determine the utilization rates of vascular interventions prior to major amputation

Utilizing the cohort identified in the first aim, adult patients with a major amputation secondary to peripheral arterial disease, the following analysis will be performed on patients with a major amputation from 2017-2020, in order to determine rates of limb salvage attempts in the two years prior to limb loss.

a. In the two years prior to major limb loss, we will determine rates of attempted limb salvage. Limb salvage attempts will include peripheral vascular interventions (PVI) such as endovascular peripheral intervention, supra-inguinal or infra-inguinal bypass or a hybrid revascularization procedure. Rates of wound

debridement, wound matrix application, toe amputation(s), and transmetatarsal amputations will also be evaluated. PVI intensity will be categorized into low intensity (0-1 procedures) vs. high intensity (2-4 procedures) PVI prior to major amputation.

b. Delineate the medical phenotype of patients with low intensity PVI vs. high intensity PVI prior to limb loss, including demographics, race, ethnicity, medical comorbidities and medication adherence.
c. Decern the qualitative differences in PVI intensity for patient populations at high risk of decreased access (i.e., time from procedure to major amputation, type of procedure performed, operator type, hospital type, associated wound debridement)
d. Geospatial analysis will be performed to determine geographic clustering of patients who experience the highest rates of limb loss and lowest rates of PVI intensity.

Hypothesis: Older patients with more advance comorbidities will have less attempts at limb salvage prior to limb loss compared to their younger, healthier counterparts. Moreover, these patients will have higher rates of these procedures performed by non-specialists, at smaller hospitals. This aim will further identify the highest risk "hot spots" of lack of access to vascular interventions, further focusing locations and initiatives for outreach programs.

Aim 3: Determine the racial, cultural, socioeconomic, and geographic accessibility factors associated with the <u>lowest</u> utilization of vascular interventions prior to major amputation

This aim will be achieved by performing two main sub analyses:

a. A logistical regression, multivariable analysis will be performed to determine independent risk factors for failure to perform limb salvage attempts prior to major amputation. This model will control for cofounding variables including demographics, race, ethnicity, socioeconomic status based on social vulnerability index and medical comorbidities. This analysis will identify social markers and targets for diminished access to vascular in the CLTI patient population and inform program development for early detection of CLTI.
b. An in-depth, geospatial analysis of the "hotspots" identified as the highest risk of major limb loss and lowest rate of prior limb salvage attempt to determine the socioeconomic and cultural environment that places patients at the highest risk of diminished access. We will assess the geographic patterns that link socioeconomic factors associated with low intensity PVI vs. high intensity PVI in major amputation patients
    1. Describe and map the demographic, socioeconomic, racial and comorbid characteristics of this patient geographic hotspots.
        I. This includes description of race, demographics, comorbidities, socioeconomic factors based on zip code (rurality index, mean/median income level, percent below poverty level, unemployment, mean/median education level, disability percentage, single-parent households, minority percentage, multiunit housing structures, mobile homes, group quarters, no vehicle),
    2. Calculate and map the spatial accessibility to health care resources
        I. This includes access to healthcare factors, as shown in Figure 5 (insurance status, primary care providers per 10,000 residents, hospitals per 10,000 residents, surgeons per 10,000 residents, vascular surgeons per 10,000 residents, wound care center per 10,000 residents, geospatial proximity to these health care resources, utilization of emergency department visits)
    3. Calculate the spatial accessibility to community resources that augment health education and health resource engagement
        I. This analysis includes evaluation of community resources such as large community centers, mega

Figure 5. Distance to Nearest Health Facility, Northwest South Carolina

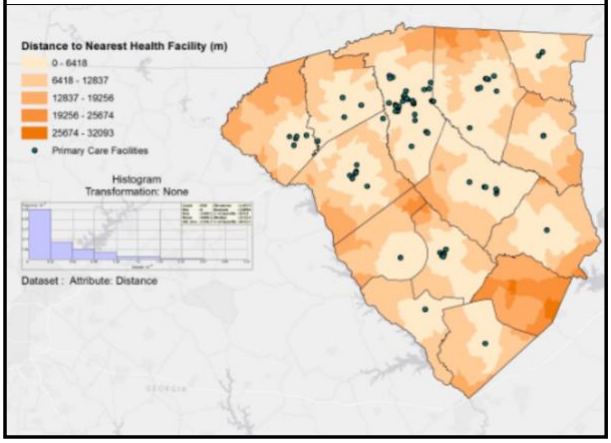
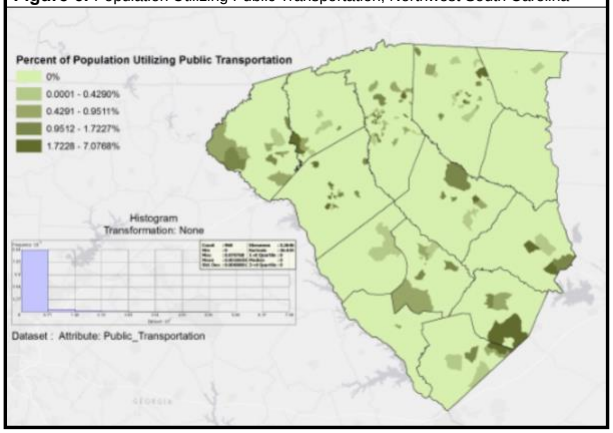


Figure 6. Population Utilizing Public Transportation, Northwest South Carolina



churches that provide health fairs and education, local colleges with community engagement, town hall attendance, access to public transportation and food insecurity index, as shown in Figure 6.

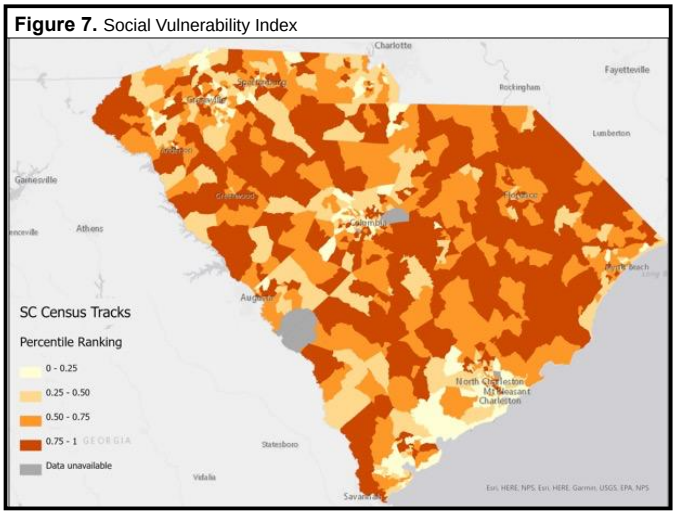
Hypothesis: Certain geographic regions and tapestries are hotspots for not only diminished vascular care but higher rates of limb loss. Specific social identities, racial and demographic features, cultural habits and geographic barriers will be associated with low PVI intensity and high limb loss. These factors then be extrapolated for outreach interventions to reduce limb loss in socially disadvantaged communities.

ENVIRONMENT

Data Sources:

This study will use the comprehensive South Carolina All Payer Claims Data base which includes all events recorded in South Carolina institutions using the UB04 required filing system. The patient cohort to be analyzed in this study will be all patients 18 years of age or older who carry the diagnosis of peripheral arterial disease in South Carolina from 2015-2020. The main outcome of interest is non-traumatic, non-malignant related major amputation. Data available in this dataset includes all inpatient hospitalizations, outpatient procedures, including outpatient labs and hospital-based outpatient procedures, and emergency room encounters. Vascular care intensity exposure variable will be defined as any ipsilateral revascularization prior to the amputation, including aortic bypass, aortic/iliac angioplasty and stenting, femoral endarterectomy, femoral/popliteal/tibial/pedal angioplasty, atherectomy or stenting, femoral/popliteal/tibial bypass. We will develop a patient phenotype using ICD-9 and ICD-10 diagnosis and procedure codes. Patient level data will be merged with zip-code level social indicator variables from the 2015-2020 Area Health Resources Files system (2016-2020); the Area Health Resources Files system is a computer-based health information system with broad analytical capabilities and will contribute population indicators of race, age, income, insurance coverage, poverty, medically underserved status, health professions density, and other important socioeconomic community variables. Relevant public health indicators and other measures will be abstracted from Department of Health and Environmental Control sources and merged onto the data set.

Figure 7. Social Vulnerability Index



Geospatial Data Sources:

Many of the socioeconomic factors will be derived from the CDC Social Vulnerability Index (SVI) of 2018, based on the 2010 U.S. Census of Population and Housing at the census tract level. The four domains of the SVI, socioeconomic status, household composition and disability, minority status and language, and housing and transportation are variables that will be used in the spatial regression model. The 2018 SVI for South Carolina is depicted in Figure 7. In order to match the geographic unit of scale of analysis, apportionment methods will convert the census tract level data to zip code. Population with no insurance or under-insured will be extracted from the American Community Survey, 5-year estimate, 2014-2018 conducted by the U.S. Census Bureau.[18] Healthcare facilities locations are available through the GIS Open Data Hub maintained by the South Carolina Department of Health and Environment Control's Bureau of Health

Facilities.[19] Zip Code level data on Food Insecurity will be obtained from the US Department of Agriculture Economic Research Service Database.

Data Collection and Storage:

The original data and the analytical data sets will be stored on the Medical University of South Carolina Comparative Effectiveness Data Analytics Resource (MUSC CEDAR) core research server behind the MUSC fire wall. Data access will be limited to study personnel only. Data security is assured by user ID control and two-factor authentication. All study personnel are trained and certified using the CITI investigator certification. Data between research institutions will be de-identified and shared through a secure cloud platform that will require double authentication.

Statistical Evaluation:

The patient population will be analyzed using means, medians, and standard deviations for continuous variables and frequencies and percent will be calculated for categorical variables. To test for differences in the proportion of patients by level of amputation chi-square statistics will be calculated. Testing for differences between groups with regard to socioeconomic and other risk factors and cost, a t-test or Wilcoxon signed-rank will be calculated as appropriate. Multivariable regression methods will be used to describe the risk factors that are potentially related to the outcome of limb loss, controlling for medical and social covariates. A competing risk model for limb loss (death as a competing event) in a stepwise fashion will be performed to test for mediating factors for difference in limb loss rates. All covariates will be test for correlation and interaction and adjusted appropriately in the model. To correct for the non-normal distribution of healthcare, gamma distributed generalized linear models using a logarithmic transformation will be used after confirming good model fit.

For geospatial analysis, the first step will be to geocode all patient data at the zip code level. Once the data is compiled, spatial statistics will be used to identify areas of higher concentration of limb amputations. Spatial statistics will determine if there are any geographic patterns to low intensity and high intensity PVI among amputation patients. In order to conduct spatial regression, independent variables need to be compiled at the zip code level and spatially joined to the amputation data. Some variables such as socioeconomic factors are only available at the census tract level, so appropriate apportionment methods will be applied for each data variable. Spatial accessibility will be calculated by computing driving time from the nearest health care facility to the centroid of each zip code. Finally, spatial regression methods will be utilized to determine the local environmental, social, economic, cultural and accessibility factors associated with decreased vascular interventions and high rates of limb loss.

Prior Research Experience and Mentorship Team:

I am an Assistant Professor of Surgery and a Board-Certified Vascular Surgeon in my fifth year of practice at the Medical University of South Carolina (MUSC). My clinical specialty includes peripheral arterial interventions for patients with chronic limb threatening ischemia (CLTI) for limb salvage. I currently serve as the Director of the Limb Preservation Program and the Medical Co-Director of the Wound Care Center at MUSC. I have a longstanding interest and formal education in clinical and outcomes and effectiveness research, with a Master's in Clinical Research from the University of Pittsburgh. I trained at the University of Pittsburgh Medical Center for residency and during my two years of dedicated research time, I performed large database analyses, fostered by a multidisciplinary clinical research interest group. I am well versed in multiple statistical programs and high-level comparative effective analysis techniques for large databases, such as NIS, the NSQIP and the VQI registry. As an attending surgeon at MUSC, I have witnessed first-hand the profound disparities in vascular care access for impoverished and African American patients. From these experiences I have developed a passion to devote my academic career to addressing these disparities through a Limb Preservation Program and through rigorous research on critical aspects of diminished access to care for our patient population.

I have developed a multidisciplinary clinical and research team who provide unique skill sets and perspectives. Kit Simpson, DrPH, who will serve as my co-mentor for this proposed project, is a Professor of HealthCare Leadership and Management in Public Health Science at MUSC, and the Director of MUSC's Comparative Effectiveness Data Analysis Resource core, whose research and mentorship would focus on the use of big data for quality improvement studies. She has extensive experience with health sciences, disparities research, large database analysis with complex regression analysis, and geospatial regression analysis.

BUDGET

The budget for this proposal includes the following:

Personnel	
Research Specialist	$6,000
Statistician	$10,000
Supplies	
South Carolina All Payer Claims Database 2018-2020 Refresh	$7,800
Tableau Software	$1,200
Total Requested	25,000

Budget Justification:

Personnel

Elizabeth Genovese, M.D., M.S., Principal Investigator (Salary Support is NOT requested). Dr. Genovese is an Assistant Professor in the Department of Surgery at the Medical University of South Carolina. She is a vascular surgeon whose clinical practice encompasses peripheral arterial, carotid, deep venous and aortic interventions. She has a Master's in Clinical Science with a specific focus on outcomes and effectiveness research utilizing large, multi-institutional databases, geospatial analysis and health disparities research. Throughout the award period, she will work closely with her mentor and research team to ensure that her scientific aims of the proposed project are met. As the Principal Investigator, Dr. Genovese will be primarily responsible for study design, conduct, analysis and preparation of scientific abstracts, presentations and manuscripts. Dr. Genovese salary support will be covered by the Department of Surgery at MUSC.

Kit N. Simpson, DrPh, Co-Mentor, (Salary support is NOT requested). Dr. Simpson is a Professor and Director of Outcomes Research in the Department of Health Care and Leadership and Management at MUSC. She has extensive experience with utilization of large databases and advanced regression analysis. She will meet with Dr. Genovese monthly to assist with database interpretation and analysis and to provide a guided study of large archival databases and advanced regression analysis. She will be available for the quarterly mentorship team meetings. Her skills and expertise in complex database analysis and mentoring junior faculty. Dr. Simpson's salary support will be covered by the Medical University of South Carolina.

Jason Hirsch, Research Specialist, (1.6 calendar months). Mr. Hirsch is an experienced and dedicated clinical research coordinator; he will assist under direct oversight by the PI. He will assist data procurement, storage and transfer under direct oversight by Dr. Genovese.

Zemin Su, Statistician, MS., (2.08 calendar months). Mr. Su is a Masters level statistician who is well versed in surgical outcomes analysis. He will be responsible for ensuring data is being captured appropriately, will also be responsible for the oversight of data integrity and minimizing the impact of missing data on analyses, assist in advanced modeling and regression analysis techniques.

Supplies

Data: (South Carolina All Payer Claims Database) Data extraction from the South Carolina Revenue and Fiscal Affairs Office for all patients 2018-2020. Prior years of data is available through the MUSC CEDAR center, as are the other databases detailed in the research plan. This database refresher is estimated at $7,800.

Software: As faculty at MUSC, access to software for data storage and analysis is provided, such as redcap, SAS, SPSS and STATA. However, we will require the purchase of a one-year license of Tableau Software for geospatial analysis. This is estimated at $1,200.

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BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Genovese, Elizabeth

eRA COMMONS USER NAME (credential, e.g., agency login): ELIZABETHGENOVESE

POSITION TITLE: Assistant Professor of Surgery

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
University of Notre Dame, Notre Dame, IN	BS	05/2006	Science Pre-Professional Studies
University of Pittsburgh, Pittsburgh, PA	MD	05/2011	Medicine
University of Pittsburgh, Pittsburgh, PA	MS	05/2011	Clinical Research
Medical University of Pittsburgh, Pittsburgh, PA		07/2018	Vascular Surgery Integrated Residency

A. Personal Statement

The main goal of my research is to conduct high quality outcomes and healthcare disparities research in the field of vascular surgery. I graduated from the University of Notre Dame Magna Cum Laude and obtained my Medical Doctorate from the University of Pittsburgh, graduating AOA and Cum Laude. During medical school, through the Clinical Scientist Training Program and as a Doris Duke Charitable Foundation Research Fellow and a TL1 Pre-doctoral Trainee, I obtained a Master's in Clinical Science with a track in outcomes and effectiveness research. Under the mentorship of Dr. Mary Amanda Dew (Professor of Epidemiology, Biostatistics, and Clinical and Translational Science at the University of Pittsburgh and Director of the Clinical Epidemiology Program) and Dr. Robert Kormos (Director of the Artificial Heart Program and Co-Director of Heart Transplantation at the University of Pittsburgh Medical Center), I performed analysis and risk modeling on patients implanted with a ventricular assist device; this resulted in 5 peer-reviewed published manuscripts (two first authored) and multiple oral presentations at annual professional society meetings, including two at the Scientific Sessions of the American Heart Association.

As an Integrated Vascular Surgery Resident at the University of Pittsburgh Medical Center I advanced my knowledge of high level comparative effectiveness methodology and cost effectiveness decision analysis, under the mentorship of Dr. Donald Baril (Assistant Professor of Surgery and Associate Program Director, Vascular Surgery Integrated Residency), and Dr. Kenneth Smith (Professor of Medicine & Clinical Translation Science) with a focus on vascular surgery outcomes research, with a specific focus on comparative effectiveness research and cost effectiveness analysis in the setting of acute limb ischemia and risk assessment of respiratory failure in vascular surgery patients. This resulted in over 10 podium presentations and 9 manuscripts.

As an Assistant Professor of Surgery at the Medical University of South Carolina (MUSC), within the first four years of my career, I have continued my research in comparative effectiveness studies in the setting of chronic limb threatening ischemia using national, prospectively collected data from the Vascular Quality Initiative. Additionally, I have submitted grants to delineate socioeconomic barriers to early vascular care and assess the use of telehealth medicine and risk predictive models in rural, underserved areas of South Carolina to identify

patients with peripheral arterial disease and provide early intervention to reduce limb loss rates. I have been appointed the Director of the Limb Preservation Program at MUSC, the Medical Co-Director of the Wound Care Center, and have been appointed to multiple, national councils for research, including the Society for Vascular Surgery's Clinical Research Committee, the SVS Vascular Quality Initiative Bypass Module Chair and the Vascular and Endovascular Surgical Society Vice-Chair of the Research Council. I continue curate a multidisciplinary team to seek career development funding to allow for my growth an independent researcher performing advanced regression analyses of large databases and geospatial analysis. I have the expertise, training and mentorship team (including those with expertise in peripheral arterial disease, large database and outcomes, health disparities research with surgical procedures and geospatial analysis), to successfully carry out the proposed research and the supportive environment at MUSC.

The following citations represent successful projects demonstrating my expertise in large database analyses and outcomes and effectiveness research:

1. Buckley, TA, Taber DJ, Veeraswamy, RV, **Genovese, EA**. The Effect of Primary Revascularization on Lower Extremity Amputation Outcomes and How Socioeconomics and Access to Care Play a Role, J Vasc Surg, Under Review.
2. **Genovese EA,** Fish L, Al-Khoury GE, Makaroun MS, Baril DT. Risk Stratification for the Development of Respiratory Adverse Events Following Vascular Surgery. J Vasc Surg. 2017 Feb;65(2):459-470. PMID: 27832989. Featured Article.
3. **Genovese EA,** Chaer RA, Taha AG, Marone LK, Avgerinos E, Makaroun MS, Baril DT. Risk Factors for Long-Term Mortality and Amputation after Open and Endovascular Treatment of Acute Limb Ischemia. Ann Vasc Surg. 2016 Jan;30:82-92. PMID:26560838.
4. **Genovese EA,** Dew MA, Teuteberg JJ, Simon MA, Kay J, Siegenthaler MP, Bhama JK, Bermudez CA, Lockard KL, Winowich S, Kormos RL. Incidence and Patterns of Adverse Event Onset During the First 60 Days After Ventricular Assist Device Implantation. Ann Thorac Surg. 2009 Oct;88(4):1162-70. PMID: 19766801.

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2018 - Present	Assistant Professor of Surgery, Division of Vascular Surgery, Medical University of South Carolina, Charleston, SC
2011 - 2018	Integrated Vascular Surgery Resident, University of Pittsburgh Medical Center, Pittsburgh, PA

Other Appointments

2021 - Present	Limb Salvage Program, Director, Medical University of South Carolina, Charleston, SC
2021 - Present	Wound Care Center, Co-Director, Medical University of South Carolina, Charleston, SC
2021 - Present	Research Council, Vice-Chair, *Vascular and Endovascular Surgical Society*
2021 - Present	INRA/SUPRA Bypass Module, Chair, Society for Vascular Surgery Vascular Quality Initiative
2020 - Present	Arterial Research Advisory Committee Chair of the Carolinas Vascular Quality Group, *Society for Vascular Surgery, Vascular Quality Initiative*
2020 - Present	Vascular Surgery Working Group, Director, Medical University of South Carolina, Charleston, SC
2019 - Present	Clinical Research Center Development Council, Medical University of South Carolina, Charleston, SC
2019- Present	Vascular Surgery Journal Club, Director, Medical University of South Carolina, Charleston, SC
2019 - Present	Social Media Director, Division of Vascular Surgery, Medical University of South Carolina, Charleston, SC
2018 - Present	Clinical Competency Council, General Surgery Residency for PGY 1, Medical University of South Carolina, Charleston, SC

2018 - Present	Clinical Competency Council, Vascular Surgery Integrated Residency, Medical University of South Carolina, Charleston, SC
2017 - 2018	Administrative Chief Resident, University of Pittsburgh Medical Center, Pittsburgh, PA
2015 - 2018	Post-Operative VTE Prevention Committee, University of Pittsburgh Medical Center, Pittsburgh, PA
2014 - 2018	Trainee Patient Safety Leadership Committee, University of Pittsburgh Medical Center, Pittsburgh, PA
2010 - 2011	President of the Medical Student Section Governing Council, *Society for Vascular Surgery*

Honors

2014	Resident Research Competition Winner, Eastern Vascular Society, Boston, MA
2011	Eli Goldstein Award, Highest Academic Honors in the First Three Years of Medical School, University of Pittsburgh Medical School, Pittsburgh, PA
2011	Alpha Omega Alpha, University of Pittsburgh Medical School, Pittsburgh, PA

Licensures and Certifications

2019 - Present	Vascular Surgery Certificate, American Board of Surgery (Certificate #:103249)
2018 - Present	Permanent Medical License (Medicine and Surgery): South Carolina (MD52173)
2017 - Present	Registered Physician in Vascular Interpretation

C. Contributions to Science

1. As an Assistant Professor of Surgery in the first four years of my career, my research focus has shifted to healthcare disparities in the vascular surgery patient population, utilizing large, archival databases. I have a specific focus on vascular health care disparities regarding chronic limb threatening ischemia as this is my area of clinical practice, and I have personally witnessed the devastating impacts of the lack of vascular care access on my patients. I am currently working on linking the Society of Vascular Surgery's Vascular Quality Initiative registry with the Distressed Community Index to further elucidate the seriocomic and racial factors that could be contributing to diminished vascular interventions and extraordinarily high rates of limb loss in at risk patient populations.
    a. Buckley, TA, Taber DJ, Veeraswamy, RV, **Genovese, EA**. The Effect of Primary Revascularization on Lower Extremity Amputation Outcomes and How Socioeconomics and Access to Care Play a Role, J Vasc Surg, Under Review.

2. During my integrated vascular surgery residency, my focus was on utilizing a variety of large databases to determine outcomes associated with vascular surgery interventions. In addition to determining outcomes after lower extremity interventions, I utilized the Vascular Quality Initiative database to determine risk factors for respiratory failure after vascular interventions. This is a highly undervalued postoperative adverse event and I was able to demonstrate the drastic impact respiratory failure has on overall outcomes and developed a predictive model and highly accurate score for the development of major respiratory adverse events for vascular surgery patients.

    a. **Genovese EA,** Fish L, Al-Khoury GE, Makaroun MS, Baril DT. Risk Stratification for the Development of Respiratory Adverse Events Following Vascular Surgery. J Vasc Surg. 2017 Feb;65(2):459-470. PMID: 27832989. Featured Article.
    b. David RA, Brooke BS, Hanson KT, Goodney PP, **Genovese EA**, Baril BT, Gloviczki P, DeMartino RR. Early extubation is associated with reduced length of stay and improved outcomes after elective aortic surgery in the Vascular Quality Initiative. J Vasc Surg. 2017 Jul;66(1):79-94. PMID: 28366307.

c. **Genovese EA,** Chaer RA, Taha AG, Marone LK, Avgerinos E, Makaroun MS, Baril DT. Risk Factors for Long-Term Mortality and Amputation after Open and Endovascular Treatment of Acute Limb Ischemia. Ann Vasc Surg. 2016 Jan;30:82-92. PMID:26560838.
d. Liang, NL, **Genovese EA,** Avgerinos ED, Singh MJ, Makaroun MS, Chaer RA. Impact of Inferior Vena Cava Filter Placement on Short-Term Outcomes in Patients with Acute Pulmonary Embolism. Ann Vasc Surg. 2017 Mar 21; 42:71-77. PMID: 28341513a.

3. While obtaining a Master's in Clinical Science, the research for my thesis defense focused on outcomes of heart failure patients with implantable ventricular assist devices as a bridge to cardiac transplantation or destination therapy. I described the largest, single center, prospectively collected data on adverse events after ventricular assist device placement, which provided benchmark data for future technology. I was also able to delineated which post-operative adverse events, and their temporal relationship to each other, impacted mortality at one year.

    a. **Genovese EA,** Dew MA, Teuteberg JJ, Simon MA, Kay J, Siegenthaler MP, Bhama JK, Bermudez CA, Lockard KL, Winowich S, Kormos RL. Incidence and Patterns of Adverse Event Onset During the First 60 Days After Ventricular Assist Device Implantation. Ann Thorac Surg. 2009 Oct;88(4):1162-70. PMID: 19766801.
    b. **Genovese EA,** Dew MA, Teuteberg JJ, Simon MA, Bhama JK, Bermudez CA, Lockard KL, Winowich S, Kormos RL. Early Adverse Events as Predictors of One-Year Mortality During Mechanical Circulatory Support. J Heart Lung Transplant2010 Sep;29(9):981-8. PMID: 20580265.
    c. Zahr F, **Genovese EA,** Mathier M, Shullo M, Lockard K, Zomack R, McNamara D, Toyoda Y, Kormos RL, Teuteberg JJ. Obese Patients and Mechanical Circulatory Support: Weight Loss, Adverse Events, and Outcomes. Ann Thorac Surg 2011 Oct; 92(4):1420-6. PMID:21958791.
    d. Bonde P, Ku NC, **Genovese EA,** Bermudez CA, Bhama JK, Ciarleglio MM, Cong X, Teuteberg JJ, Kormos RL. Model for End Stage Liver Disease Score Predicts Adverse Events Related to Ventricular Assist Device Therapy. Ann Thorac Surg 2012 May; 93(5): 1541-7. PMID: 22480391.

Complete List of Published Work in MyBibliography:
https://www.ncbi.nlm.nih.gov/myncbi/elizabeth.genovese.1/bibliography/public/

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: : Kit N. Simpson

eRA COMMONS USER NAME (credential, e.g., agency login): SIMPSONK

POSITION TITLE: Professor, Healthcare Leadership & Management and Public Health Sciences, Medical University of South Carolina

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Hospitalslaborantskolen, Copenhagen, Denmark	Diploma	02/1968	Medical Technology
UNC School of Public Health, Chapel Hill, NC	MPH	05/1983	Health Administration
UNC School of Public Health, Chapel Hill, NC	DrPH	05/1988	Health Services Research
Johns Hopkins University, Baltimore, MD	Fellow	08/1992	Economics/Outcomes Research

A. Personal Statement

I am a health services researcher with more than 25 years of experience in clinical trials and quasi-experimental studies aimed at the evaluation of efficacy, effectiveness, cost and quality of life outcomes associated with interventions and programs that affect population health and cost of care. My current research focus is on 1) using “Big Data” and pragmatic trial designs, such as stepped-wedge approaches, for evaluating outcomes and economic impacts of health care interventions and 2) working on “team science-based” multi-site clinical trials that require a mix of methods, such as decision analysis modeling, archival data analysis, diffusion of innovation measures, and economic and quality of life data collection “piggy-backed” onto multi-site studies. My experience includes a broad portfolio of research that requires some mix of methods, such as decision analysis modeling, archival data analysis, and economic and quality of life data collection “piggy-backed” on clinical studies. I have lead cost and/or HRQOL studies focused on surgical interventions, HIV-disease, acute ischemic stroke, juvenile idiopathic arthritis, treatment-resistant depression, hepatitis C virus infection (HCV), and age-related hearing loss. Most of these studies have required me to use a combination of archival data and prospectively collected data to examine access to care, cost of care, and economic impacts of different treatment approaches. In addition, I have extensive experience in the analysis of archival billing data from SC All-payer data, Medicare and Medicaid to identify differences in costs and outcomes for patients with complex chronic conditions. I am the Director of the MUSC CEDAR (Comparative Effectiveness Data Analytics Resource) core which is the custodian of the MUSC collection of 9 terra bytes of “Big Data” administrative data sets and I provide consultation and analytical support for faculty and students on use of these data for practice improvement and program evaluation. I will take the lead in assuring access to the SC data, assure accurate programming for timely results, and will collaborate in manuscript preparation based on the results of the study and with other study investigators in developing new research protocols derived from the study findings. This study is ***novel*** and timely in that it is using archival data to assess the socioeconomic risk factors leading to diminished access and utilization of health care resources in the setting of critical limb ischemia. This is the first step in understanding how best to target efforts at early detection and prevention of key factors leading to major limb loss in disenfranchised patient populations in South Carolina. From a mentoring standpoint, I am the recipient of the 2018 MUSC Advancement of Women Award, which is given to one faculty member who best demonstrates excellence in his/her commitment to the advancement of women faculty at MUSC. My many pre- and post-doc mentees (both males and females) who are now faculty

at research universities nominated me for this honor. I am totally committed to mentoring junior faculty and fellows. Below are examples from more than 40 papers published with mentees.

Previous Grants Relevant to these objects includes:

University Research Core Simpson (PI) 11/01/2015 – 10/30/2020
MUSC Provost for Research
Comparative Effectiveness Data Analytics Research Resource
The goal is to develop and direct a new university research core that will be the custodian of "Big Data" administrative data sets and provide consultation and analytical support for faculty and students to use these data for research.
Role: Principal Investigator

I have listed papers below that show examples of my published work relevant to this study.

1. Seamon BA, **Simpson KN**. The effect of frailty on discharge location for Medicare beneficiaries after acute stroke. *Archives of Physical Medicine and Rehabilitation* 2019 Jul;100(7):1317-1323. doi: 10.1016/j.apmr.2019.02.006. Epub 2019 Mar.
2. **Simpson KN**, Seamon BA, Hand BN, Roldan CO, Taber DJ, Moran WP, Simpson AN. Effect of frailty on resource use and cost for Medicare patients. *J Comp Eff Res* 2018 doi:10.2217/cer-2018-0029. PNID: 30922879
3. **Simpson KN**, Simpson AN, Maulden P, Palesch Y, et al. Observed Cost and Variations in Short Term Cost-effectiveness of Therapy for Ischemic Stroke in IMS III. *JAHA* J Am Heart Assoc. 2017 May 8;6(5). pii: e004513. doi: 10.1161/JAHA.116.004513.
4. Davis M, O'Connell T, Johnson S, Cline S, **Simpson KN**. Estimating Alzheimer's Disease Progression Rates from Normal Cognition Through Mild Cognitive Impairment and Stages of Dementia. *Curr Alzheimer Res* 2018 doi: 10.2174/1567205015666180119092427.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2006 - Present	Professor, Departments of Healthcare Leadership and Management, College of Health Professions, and Public Health Sciences, College of Medicine, and Director of the MUSC Comparative Effectiveness Data Analytics Research Core, Medical University of South Carolina, Charleston, S.C.
2005 – 2006	Chair and Professor, Department of Health Administration and Policy, College of Health Professions, MUSC, Charleston, S.C.
1998 – 2005	Professor (tenured) and Vice Chair for Research, Department of Pharmacy and Clinical Sciences, College of Pharmacy; and Professor, Health Administration & Policy, Biometry & Epidemiology, Hollings Cancer Center, and the Center for Health Care Research, Medical University of South Carolina (MUSC), Charleston SC.
1997 – 1998	Director, Clinical Economics Research, Chiron Corporation, Emeryville CA.
1996 – 1997	Associate Professor of Pharmaco-economics, School of Business and Economics, University of Odense, Denmark.
1985 – 1998	Associate Professor (tenured), Health Policy & Admin. UNC School of Public Health, Chapel Hill, NC. (on leave 96-98)

Honors

2018-1019	NCI Prevention and Control special review panels
2011-2013	NCI Prevention and Control special review panels
2007-2011	Member, MUSC Institutional Review Board
2007	Member of the Editorial Board for Clinical Medicine & Research
2006-2016	NIAID, National Institute of Health. Member, Special Emphasis Review Panels: AIDS Clinical Research Network

2006-2008 NCI Prevention and Control special review panels

1999-2000 Member, Planning Consortium for the Tri-national Trial of Options in Management with Antiretrovirals (OPTIMA)

1998 Expert Panel. Traumatic Brain Injury Rehabilitation, NIH Consensus Conference

1996-2000 AIDS Economics Research Collaboration, London, United Kingdom

1996-1997 MPH Degree Development Commission, Member. Universities of Copenhagen, Aarhus and Odense, Denmark

1995-1998 Information Systems Development and Research Committee, Kobler Center, Chelsea and Westminster Hospital, London England. 1995-98.

Reviewer for the following journals:

JAMA; Stroke; AIDS; JAIDS; AIDS Care; AIDS Research and Therapy; Antiretroviral Therapy; Health Economics; PharmacEconomics; Medical Economics; Value in Health; Disease Management & Health Outcomes; Medical Care; CRMO; American J. of Public Health; Hospital & Health Services Administration; J. of Health Services Research; J of Preventive Medicine; J. of Urology; National Journal of Medicine; J of Rheumatology, Plos One, Nature, JACOG.

C. Contributions to Science

1. **Using "Big Data" in Health Services Research:** My training in health services research was focused on evaluation of programs to improve access to care efficient use of public resources. My dissertation was an evaluation of the effect of funding of three public programs (WIC, prenatal care and food stamps) on rates of low birthweight births in NC over 5 years. This required the combination of data from a number of archival data sources and the application of sophisticated multivariable modeling techniques to control for selection bias and temporal policy changes. In 1988 this type of research was not common, and the skills that I gained lead to a number of opportunities to work with large data bases. Over the years I have gained extensive experience in the use of archival data to answer important questions related to population access, outcomes, and factors driving cost of care, and helped move the field towards increasing understanding of where these types of analyses can contribute, and most importantly, the requirement for stringent approaches to control for selection bias and ascertainment bias in such studies. Example publications are:
   a. **Simpson KN**, Seamon BA, Hand BN, Roldan CO, Taber DJ, Moran WP, Simpson AN. Effect of frailty on resource use and cost for Medicare patients. *J Comp Eff Res.* 2018 doi: 10.2217/cer-2018-0029.PMID: 29808714
   b. Andrews AL, Brinton D, **Simpson KN**, Simpson AN. A longitudinal examination of the asthma medication ratio in children. Am J Manag Care. 2018 (6):294-300. PMID: 29939504
   c. Simpson AN, **Simpson KN**, Dubno JR. Healthcare Costs for Insured Older U.S. Adults with Hearing Loss. J Am Geriatr Soc. 2018 Aug;66(8):1546-1552. PMID: 29797584
   d. Hand BN, Krause JS, **Simpson KN**. Dose and Duration of Opioid Use in Propensity Score-Matched, Privately Insured Opioid Users With and Without Spinal Cord Injury. Arch Phys Med Rehabil. 2018 99(5):855-861. PMID: 29307814

2. **Cost-effectiveness Modeling:** During my Robert Wood Johnson Finance Fellowship at Johns Hopkins University in 1990, I focused on methods for evaluating cost effectiveness of interventions. I vas focused on developing methods for cost effectiveness and cost utility analysis under the mentorship of Bryan Luce, PhD, and had the opportunity to coauthor some of the early papers on methods for cost effectiveness analysis, as well as examining specific interventions of interest to policy makers and payers. Example publications are:

   a. Luce, BR, **Simpson KN**. Methods of Cost Effectiveness Research: Areas of Consensus and Debate. *Clinical Therapeutics* 1995 17:1 109-125.
   b. **Simpson KN**. Modeling with clinical trial data: Getting from the data researchers have to the data decision makers need. *Drug Information J.* 1995 29:4 1431-1440.

c. **Simpson KN**. Design and assessment of cost effectiveness studies in AIDS populations. *JAIDS* 1995 Vol 10 Supp.4 S28-S32. **Simpson KN**. Economic Modeling of HIV Treatments. *Current Opinion in HIV and AIDS* 2010 5(3):242-8.

3. **Economics of HIV-disease:** A major issue of access to care and cost effectiveness at the time (1990) that I was developing my expertise in economic modeling was related to the use of antiretroviral therapy in patients with HIV-disease. By chance I had to cover a consulting request from Roche Pharmaceutical in Switzerland for a colleague who became ill. The task was to design a cost effectiveness study for assessing the cost effectiveness of using two antiretroviral drugs instead of current practice, which was to use only one drug. This request lead to 25 years increasingly sophisticated economic modeling of intervention for HIV-disease and more than 30 publications in this field. It is hard to select the most important of these, but the four below show my progression as an expert in this area:
   a. **Simpson KN**, F. Andersson, A. Shakespeare, I. Oleksy, and E.J. Hatziandreu. Cost Effectiveness of Antiviral Treatment with Zalcitabine in Combination with Zidovudine for AIDS Patients with CD4 counts 300 per mm^3 in Five European Countries*. PharmacoEconomics* 1994, (6)6; 553-562.
   b. **Simpson KN**. Design and assessment of cost effectiveness studies in AIDS populations. *JAIDS* 1995 Vol 10 Supp.4 S28-S32.
   c. **Simpson KN**, Baran R, Kirbach SE, Dietz B. Economics of Switching to Second-Line Antiretroviral Therapy with Lopinavir/ritonavir (LPV/r) in Africa: Estimates Based on DART Trial Results and Costs for Uganda and Kenya. *Value Health* 2011 14(8):1048-54.
   d. **Simpson KN**, Chen SY, Wu A, Boulanger L, Chambers R, Nedrow K, Tawadrous M, Pashos C, Haider S. Cost of adverse events among patients with HIV infection treated with non-nuceleoside reverse transcriptase inhibitors. *HIV Med.* 2014 Mar 18. doi: 10.1111/hiv.12145. PMID: 24641448.

4. **Design of Economic Studies to "Piggy-back" Clinical Trials:** To be of value, it is essential that economic studies done within clinical trials are designed correctly and are minimally burdensome to clinical sites and participants. The expertise that I developed in the on economic analysis for clinical trials has lead me to many collaborative efforts with investigators in other areas. Most recently I have been applying these methods, combined with my skills in archival data analysis to examination of outcomes and cost for treatments for depression, stroke and other conditions. These conditions are, like HIV- disease, complex, costly and economic studies in these areas are vulnerable to effects of selection bias and to inadequate control of comorbid conditions. I an increasingly focusing my research on these conditions. Example papers are:

   a. **Simpson KN**, Welch MJ, Kozel FA, Demitrack MA, Nahas Z. Cost-effectiveness of transcranial magnetic stimulation in the treatment of major depression: a health Economics analysis. *Adv Ther* 2009 26(3): 346-68.
   b. **Simpson KN**, Marlow N, Shaw J, Rudakova AV. Фармакоэкономические аспекты терапии ингибиторами фактора некроза опухоли хронического увеита, рефрактерногок базисной терапии (в том числеассоциированного с ювенильным идиопатическим артритом) [Pharmacoeconomic issues of adalimumab therapy in juvenile idiopathic arthritis in Russia] *Pharmacoeconomics in Pediatrics* 2012 8(4):55-58.
   c. **Simpson KN**, Tilley BC. Economic Analysis of Secondary Trial Data**.** *Progress in Cardiovascular Diseases*, 2012, 54(12):351-356.
   d. **Simpson KN**, Simpson AC, Mauldin PD, Hill MD, Yeatts SD, Spilker JA, Foster LD, Khatri P, Martin RL, Jauch EC, Kleindorfer D, Palesch YY, Broderick JP, for the IMS III Investigators. Drivers of Costs Associated with Reperfusion Therapy in Acute Stroke: The IMS III Trial. *Stroke* 2014 45(6):1791–1798 DOI: 10.1161/STROKEAHA.113.003874.

5. **Comparative Effectiveness Research:** My currently funded research is multifaceted but incorporates my interests in assessing outcomes and cost from treatment changes or changes in the care process. Current work includes:1) Examining population health effects and economic impacts of tele-health; 2) use of EHR systems to screen patients in primary care settings; 3) economic impacts of medication-assisted treatment (MAT) induction for opioid use disorder (OUD) in emergency departments (EDs); 4) measuring the effects of implementation science trial protocols on retention in care for HIV-infected youth; 5) measuring improvements in outcomes for sepsis and respiratory failure patients from guideline-specified care in intensive care units (ICU). Much of this work is under review, example

publications are:

a. Goodwin AJ, **Simpson KN**, Ford DW. Volume–Mortality Relationships during Hospitalization with Severe Sepsis Exist Only at Low Case Volumes. *Annals of the American Thoracic Society*, Vol. 12, No. 8 (2015), pp. 1177-1184. doi: 10.1513/AnnalsATS.201406-287OC
b. Basco Jr WT, Ebeling M, Garner SS, Hulsey TC, **Simpson K.** Opioid Prescribing and Potential Overdose Errors Among Children 0 to 36 Months Old. *Clinical Pediatrics*. 2015 Jul;54(8):738-44.
c. Simpson AN, **Simpson KN**, Dubno RJ. Higher health care costs in middle-aged US adults with hearing loss. *JAMA Otolaryngol Head Neck Surg,* 2016 doi:10.1001/jamaoto.2016.0188. PMID: 27054903.
d. Andrews AL, Bundy DG, **Simpson KN**, Teufel RJ, Harvey J, Simpson AN. Inhaled Corticosteroid Claims and Outpatient Visits After Hospitalization for Asthma Among Commercially Insured Children. *Academic Pediatrics,* 2017 17(2):212-217.

Complete List of Published Work in MyBibliography:

http://www.ncbi.nlm.nih.gov/sites/myncbi/kit.simpson.1/bibliography/48196945/public/?sort=date&direction=ascending

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June 2, 2022

To: Eastern Vascular Society Research Committee
Re: Recommendation of Elizabeth Genovese, MD, MS for EVS Research Seed Grant

Dear Committee Members,

This letter is to enthusiastically endorse Dr. Elizabeth Genovese's application to the Eastern Vascular Society's 2022 Research Seed Grant, entitled *Identification of Social Determinates Leading to the Diminished Utilization of Vascular Care in the Setting of Chronic Limb Threatening Ischemia Resulting in Limb Loss.* As a Professor in the Departments of Healthcare Leadership and Management and Public Health Sciences at the Medical University of South Carolina, I am dedicated to examining factors affecting access to healthcare and in assessing health outcomes. I have over 25 years of Health Services Research experience, chaired more than 20 doctoral dissertations and have mentored over 15 junior faculty and clinical fellows, most of whom have pursued academic research careers. Moreover, I serve as the director of Comparative Effectiveness Data Analytics Resource Core, have extensive experience in using our state's unique archival data resources to improve the health of disenfranchised individuals in the state. I am committed to providing leadership in the design and data collection as well as expert analytic support to identify at-risk patients for amputation.

I have mentored many dedicated young clinical researchers and under my mentorship they have completed successful research projects and continued on to obtain extramural funding. I have also served as co-author on several publications regarding surgical interventions and risk assessment. Given the nationwide problem of limb loss, my knowledge of archival data studies fits well with the need for increased research in this field, especially as it pertains to prevention of disabilities, an area where this project is of relevance. I have worked with Dr. Genovese for the two years on an unprecedented collaboration between Medtronic and MUSC to develop complex algorithms to screen patient electronic medical records to identify patients at high risk of peripheral arterial disease. I have found her to be an invaluable member of this team, providing keen clinical and statistical insight to this project. As Dr. Genovese's co-mentor, I have assisted her in developing her research proposal and will establish regular meetings with Dr. Genovese, along with her research team, to ensure successful and timely completion of the project.

I am extremely enthusiastic about this project and believe that it will contribute to both clinically and methodologically to scientific advancement of vascular surgery. I will use my expertise and experience to provide input to the project, including serving as a senior expert on issues related to the construction and analysis of these archival data. I will continue to help her set specific and measurable research and career development goals to guide her towards increasing levels of independence and leadership. I have no doubt that this Research Seed Grant will be the initial funding that Dr. Genovese requires to launch her career to the next level and develop into an independent, federally funded investigator.

Kit N Simpson, DrPH
Professor and Director
MUSC Comparative Effectiveness Data Analytics Resource (CEDAR) Core