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PROGRAM EVALUATION OF A COMMUNITY-BASED MODEL FOR DRIVER OFF-ROAD ASSESSMENT IN POST-ACUTE ABI

Presented in Partial Fulfillment of the

Requirements for the Degree of Doctor of Occupational Therapy

Eastern Kentucky University

College of Health Sciences

Department of Occupational Science and Occupational Therapy

Eugenia R. Herbst, OTR/L

2023

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Executive Summary

Background: Social conditions from the pandemic forced changes to outpatient rehabilitation programs, necessitating pre-driving assessment be administered via telehealth, an alternative model of OT service-delivery. As a result, Shepherd Pathways adapted the clinical pre-driving program for telehealth service delivery. Program outcomes had not been formally assessed.

Purpose:
The purpose of this Capstone project was to conduct a formal program evaluation to collect, analyze, and use data to evaluate effectiveness and efficiency of a clinical return to drive program delivered via telehealth (CDC, n.d.; The university of Kansas toolbox, n.d.). The program evaluation examined the OT process and scope of services for driver off-road assessment at Shepherd Pathways, in Atlanta, Georgia, and addressed the following objectives.

1. Does Shepherd Pathways clinical pre-driving program meet the needs of acquired brain injury (ABI) clients in a traditional, hybrid, or telehealth model?
2. What are the current practices (assessments and interventions) used within an OT led clinical pre-driving program delivered via telehealth?
3. Does an OT clinical pre-driving program delivered via telehealth result in an on-road driving evaluation (ORDE) outcome of unrestricted driving for ABI clients?

Theoretical Framework. A pragmatic research approach (Creswell & Creswell, 2018) and Canadian model of occupational performance-engagement (CMOP-E) and the Ecology of Human Performance (EHP) (Dunn, 1984) influenced the approach.

Methods. Program evaluation identified outcomes of a telehealth approach for return to driving. A logic model was used to identify main components of the program and showed relationships among the telehealth pre-driving program goals, objectives, activities, and outcome measurements (Adu, 2017).

Results. Research questions were answered-the needs of individuals with ABI were met in the program. OT telehealth clinical standards of practice for the pre-driving program were identified and successful ORDE outcomes indicated a positive relationship between use of telehealth and return to drive after ABI.

Conclusions: A logic model illustrated the processes developed for OT driver-off road assessment during the COVID-19 pandemic from March 2020 - December 2020 at Shepherd Pathways. Results indicated a high percentage of program effectiveness, ORDE referrals, and ORDE passing rates for participants with ABI.

Acknowledgements

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EASTERN KENTUCKY UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF OCCUPATIONAL SCIENCE AND OCCUPATIONAL THERAPY

CERTIFICATION OF AUTHORSHIP

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Title of Submission: Program evaluation of a community-based model for driver off-road assessment in post-acute ABI

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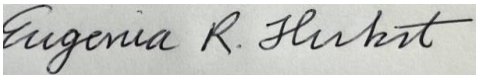
Student's Signature: 

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Section 1-Nature of Project and Problem Identification

Individuals achieve health, well-being, and participation in life through engagement in occupations. Occupations, or everyday activities people do to occupy time and bring meaning and purpose to life, are viewed as human needs essential for survival (AOTA, 2020; Wilcox, 1993). Occupations are categorized as activities of daily living, instrumental activities of daily living (IADL), health management, rest and sleep, education, work, play, leisure, and social participation. Driving and community mobility is an IADL providing access for people to engage in everyday life activities and promotes social participation, whether driving, walking, bicycling, or using transportation systems (AOTA, 2020). When individuals choose to engage in the IADL of driving, it becomes meaningful, offering psychological rewards. Consideration of why one wants or needs to drive gives meaning and value. The importance of driving is represented as parents drive children to school, employees drive to and from jobs, friends and family's road trip for vacation, or farmers operate equipment during harvest. In adolescence, learning to drive and legally obtaining a driver's license leads to a sense of independence (American academy of child and adolescent psychiatry, 2017). Older adults in rural communities often rely on driving as the primary means to access medical care, pharmacies, and grocery stores. The daily activity of driving is often taken for granted until something prevents a person's ability to do so. Recent evidence shows a relationship between what individuals do in their environment, (the occupation of driving), and a perceived sense of self (identity). When problems interfere with an individual's ability to drive, feelings of loss of one's identity, loss of control and loss of choices have been reported (Bertrand et. al., 2020; Erler et. al, 2018; Marfeo et. al, 2021). Schultheis & Whipple (2014) noted driving is a complex task, requiring synthesis of physical, cognitive, perceptual, and emotional skills. Individuals sustaining neurological injury, such as an acquired brain injury

(ABI), a non-hereditary injury occurring after birth (Brain Injury Association of America, 2022) may have impairments impacting safe driving (Classen et al., 2009; Liddle et al., 2014). Subsequently, individuals who experience driving disruption or driving cessation frequently state goals and desires for return to driving during rehabilitation (Novack et al., 2021; Shultheis & Whipple, 2014). Occupational Therapy (OT) may administer driver off-road assessments (DORA) in the clinic to determine readiness for on-road driving evaluation (ORDE) and safe return to driving (Dickerson et al., 2011; Dickerson, 2013; Unsworth, et al., 2012; Unsworth et al., 2019).

Occupational therapists at Shepherd Pathways, a post-acute rehabilitation program, served adolescents and adults with ABI, and received referrals for pre-driving assessments. OT providers at Shepherd Pathways may be generalists or specialists recognized as certified driving rehabilitation specialists (CDRS). CDRS is a professional credential offered by the Association of Driver Rehabilitation Specialists (ADED) to represent specialized, advanced expertise and experience in driving rehabilitation (Association for Driver Rehabilitation Specialists, 2016).

In early March 2020, the World Health Organization (WHO) declared the coronavirus disease 2019 (COVID-19) a pandemic (Durchame, 2020), and local and state governments issued regulations to safeguard against the spread of coronavirus disease of 2019 (COVID-19). These regulations resulted in temporary closure of outpatient therapy clinics. People had to choose between the risk of being exposed to COVID-19, stopping therapy, or moving to a virtual platform. These social conditions from the pandemic forced changes to outpatient rehabilitation programs, necessitating pre-driving assessment be administered via telehealth, an alternative model of OT service-delivery (Hung & Fong, 2019). As a result, Shepherd Pathways adapted the clinical pre-driving program for telehealth service delivery.

Problem statement

There was consensus in the literature that driving is one of the most dangerous and complex IADLs performed on a regular basis (Fleming et al., 2014; Ross et al., 2015; Schultheis & Whipple 2014; Tamietto, et al., 2006). There was also recognition that individuals sustaining neurological injuries may have impairments impacting safe driving (Classen et al., 2009; Palubiski & Crizzle, 2016; Unsworth et al., 2019). Much of the research on return to driving sought to identify predictive measures for on-road driving performance, however, research concluded there is no single assessment measure used as a predictor for on-road driving evaluation performance (Classen et.al, 2009; Dickerson, 2013; Gibbons et al., 2017; Holowaychuk, et al., 2020; Palubiski & Crizzle, 2016). In the absence of a single assessment measure, clinicians used a variety of tools that may or may not be effective predictors. However, findings showed using multiple assessments to address cognitive, motor, and sensory skills may help OTs determine fitness to drive (Gibbons, et. al, 2017; Shultheis & Whipple, 2014). One battery, the Occupational Therapy-Driver Off Road Assessment (OT-DORA) found scores of three cognitive sub-tests and one physical sub-test predicted positive driving outcomes for adults' post-stroke (Unsworth et al., 2019). The Mini Mental State Examination (MSSE), Road Law Road Craft Test (RLRCT), OT Drive Home Maze Test (OT-DHMT), and the Right Heel Pivot Test (RHPT) had good predictive validity and could be used for pre-driving assessment.

A prior needs assessment conducted at Shepherd Pathways in August 2021 indicated a study to determine the effectiveness of a clinical pre-driving program was warranted. Strengths noted in the needs assessment indicated the program achieved some desired outcomes for in-clinic programming. However, a recently developed telehealth model, or service delivery through information and or communication technology (AOTA, 2018), had not been evaluated.

Although telehealth had been studied in some populations and settings and was shown to be effective (Dahl-Popolizio, et. al., 2020; Shenoy & Shenoy, 2018), there was a lack of evidence to support a telehealth approach to return to driving. An opportunity of performance improvement through formal program evaluation existed to identify outcomes of a telehealth approach for return to driving.

Purpose

Therefore, the purpose of this Capstone project was to conduct a formal program evaluation to collect, analyze, and use data to evaluate effectiveness and efficiency of a clinical return to drive program delivered via telehealth (CDC, n.d.; The university of Kansas toolbox, n.d.). The program evaluation examined the OT process and scope of services for DORA in the Shepherd Pathways, a community-based program. Specifically, examination of outcomes of participants served in the pre-driving program via telehealth was compared with outcomes of the ORDE. This study described current 1) DORA standards of practice at Shepherd Pathways 2) The Shepherd Pathways OT telehealth pre-driving toolkit assessments and interventions and 3) outcomes of individuals recommended for ORDE after completion of the pre-driving program. Through retrospective document review, a logic model (CDC, n.d.) illustrated the driver-off road assessment process delivered via telehealth in ABI during the COVID-19 pandemic March - December 2020 at Shepherd Pathways in Decatur, Georgia (Shepherd Pathways, n.d.-a).

Project Objectives

Using a formal program evaluation, this Capstone project will address the following objectives.

1. Does Shepherd Pathways clinical pre-driving program meet the needs of ABI clients in a traditional, hybrid, or telehealth model?

2. What are the current practices (assessments and interventions) used within an OT led clinical pre-driving program delivered via telehealth?

3. Does an OT clinical pre-driving program delivered via telehealth result in an ORDE outcome of unrestricted driving for ABI clients?

Theoretical Framework

The Capstone study was shaped by a pragmatic approach or worldview. Creswell & Creswell (2018) described a pragmatic research philosophy and indicated there is no single way of learning, rather the researcher had a choice of methods and techniques to meet the needs of a study. The program evaluation was supported using mixed methods or multiple approaches used to collect and analyze data (CDC, n.d.) A choice to explore the clinical outcome of driving and community mobility was influenced by personal levels of theory, including the Canadian Model of Occupational Performance-Engagement (CMOP-E) and Ecology of Human Performance (EHP) (Dunn, 1994). These influenced a practitioner's choice of assessment measures, while considering person, task, context, environment, well-being, and quality of life.

Significance of the study

This study was significant in that a systematic assessment of the program and outcomes may contribute to policy changes and improvements in program direction and growth. Results served as a method of continuous process improvement to meet the needs of the clients and customers served. An ever-changing healthcare environment requires programmatic processes and staff competency be reassessed or revised. The study may assist therapy programs to inform and develop practice standards and may serve as a model for other healthcare practitioners.

Results may support payment and reimbursement for telehealth services delivered by OT practitioners outside of a public health emergency.

Summary

This capstone project focused on formal program evaluation of a post-acute program serving adolescents and adults with ABI referred to OT generalist practitioners for DORA. The purpose of the project was to describe the Shepherd Pathways OT pre-driving telehealth practices for assessment and intervention and identify program outcomes from March 2020-December 2020. Outcomes, including referral to a certified driving rehabilitation specialist for ORDE results and recommendations were collected and analyzed. Results may be communicated with stakeholders and utilized for continuous process improvement in the program.

Section 2-Detailed Review of the Literature

A literature search conducted using search engines PubMed/Medline, CINAHL, and Google Scholar provided articles resulting from keywords driving rehabilitation, brain injury, stroke, driving assessment, telehealth, and program evaluation.

Driving and community mobility involves planning and moving around in the community, using public or private transportation, such as driving, walking, bicycling, or accessing and riding in buses, taxi cabs, or other transportation systems (AOTA, 2020). Driving is one of the most complex and dangerous IADLs performed on a regular basis and has significant impact on safety and public health (Tamietto, et al., 2006). Constant coordinated demand of visual, cognitive, and motor skills is needed for safe vehicle operation in ever-changing environments (Schultheis & Whipple, 2014).

Recognizing the complexity of driving skills led to the development of a conceptual framework, Michon's model of driving behavior. Michon's model evolved from the study of human behavior and traffic and continues to be commonly referenced in the literature (Dimech-Betancourt, B., 2021; Fleming, et al., 2014; Ross et al, 2018; Unsworth et al., 2012; Unsworth & Baker, 2104). The conceptual framework acknowledges one's ability to safely manage strategic, operational, and tactical driving skills. Strategic skills are used for planning and decision-making before, during and after driving. Operational skills are utilized for vehicle operation, steering, braking, comfort controls, mirror and turn signal use while driving. Tactical skills are applying rules of the road and adaptation to demands of varied conditions, while driving (Michon, 1985; Ross et al., 2018).

While consensus in the literature recognized the demands and complexity needed for safe driving, there was also agreement on how cognitive, motor, and sensory impairments from neurological injuries impacted driver safety (Classen et al., 2009; Liddle et al., 2014; Palubiski & Crizzle, 2016; Shultheis & Whipple, 2014; Unsworth & Baker, 2014; Unsworth et al., 2019). Dimech-Betancourt et al. (2021) identified visual, physical, and cognitive functions affecting driving ability. Visual and ocular motor changes of diplopia, blurred vision, photophobia, decreased visual field awareness, impaired depth perception, and visual perceptual deficits negatively impacted an individual's ability to process visual information. Physical limits in range of motion, coordination and motor function slowed brake reaction time and operation of vehicle controls. Cognitive impairment, lack of insight, memory, decreased processing speed, decreased divided attention and mental fatigue resulted in reduced reaction time and distractions inside and outside of the vehicle. Sensory dysfunction, inability to process and regulate sensory information, lead to poor tolerance of sensory input, which, in combination with other deficits,

resulted in symptoms such as nausea, dizziness, anxiety, headache, and emotional regulation (Lindsay & Stoica, 2017; Schultheis & Whipple, 2014). A presence of neurological impairment impacted safe driving, resulting in driving interruption or driving cessation and a need for assessment prior to resuming on-road driving (Fleming et al., 2014; Ross et al., 2015).

During driving interruption, individuals with ABI and caregivers needed education on the process for return to drive (RTD), as there was no evidence to support an ideal timeframe for driving assessment (Fleming et al., 2014; Liddle et al., 2014; White et al., 2012). Individuals with ABI and caregivers also needed strategies and resources to plan and transition from driver to non-driver (Bertrand et al., 2021). A spectrum of driver rehabilitation programs and services exist to serve at-risk individuals. Driver services included community-based education (driver safety programs or driving schools), medical based assessment, education, and referral (driver screening, clinical IADL evaluations), and specialized evaluation and training (driver rehabilitation and driver evaluations). Program services and provider credentials varied in the types of services offered, skill, knowledge, credentials, and outcomes expected. Some providers were generalists, others held advanced specialty certification and/or credentials supported by professional organizations from the Association for Driver Rehabilitation Specialists (ADED) or the American Occupational Therapy Association (AOTA) (Lane, et al., 2014).

OT scope of practice enables clinicians to address impairments interfering with one's ability to safely drive (AOTA, 2020). The profession gained consensus on a need for in-clinic and behind-the-wheel assessments to determine one's ability to drive (Palubiski & Crizzle, 2016; Unsworth et al., 2012). However, lacked agreement for standardization of assessments of driving capacity in the ABI population. The literature suggested multi-level batteries of assessment measures be used in screening, while other studies sought to identify predictive measures for on-

road driving performance (Gibbons et al., 2017; Holowaychuk, et al.,2020; Palubiski & Crizzle, 2016; Ross et al., 2015). Suggested batteries included cognitive and physical tests shown to have predictive validity for fitness-to-drive, such as the Occupational Therapy- Driver Off Road Assessment Battery (OT-DORA) (Shultheis & Whipple, 2014; Unsworth et al., 2019). Research lacked consistency in the measures used and reported, including neuropsychological assessment, on-road assessment, off-road driver risk assessment and education, driver simulator training, and off-road training specific skills (Dimech-Betacourt et al., 2021; Ross, et al., 2018). Off-road skill specific training included interventions to address attention, speed of processing, perception, and reaction/ response speed training, targeting specific skills (Lane et al., 2014). Driving simulators served as a tool for re-training and provided experiences to challenge motor, cognitive and perceptual skills within a safe contextual driving environment (Alvarez, 2018; Ross et al., 2018). The literature also indicated specific driving-related skills may improve with simulator practice (Classen, 2017; Dimech-Betacourt et al., 2021).

Driving disruption has been reported as an important quality of life issue and individuals experienced a symbolic loss of independence. In the first six months after injury, driving outcomes indicated individuals with ABI and caregiver's needed information and more communication from professionals. (Fleming et al., 2014). Qualitative studies showed both individuals and caregivers experience distress resulting from the uncertainty of life being on hold and not knowing if, and, when one may be able to drive again. When disruption lasts greater than one year, the experience became highly stressful for individuals with ABI and caregivers (Fleming et al., 2014; Schultheis & Whipple, 2014), and a loss of one's ability to drive lead to social isolation, loneliness, and depression (Erler, et al., 2018). For non-drivers, education in alternative transportation should focus on screening for passenger safety, ability to cross the

street and negotiate curbs and sidewalks, visual motor skills for reading signs, and an ability to use transportation other than a private vehicle (Lindsay & Stoica, 2017).

A traditional model of service-delivery of driver off-road assessment is face to face administration, however, social conditions from the COVID-19 pandemic in 2020 forced changes to outpatient programming, resulting in pre-driving assessments administered via telehealth at Shepherd Pathways. Telehealth used telecommunication and information technologies to apply evaluative, consultative, preventative, and therapeutic services (Cason, 2014). Recent studies focused on the effectiveness of a telehealth model in OT and supported the adoption of telerehabilitation in populations such as stroke, total knee arthroplasty, shoulder, geriatric, and home healthcare settings (Dahl-Popolizio, et. al., 2020; Shenoy & Shenoy, 2018). Other studies on effectiveness of an OT telehealth model focused on practitioner's perspectives and acceptance (Corey, 2019; Rortvedt, 2019). Practitioners recognized potential benefits of telehealth, such as gaining access to clients in rural areas and reducing therapy cancellation rates (Corey, 2019). Subsequently, telehealth has emerged as an alternative model for OT services (Hung & Fong, 2019). However, there appears to be a gap in the evidence to support a telehealth approach to driving and community mobility.

Program evaluation was recognized in literature as a method of collecting, analyzing, and using data to explore the effectiveness and efficiency of programs (CDC, n.d.; Kellogg, 2004). Programs were defined as sets of related activities sharing common, identified outcomes or as groups of projects (CDC, n.d.). One purpose of program evaluation was to attain information on how well an intervention, product, or system is working, while another purpose was to achieve an objective view of a process (University of Kansas, n.d.). When considering what type of

evaluation design to use, the purpose or intent of the evaluation should be determined first (Adu, 2017).

Program theory evaluation was focused on the theory of change. A commonly used tool, known as a logic model, documents change by describing steps of how and why a strategy worked to achieve results. A logic model may be used to identify main components of programs and show relationships among program goals, objectives, activities, and outcome measurements (Adu, 2017). Essentially, a logic model serves as a "logical linkage" (Frechtling, 2007) of the components, documenting a theory of change occurred. As a framework, a logic model was used to guide and monitor program implementation and evaluation (Hulton, 2007). A logic model may be global, showing how an entire program operates, or may be nested, focusing on a specific component (CDC, n.d.). Recognized in the literature since 1972 (Taylor, 2017), logic modeling had evolved into a framework increasingly used to guide and monitor program implementation or evaluate a program's effectiveness (Hulton, 2007; McLaughlin & Jordan, 2015). The CDC (n.d.) indicated retrospective documentation review, (used in the Capstone project), has been shown as a reliable method for data sourcing during program evaluation. An advantage of documentation review was ease of access to existing data used for objective reporting. A disadvantage of document review was time and labor intensity, with potential for data limitations if lacking or incomplete (CDC, n.d.).

Summary

Evidence in the literature, including findings from a variety of professional journals and resources across practice settings was summarized. No standard protocol or guidelines existed for driver off-road assessment; however, consensus recommended using a multi-level battery for off-road assessment for individuals with neurological impairments prior to resuming on-road

driving (Schultheis & Whipple, 2014; Unsworth et al., 2019). Rehabilitation programs should include education on the return to drive process for individuals with ABI and caregivers during periods of driving interruption (Liddle, et al., 2014). Comprehensive assessment and interventions may include driving simulation to prepare individuals with ABI for on-road driving (Lindsay & Stoica, 2017). Finally, a framework of logic modeling was used for program evaluation (Taylor, 2017; Savaya & Waysman, 2005; University of Kansas, n.d.) to show program effectiveness.

Section 3-Methods

Project Design

The descriptive study followed a needs assessment previously conducted to gain stakeholder perspective on the OT clinical pre-driving program at Shepherd Pathways. The project design, a program evaluation, utilized retrospective electronic document review, data collection, and analysis. A logic model, as a systematic assessment, was used to illustrate program theory, or the degree of effectiveness of the program and its outcomes, from March 2020 - December 2020. The logic model showed how OT telehealth sessions contributed to goals and outcomes.

Setting

Shepherd Pathways, an outpatient neurological program at the Shepherd Center in Atlanta, Georgia, serves adolescent and adults, ages 18-65, with an admitting diagnosis of ABI (Shepherd Pathways, n.d.-b). During the COVID-19 pandemic in March of 2020 (Ducharme, 2020), the clinical pre-driving program adapted and added a telehealth service delivery model. The OT program defined telehealth as virtual sessions and a single community navigation

session, completed in the context of a participant's familiar environment. Pre-driving assessment and treatment interventions were delivered via a telehealth approach, using the ExamMed™ software platform. Shepherd Pathways served as the setting for this project, chosen due to a gap in the literature to support a telehealth approach for clinical pre-driving, and a need for a formal program evaluation.

Inclusion/exclusion criteria

Inclusion: Healthcare records for individuals with an ABI diagnosis, aged 18-65, referred with orders for OT evaluation at Shepherd Pathways, admitted June 1, 2020 - December 31, 2020, were included. Participants met the organization's technical and clinical screening criteria for telehealth eligibility. All participants resided in the state of Georgia and held a valid Georgia driver's license.

Exclusion: Healthcare records for individuals without cognitive capacity for decision-making were excluded. Non-English-speaking individuals and those with moderate expressive language impairments were excluded.

Research Questions

1. Does Shepherd Pathways pre-driving program meet the needs of individuals with ABI in a traditional, hybrid, or telehealth model?

2. What are the current practices (assessments and interventions) used within an OT led pre-driving program delivered via telehealth?

3. Does an OT pre-driving program delivered via telehealth result in an on-road driving evaluation outcome of unrestricted driving for individuals with ABI?

Project Methods

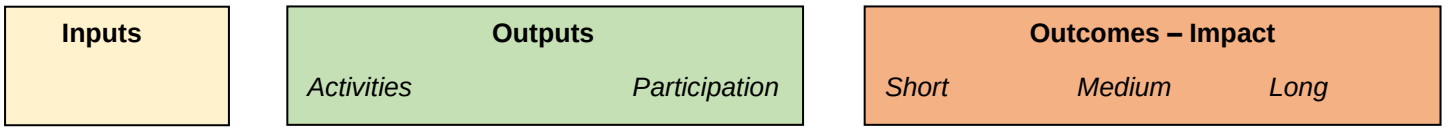
Documentation review occurred in two phases. An initial phase of documents reviewed included telehealth committee meeting minutes for Shepherd Center and Shepherd Pathways for March 2020 - December 2020 and outpatient OT admission and census list for the same timeframe. Data of individuals meeting inclusion criteria was collected. In a secondary phase of review, Epic electronic healthcare records served as a data source. Protected health information was de-identified, pseudonyms were assigned, and was transferred to an excel spreadsheet. Demographic data included individual's identified gender, age, admission diagnosis, and year of onset. The method of service delivery of OT sessions, OT-DORA road law and road craft test (RLRCT) cognitive subtest score, assessments and interventions received, ORDE referral status, ORDE results (Pass/Fail) and the Pathways OT provider were collected. Goal Attainment Scale (GAS) status at discharge was recorded. GAS, a patient reported outcome measure, uses individual goal identification, and standardized scaling, to calculate the degree to which a goal was met (Ertzgaard et al., 2011). The telehealth program's effectiveness was measured by a percentage of goals met, set at a threshold of 85%, and was consistent with the organization's customer satisfaction outcomes. The outcome for ORDE results (pass/fail) served as a measure to determine return to unrestricted driving.

Outcome Measures

A logic model visual illustration of program theory (Adu, 2017) was used to describe the telehealth model of service delivery for a clinical pre-driving program (Appendix A). The logic model served as an evaluation tool to display the effectiveness of plans and to communicate the program's interventions and outcomes. The W.G. Kellogg Logic Model Guide (2004) recommended use of tables and flowchart formats to categorize program inputs, outputs, and

outcomes to show planned work and intended results over time. A sample format was represented in Figure 1. Using "if…then…" statements connect and link program parts to results and showed a relationship between telehealth pre-driving activities and program outcomes.

Figure 1: Sample Logic Model Format



Inputs

Inputs are the investments or resources that go into a program, and may include financial and personnel resources (CDC, 2003). Center-wide stakeholder contributions were identified as inputs or necessary resources. Examples included funding and tech support for the ExamMed™ software platform and workstation adaptations.

Outputs

If inputs or resources are accessed, then planned activities may be accomplished. Activities were the actions or events undertaken by the program, the "to do" list tasks. Activity examples included development of OT clinical competencies and a RTD toolkit. These actions and processes, represented as outputs, promoted delivery of therapeutic assessment and intervention delivered via telehealth. Designated OT providers participated in delivery of services and individuals with ABI received interventions that produced results or outputs. These activities resulted in generation of output data such as clinical assessments and interventions

delivered. Output data, assessments and interventions administered via telehealth, served as an outcome for research question #2.

Outcomes

W.G. Kellogg Logic Model Guide (2004) defined specific changes in participant knowledge, skill, or level of function as outcomes. Short-term outcomes are immediate effects of the intervention activities. If pre-driving planned activities were accomplished as intended, then, participants benefitted from therapy, as measured by an outcome. Short-term program outcomes were measured using Goal Attainment Scale. The person-centered goal status, or GAS goal, at the time of discharge from the pre-driving program was the outcome measure for research question #1. The OT provider identified the GAS goal as met or not met at discharge. Long-term outcomes were measured by assessing participant outcomes of ORDE. If the intended result (return to driving), was accomplished, then a program change was impactful. ORDE results were the outcome measure for research question #3. A logic model for the OT telehealth pre-driving program theory illustrated and identified indicators of success.

Ethical considerations

The Shepherd Center Research Review Committee determined Institutional Review Board (IRB) oversight was not needed, as program evaluation was not considered human subject research. An official determination for Not Research letter was issued by Dr. Deborah Backus, Chair of Shepherd Center Research Review Committee. The primary author was employed by Shepherd Center; therefore, no new access was necessary. All protected health information was accessed via current Epic user login, was de-identified, and pseudonyms used. Data storage occurred on the organization's server throughout the duration of the study to maintain data

security. There was no risk to participants who consented to data use at the time of registration in the program, per the organizations registration and admission policies.

Timeline of project procedures

Table 1: Proposed Project Timeline

Timeframe	**Activity**
August 2021	OTS 901 • Conducted needs assessment at Shepherd Pathways clinical pre-driving program
October 2022	OTS 903 • Initiated capstone project report Section 1 • Expanded literature review on program evaluation and logic modeling. • Initiated capstone project report Section 2 • IRB process and communicated with Shepherd Center and Eastern Kentucky University (EKU). • Submitted Collaborative Institutional Training Initiative (CITI) certification to EKU. • Registered IRBNet.org to receive Shepherd Center letter of acknowledgement. • Capstone mentor and communication initiated
November 2022	OTS 903 • Revised and finalized capstone project report Section 1 • Revised and finalized capstone project report Section 2 • Revised and finalized capstone project report Section 3 • Confirmed IRB process and communicated with Shepherd Center and EKU • Scheduled capstone project presentation with committee. • Presented capstone project to committee
January 2023	OTS 904 • Initiated document review and data collection. • Focused on inputs and actions (Shepherd plans and processes to launch telehealth service delivery model; policy/procedures; OT provider education/resources) • Collected participant admission and referral data
February 2023	OTS 904 • Continued document review and data collection.

	• Focused on output data (Participant demographics; volume served; method of delivery; assessments administered; interventions administered; OT provider) • Focused on outcome data (GAS goal status at discharge; ORDE recommendation and results)
March 2023	OTS 904 • Initiated analysis of results • Initiated illustration using logic model. • Documented results in narrative, table, and appendix formats • Documented discussion
April 2023	OTS 906 • Finalized logic model. • Revised and finalized Capstone manuscript. • Scheduled capstone project presentation with faculty. • Presented capstone project to committee to faculty.
May 2023	OTS 906 • Revised and finalized Capstone manuscript.

Section 4- Results and Discussion

The Capstone project, a formal program evaluation of the pre-driving program at Shepherd Pathways, addressed three research questions. 1. Does Shepherd Pathways pre-driving program meet the needs of individuals with ABI in a traditional, hybrid, or telehealth model? 2. What are the current practices (assessments and interventions) used within an OT led pre-driving program delivered via telehealth? 3. Does an OT pre-driving program delivered via telehealth result in an on-road driving evaluation outcome of unrestricted driving for individuals with ABI? A method of retrospective documentation review was chosen, data was collected, analyzed, and results were illustrated in a logic model located in Appendix A.

Results

An initial phase of retrospective documentation review focused on stakeholder resources needed to launch telehealth programming. Stakeholders included but were not limited to senior leadership, information systems, health information management, and OT providers. Documents viewed were monthly telehealth committee meeting agendas and minutes for Shepherd Center and bi-weekly minutes for Shepherd Pathways from March-December 2020. Tangible outputs were identified from review of the action items from the committees. Documents examined included program process maps, policy, and procedures, and OT provider resources, such as a telehealth competency, clinical RTD toolkit for assessment, intervention, documentation, and billing. A list of resources (inputs) is illustrated in Table 2, and a list of processes (outputs) is shown in Table 3.

Table 2: Logic Model Inputs: Resources for Telehealth Pre-driving Program

Governance: Executive leadership and board of directors commit additional finances and re-allocation of human resources. Creation of center wide and programmatic telehealth committees; Software vendor contract with ExamMed™ for provider licensing and technical support.
Multi-disciplinary departments included: Information systems, Compliance, Financial Services, Health Information Management, Patient Access, Case Management, and Clinical Operations including the Pathways leadership team and designated OT providers.

Table 3: Logic Model Outputs: Activities for Telehealth Pre-driving Program

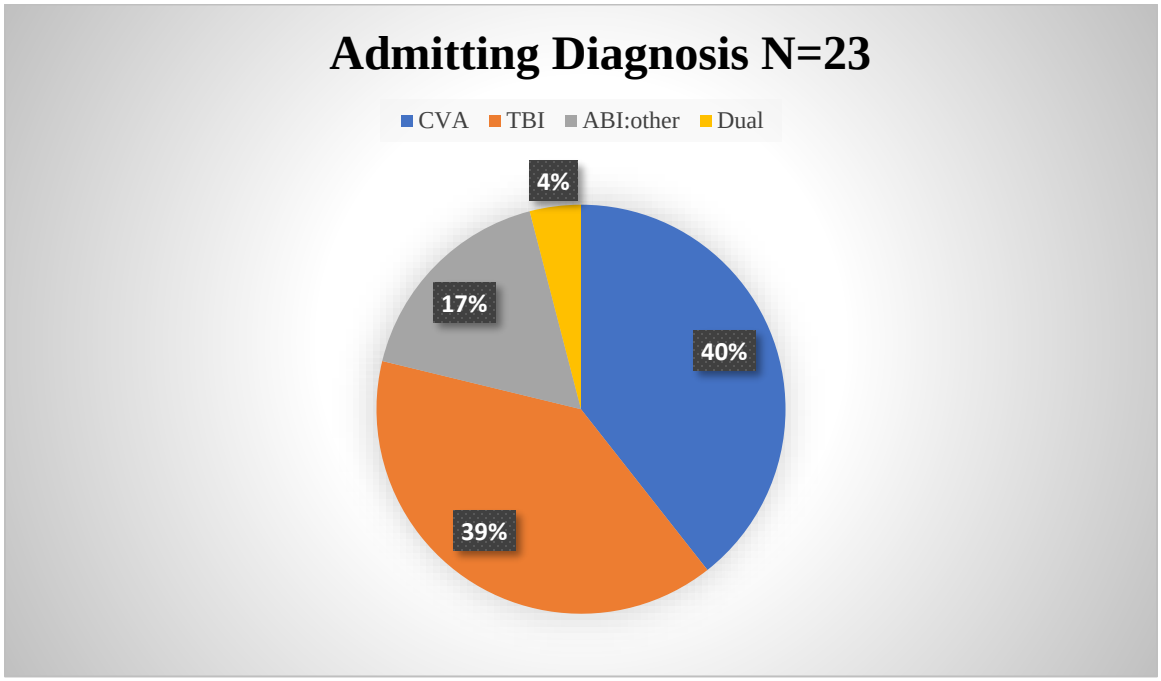
Information systems: Technology education, training, support, and troubleshooting using virtual software platform ExamMed™. Upgraded hardware for user workstations (added monitors, headsets, document cameras); purchased, set-up and supported additional Ergotron® mobile workstations.
Pathways telehealth committee: Created policy and processes for: patient access and technology screening, admissions, benefit authorization, patient scheduling, consent for treatment, patient safety/adverse events, customer satisfaction, provider staffing and call outs; process mapping, staff education and training; client and caregiver education, and technical support.
Health information systems: Epic (electronic healthcare record) analysts built and revised documentation for physician orders, visit types, documentation, billing, and coding.
OT providers: Created resources: OT clinical screener; 2 OT clinical RTD toolkits (mild and moderate) for assessments and interventions, billing and coding resource by payor source;

completed mentored practice sessions using ExamMed™; reduced therapy session duration from 60 to 45-minute timeslots; revised pre-driving program clinical practice standards for telehealth; implemented infection control policies for community navigation; provided technology support for clients and caregivers.

The secondary phase of documentation review included admissions for outpatient OT referrals for June-December 2020 timeframe. Thirty electronic medical records were reviewed, and seven charts were excluded from further analysis. Of the seven excluded, two exceeded the age criteria. One participant was excluded due to speaking English as a secondary language and lacked a legal Georgia driver's license. Two participants were eliminated due to cognitive and/or moderate language impairment barriers, and two were missing data elements for OT-DORA RLRCT sub-test results.

Participant demographics of age and identified gender were represented as output data in the logic model. Additional results analyzed were participant's admitting diagnosis (Figure 2); year of onset or length of time post-injury (Figure 3); sessions by OT provider (Figure 4); method of service delivery (Figure 5); and the OT-DORA RLRCT cognitive sub-mean test score.

Figure 2: Admitting diagnosis of participants in telehealth pre-driving program



Note. CVA = stroke; TBI = traumatic brain injury; ABI other = anoxia, tumor; Dual = ABI/SCI (spinal cord injury)

Figure 3: Length of time post-injury onset of pre-drive program participants

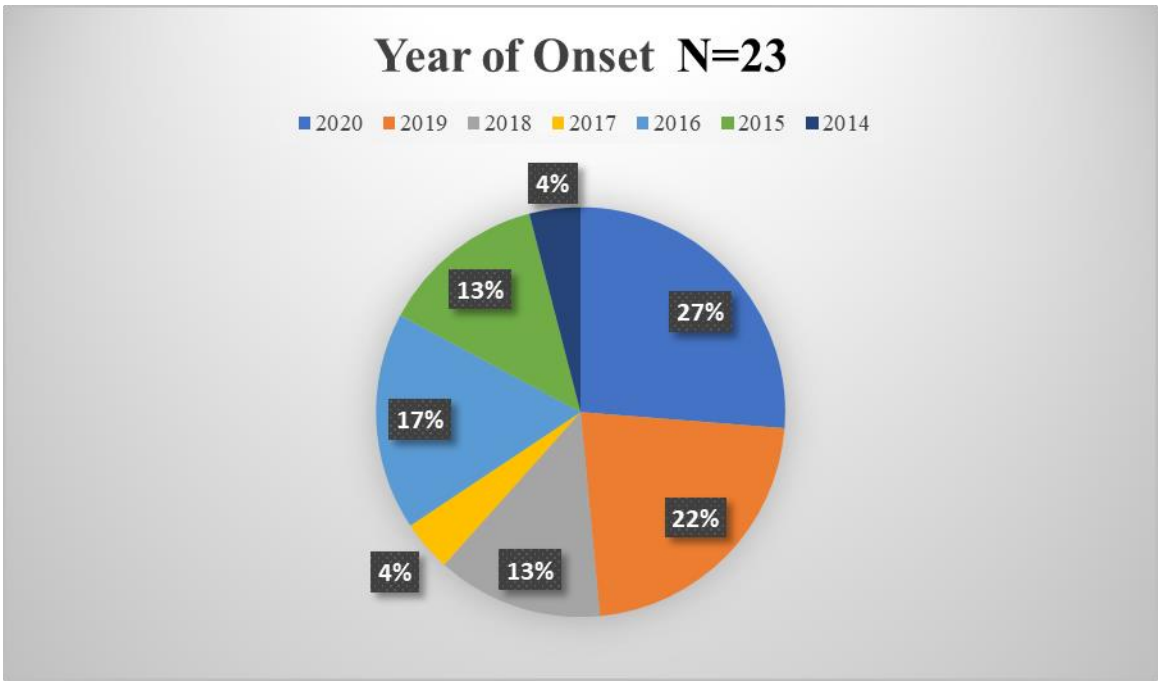
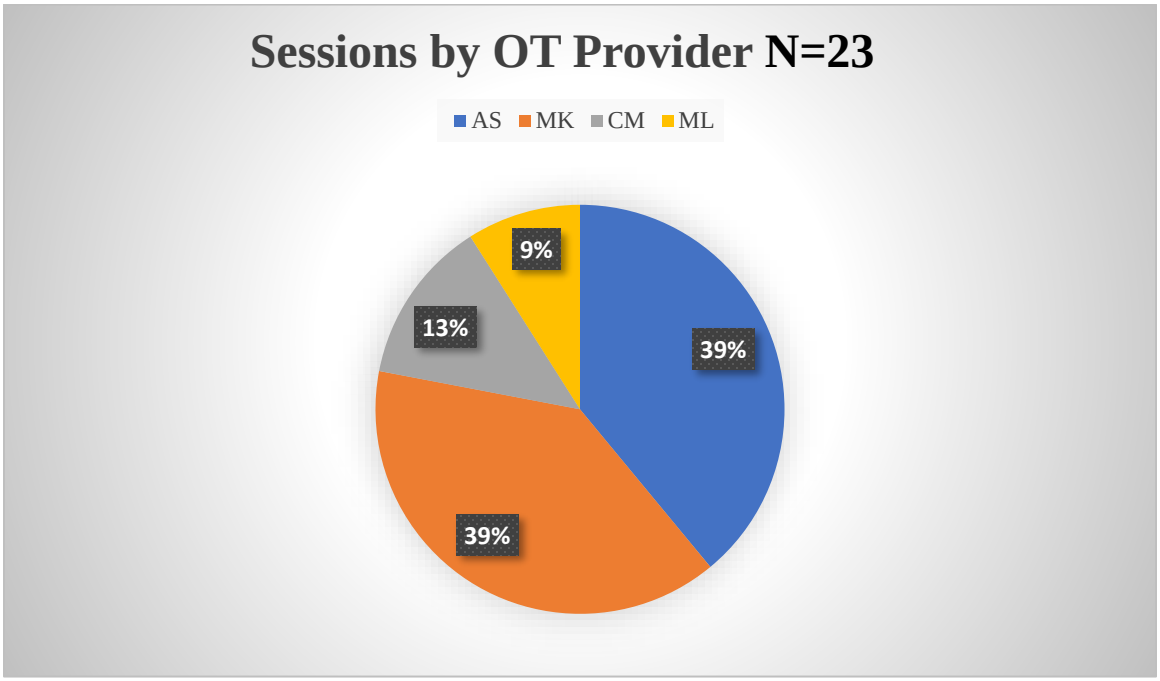


Figure 4: Sessions by OT provider for telehealth pre-driving program participants



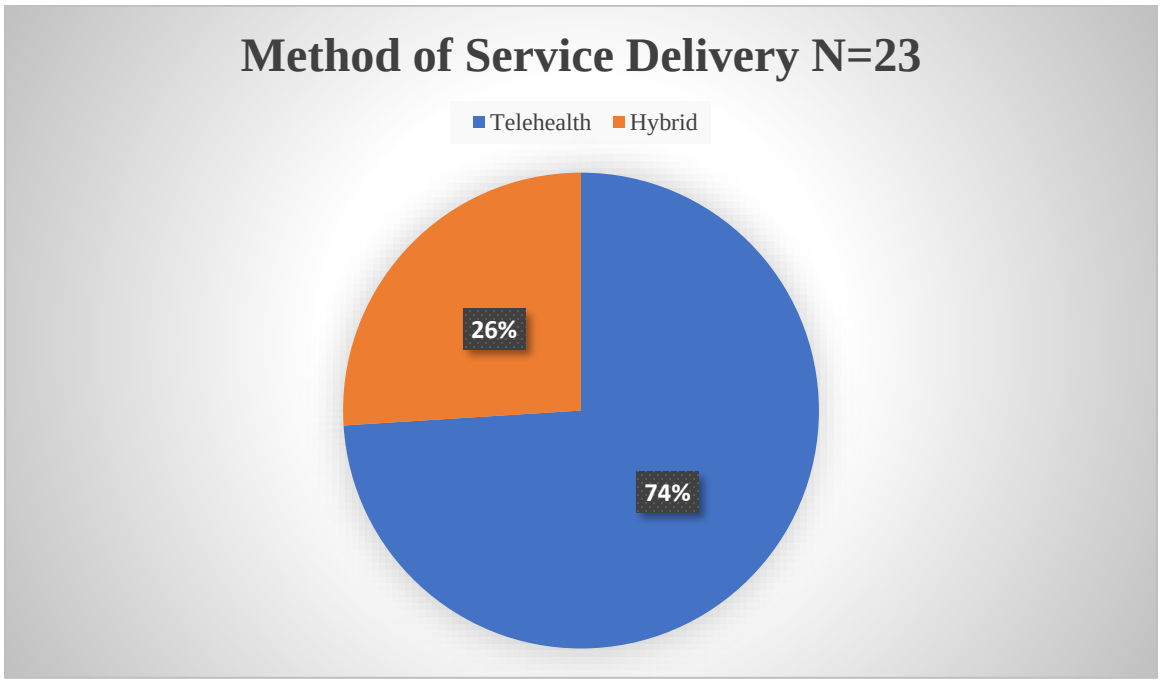
Note. Providers are master's level Occupational Therapists

[a] AS holds credentials as a certified driving rehabilitation specialist (CDRS)

When analyzing the service model delivery as an output, specific definitions were utilized. Shepherd Pathways designed the virtual telehealth pre-driving program to include a community navigation session. A community navigation session was designed with the context of a familiar community environment, near a participant's residence. Therefore, a telehealth model of service delivery was defined as virtual sessions and a single community navigation session. A hybrid program was defined as virtual telehealth sessions and a face-to-face visit. Over the six-month timeframe, dynamic conditions of the pandemic resulted in program and guideline changes at Shepherd Pathways. The change resulted in specific criteria that allowed an

OT telehealth provider to schedule limited in-clinic visits based on individualized plan of care needs. Criteria for face-to-face visits was upper limb splinting and positioning, physical agent modality use, and use of driving technology for assessment. Therefore, the telehealth method of service delivery included a single community navigation session and a hybrid session included virtual telehealth and an in-clinic visit. Of participants who received hybrid sessions, 13% attended an in-clinic session using driving technology, such as driving simulation or Dynavision D2, an interactive training device for visual skills (Dynavision n.d.). Another 9% of hybrid services received upper extremity (UE) splinting and/or physical agent modalities in clinic**.**

Figure 5: Method of service delivery for participants in telehealth pre-driving program



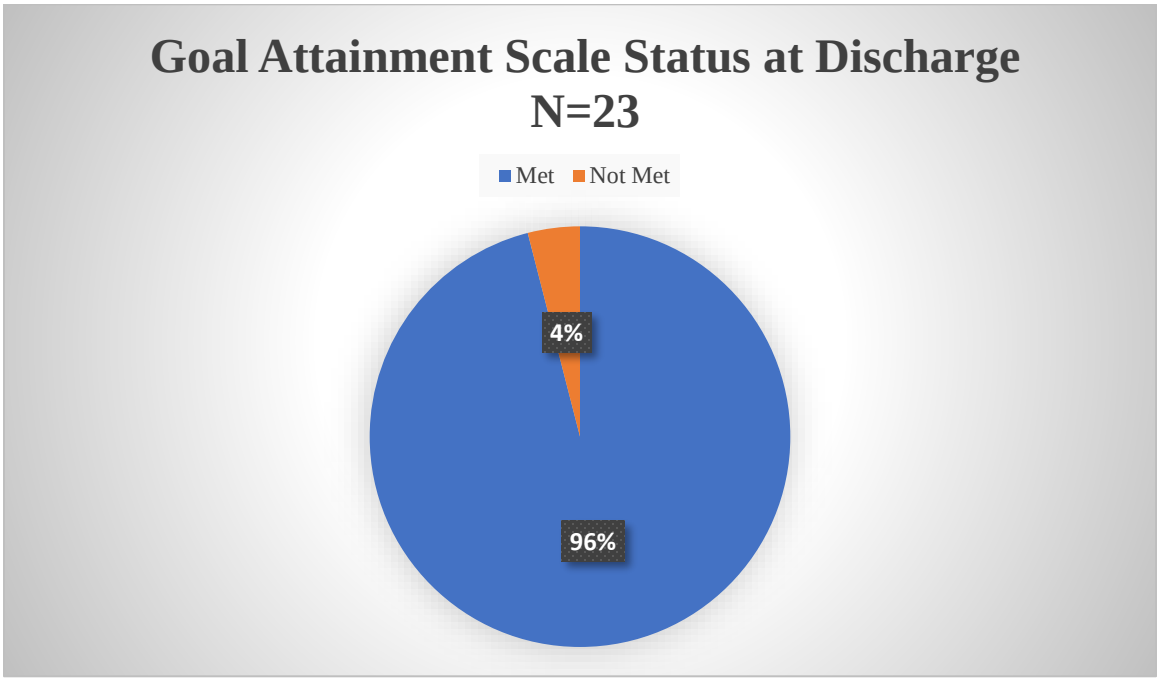
The final output data analyzed was the OT-DORA RLRCT administered as a standardized cognitive assessment. A maximum score of 37 was possible. Participant scores were examined, and the calculated mean score was 33.6. Unsworth (2010) recommended drivers with a score of <20 be monitored carefully during ORDE due to a higher likelihood of failure.

Outcomes

When the data was analyzed using a program evaluation framework, results indicated the objectives were met, and three research questions were answered. The Shepherd Pathways pre-driving program met the needs of individuals with ABI via telehealth and hybrid models of service delivery (research question #1). (See Figure 6). The current practices (assessments and interventions) used within an OT led pre-driving program delivered via telehealth (research question #2) were identified. (See Appendix B). An OT pre-driving program delivered via telehealth resulted in an on-road driving evaluation outcome of unrestricted driving for individuals with ABI (research question #3). (See Figure 8).

Outcomes indicated 96% of individuals met their GAS goal at discharge (Figure 6). This was represented as short-term outcomes in the logic model. One GAS goal was specific to upper extremity recovery and did not address RTD. (The client passed the ORDE without restriction; however, the OT plan of care was extended status-post UE surgical intervention).

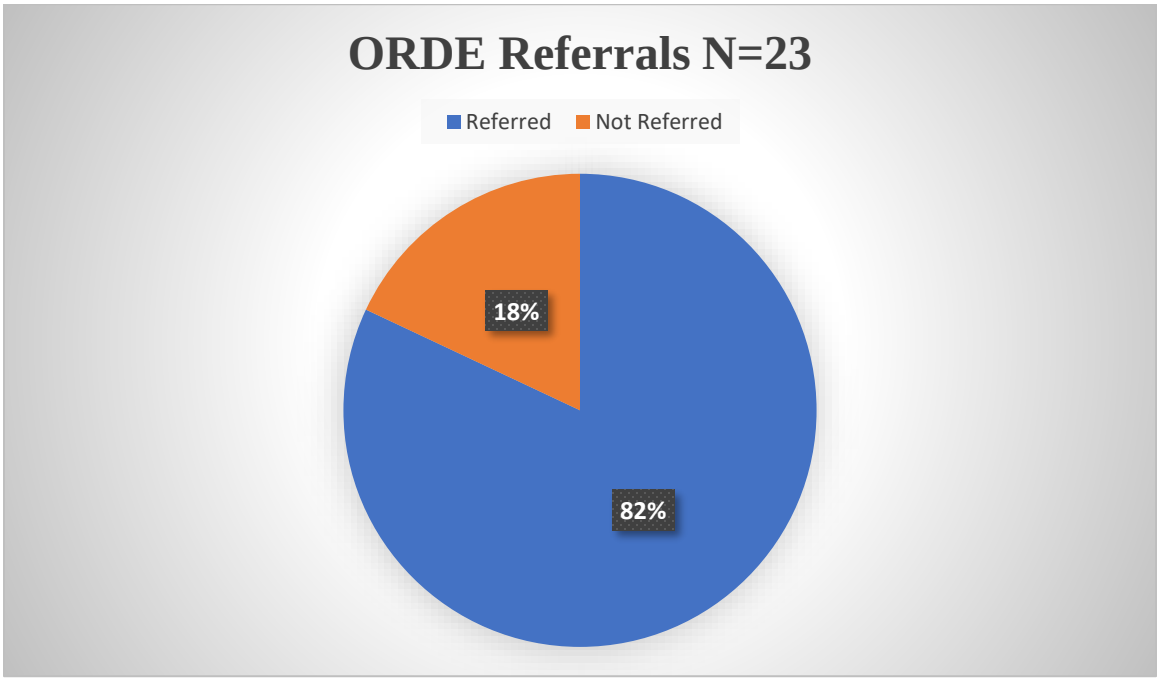
Figure 6: Program Outcomes: Goal Attainment Scale status at discharge for participants in telehealth pre-driving program



Medium outcomes

In the logic model, intermediate outcomes represented a percentage of participants referred for ORDE after completing the telehealth pre-driving program (Figure 7). Eighty-two percent of participants were referred for ORDE. Of the 18% who were not referred, 50% did not meet legal vision standards for driving in the state of Georgia, 25% were prohibited due to medical (seizure) conditions, and 25% had a workers compensation funding barrier.

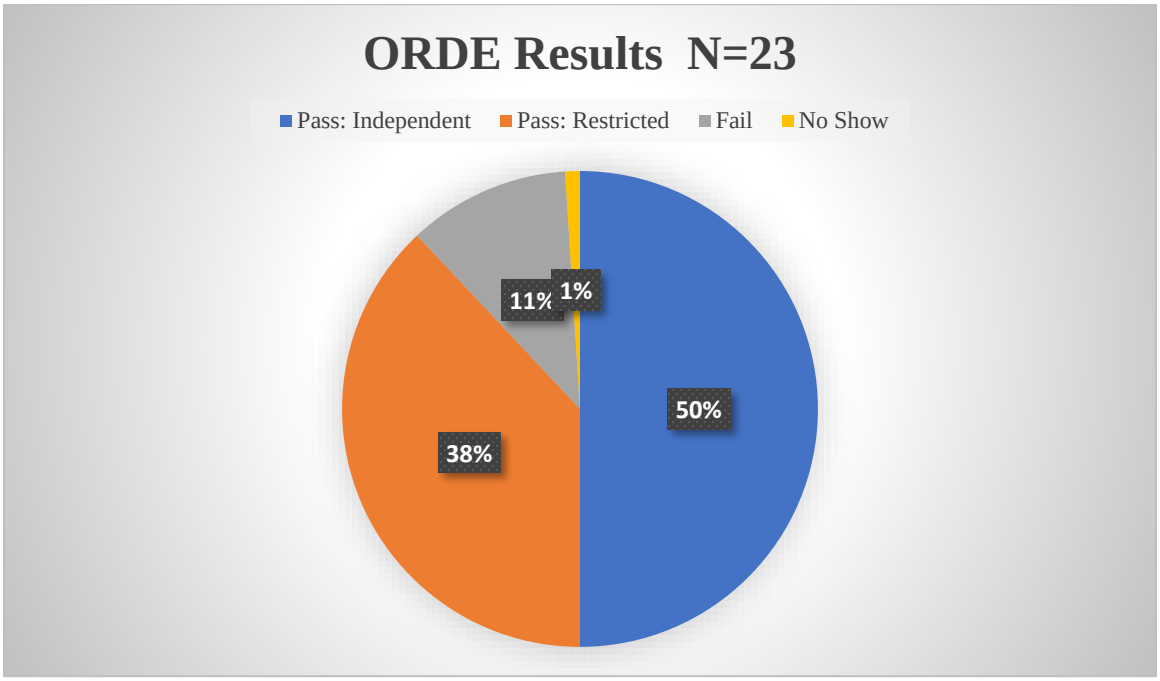
Figure 7: Program Outcomes: On-road driver evaluation referrals for participants in the telehealth pre-driving program



Long-term outcomes

The OT pre-driving program delivered via telehealth resulted in an on-road driving evaluation outcome of unrestricted driving for 50% of participants. An additional 38% passed the ORDE with recommendations for training. Overall, 88% of participants returned to drive after receiving telehealth or hybrid pre-driving assessment or intervention (research question #3). Of the 38% of participants with training recommendations with a CDRS, 57% required the use of adaptive equipment or devices; 42% required additional practice drives. One participant with a TBI and one participant with a CVA failed the ORDE.

Figure 8: Program Outcomes: On-road driver evaluation results for participants in the telehealth pre-driving program



The current practices (assessments and interventions) used in an OT led pre-driving program delivered via telehealth were documented (research question #2) (Appendix B). Policies, program guidelines, telehealth competencies and an OT RTD toolkit of assessments and interventions represented clinical practice standards for a telehealth pre-driving approach. A comparison of the OT RTD toolkit with assessments and interventions indicated measures were adapted and additions were made. A multi-level approach for assessment and intervention was used, as supported by the literature (Ross et al., 2018; Unsworth & Baker, 2014). The literature also supported pre-driving assessment and intervention measures addressing cognitive, motor, and sensory skills (Barco et al., 2020; Erler, 2018; Liddle, 2014; Ross et al., 2018; Tamietto et al., 2006; Shultheis & Whipple, 2014). Many of the measures used in the telehealth and hybrid

pre-driving program had been documented for effectiveness in a face-to-face clinical setting *(Dickerson, 2013; Holowaychuk, Parrott & Leung, 2020).*

Impact

The purpose of the program evaluation was to collect, analyze, and use data to evaluate effectiveness and efficiency of Shepherd Pathways' clinical return to drive program delivered via telehealth. The study described current the OT telehealth pre-driving toolkit assessments and interventions and outcomes of individuals recommended for ORDE after completion of the pre-driving program. The logic model provided a visual representation of findings for the research questions.

1. Does Shepherd Pathways pre-driving program meet the needs of individuals with ABI in a traditional, hybrid, or telehealth model? The outcomes served as evidence, supported by the OT literature, to indicate clinical practice should be client-centered, should work to remove barriers within a client's environment, and focus on occupational performance needs (Baum & Law, 1996). OT providers were aware of client goals for RTD, provided education and information, and optimized the timing to facilitate successful driving outcomes for their clients (Liddle et al., 2014; Unsworth et al., 2019). A telehealth model of service delivery resulted in participants safely returning to drive.

2. What are the current practices (assessments and interventions) used within an OT led pre-driving program delivered via telehealth? Appendix B represents a comprehensive list of assessments and interventions utilized. The current practices (assessments and interventions) used in an OT led pre-driving program delivered via telehealth were documented (Appendix B). Policies, program guidelines, telehealth competencies and an OT RTD toolkit of assessments and

interventions represented clinical practice standards for a telehealth pre-driving approach. A comparison of the OT RTD toolkit with assessments and interventions indicated measures were adapted and additions were made. A multi-level approach for assessment and intervention was used, as supported by the literature (Ross et al., 2018; Unsworth & Baker, 2014). The literature also supported pre-driving assessment and intervention measures addressing cognitive, motor, and sensory skills (Barco et al., 2020; Erler, 2018; Liddle, 2014; Ross et al., 2018; Tamietto et al., 2006; Shultheis & Whipple, 2014). Many of the measures used in the telehealth and hybrid pre-driving program had been documented for effectiveness in a face-to-face clinical setting (Dickerson, 2013; Holowaychuk, Parrott & Leung, 2020).

3. Does an OT pre-driving program delivered via telehealth result in an on-road driving evaluation outcome of unrestricted driving for individuals with ABI? The literature has shown program evaluation in healthcare can be beneficial and may be used to determine the quality and effectiveness of services delivered (Adams & Neville, 2020). Program evaluation may also determine whether initiatives proved successful and aid-in identifying opportunities for improvement (W.G. Kellogg, 2004). Results of the program evaluation indicated a telehealth approach to pre-driving resulted in a return to unrestricted driving for individuals with ABI. Analysis also showed that individuals with left brain involvement, resulting in right hemiparesis, may require adaptive devices, vehicle modification, and/or driver training with a CDRS to promote safe operation of driving controls. These findings are consistent with the literature supporting vehicle modifications for individuals after stroke (ADED, 2016; DiStefano, 2019).

Strengths

Shepherd Center, a center of excellence, had a substantial repository of existing data and reliable documentation easily accessible for retrospective document review. Shepherd Pathways had a well-established clinical pre-driving program prior to the global pandemic. When the pandemic prohibited outpatient in-person visits, the program adapted quickly and developed a new model of service delivery, based upon a successful existing model. The telehealth program incorporated clinical practice standards for assessment and interventions, competency-based education, and mentored training for OT providers. A logic model provided a clear visual representation to highlight program processes, effectiveness, and outcomes.

Limitations

The project had several limitations. First, using a retrospective study approach with a defined timeframe during a global pandemic resulted in ever-changing program guidelines and OT plan of care changes. Second, using the terminology of unrestricted RTD in research question #3 may have introduced bias toward individuals needing adaptive equipment or vehicle modification (VM). As OTs, independence is viewed through an inclusive lens, regardless of the amount or type of external assistance required (AOTA, 2020), including promotion of safe driving through environmental modification. VM promoted independence in safe driving, independent mobility, and community re-entry (DiStefano et al., 2019). Expanding the definition of unrestricted driving to passing with modified independence/or independence with driving, may impact the overall outcome. Third, OT provider experience in virtual assessment administration provided feedback on feasibility. Participants and caregivers experienced occasional limitations using technology. Subsequently, the OT-DORA right heel pivot test (RHPT) was discontinued due to participant limitations, and data was inconsistent. Lastly, a

logic model, as a program evaluation tool, represented a range of factors from the author's individual perspective and may not be inclusive of all factors impacting program results and outcomes.

Implications for practice

The results of this study have several implications for OT practice. Study outcomes support a telehealth model of service delivery for OT services. Policy changes and legislation for continued funding of telehealth OT assessment and intervention services, outside of a public health emergency, should be further considered by payors. A permanent telehealth therapy billing code is needed. (AOTA, n.d.). Appendix B served as a sample of telehealth RTD clinical practice standards for OT providers. Outcomes also support generalist OT providers when addressing the IADL of driving and community practice in clinical practice (Davis & Dickerson, 2017). Program evaluation was a useful tool and showed effectiveness of a newly created and expanded program (Adams & Neville, 2020), and provided evidence for continued program improvement.

Future Research

There is limited research in driving and community mobility for individuals with ABI. The OT profession may benefit from additional research in clinical pre-driving assessment and intervention, and use of telehealth as a service delivery model. The study served as a foundation for future studies. A nonrandomized trial may compare in-clinic and telehealth approaches. A randomized trial could result in greater impact and statistical relevance to support pre-driving assessment and intervention.

Conclusion

A formal program evaluation provided an opportunity to identify outcomes of a telehealth approach for RTD. The OT scope of services for pre-driving assessment via telehealth and hybrid approach was examined and compared with outcomes for ORDE. A logic model illustrated the process developed for OT driver-off road assessment during the COVID-19 pandemic from March 2020-December 2020 at Shepherd Pathways. Results indicated a high percentage of program effectiveness, ORDE referrals, and ORDE passing rates for participants with ABI.

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Appendices

Appendix A: Logic Model: Shepherd Pathways OT telehealth pre-driving program

Inputs	Outputs		Outcomes -- Impact		
	Activities	*Participation*	*Short*	*Medium*	*Long*
Executive Leadership & Board of Directors Financial resources Human resource re-allocation **Multi-disciplinary Support** Transdisciplinary center-wide committee **Information Systems** Software platform ExamMed™ Provider licensing Hardware upgrades Prioritized Support Facility/workstation upgrades **Compliance** **Health information management** **EPIC analysts** **Patient Financial Services** Case Management **Clinical Operations** Pathways Leadership OT providers OT subject matter experts (SME) & mentors	**PW TH Committee** Process Mapping for Admissions & workflow Policy & procedure revisions Physician orders Adverse events/ patient safety Facility workspace Ergotron workstation upgrades (cameras, monitors, headsets, document sharing) Trouble shooting Resource development OT competency OT clinical toolkit OT documentation Billing & coding OT training & education Simulated sessions Mentored sessions Co-treatment sessions Community navigation -Infection control practices End User Acceptance	Referrals =30 Exclusions =7 N = 23 **Age** Mean= 35.8 years **Identified Gender** Male =39% Female =61% **Admit diagnosis** CVA =39% TBI =39% ABI other =18% Dual (ABI/SCI) =4% **Length of time post-injury onset** <1 year=27% 1 year=22% 2 years=13% 3 years=4% 4 years=17% 5 years=13% 6 years=4% **OT providers** OTR=4 *1 credentialed CDRS **Service delivery method** Telehealth=74% Hybrid=26% **OT-DORA Road Law & Road Craft sub-test** Mean score=33.6 / 37 total points	**Goal Attainment Scale** Status @ Discharge Met =96% Not Met =4%	**ORDE referrals** Referred = 82% Not referred = 18% Reasons for ORDE non-referrals Legal / Medical = 25% Legal/ Vision= 50% Barrier/Funding = 25%	**ORDE results** Pass: Return to Independent driving = 50% Pass: Restricted driving = 38% Fail = 11 % No show = 1% Total Returned to Drive = 88% Recommendations for restricted drivers 57% = Adaptive equipment 42% = Training drives **Impact** -Increase capacity for referral -Reduce waitlist -Serve referrals outside metro Atlanta in rural communities via telehealth -Customer service outcomes -Influence policy & legislation for reimbursement via positive outcomes -Clinical standards of practice

Assumptions

A successful clinical pre-driving program was adapted for virtual delivery. The OT RTD toolkit was adapted from clinical practice standards. The public health emergency declaration resulted in temporary billing and coding practices for OT telehealth services.

External Factors

Conditions of the global pandemic resulted in changes in program guidelines for face-to-face therapy services during the June-Dec 2020 timeframe.

Appendix B

Assessments and Interventions

Assessments administered via Telehealth Virtual Platform
Occupational profile
Goal Attainment Scale (GAS)
Vision Screen
Brain Injury Vision Symptom Survey (BIVSS)
Motor Free Visual Perceptual Test-3rd edition (MVPT-3)
Color perception test
Design copy test (house, clock, flower)
Line bisection
School vision questionnaire
King-Devick test (K-D)
Trail making test-A (TMT-A) (non-standardized)
Trail making test-B (TMT-B) (non-standardized)
Occupational Therapy-Driver off-road assessment (OT-DORA)
OT-DORA subtests
Road law road craft test (RLRCT)
Right heel pivot test (RHPT)
Drive home maze test (DHM)
Bells test
Weekly Calendar Planning activity (WCPA)
Independent Living Skills checklist
Stop light reaction test
JustPark reaction test
The unsafe kitchen safety assessment (clinical observation)
Disability Arm Shoulder Hand (DASH)
Fugl-Meyer Assessment of Motor Recovery after stroke (FMA) motor & upper extremity
Shoulder pain and disability index (SPADI)
Physical Assessment clinical observation
Functional range of motion (ROM)
Diadokokensis test
Finger to nose test
Digit opposition
Object pick up
Modified Fatigue Impact Scale (MFIS)
Assessments administered face to face in clinic
OPTEC 5500 vision screener
Simulator Systems (SSI) desktop driving simulator or Simulator Systems (SSI) cockpit simulator (Brake reaction time; lane maintenance & speed regulation)
Dynavision ™ D2
UE splinting and positioning needs

Tool assessment (lawn & garden tools; power tools)
Treatment Interventions via Telehealth Virtual Platform
Functional cognitive-perceptual tasks
McGill Hazard Perception Driving Training Tool (MHPDTT)
Road smart judgment
Visual search skills for driving
Pathways pre-driving program: functional problem-solving modules
Pathways pre-driving program: car budgeting modules
Pathways pre-driving program: car care modules
Pathways pre-driving program: state of Georgia driver licensing practice exam
Road sign recognition
Dashboard quiz
Home Activity Programs
Stop light tap
DriveFocus ™
Client education
Technology and device use
Pt pal: platform for remote monitoring of prescribed home exercise programs (HEPs)
RTD process- Pathways Driving Triangle
ORDE process
Distracted driving and injury prevention
Transportation alternatives
Licensing and renewal requirements
Vehicle modifications and adaptive equipment
Oculomotor HEP
Brock string
Pencil pushups
Hart charts
Upper Limb Home Exercise Programs
Repetitive task practice and task-oriented training skills for upper limb neuro-recovery
Mental practice via SaeboMind
Mirror box
Shepherd Center My Shepherd Connection Family Training website
Shoulder, elbow, hand, and grip strengthening
Range of motion and stretching via Flint Rehab
Fine motor coordination and manual dexterity
Keyboarding and typing tasks
Handwriting- Handwriting for heroes
Instrumental Activities of Daily Living (IADLs)
Driving and community mobility
Co-pilot community navigation
Planning community navigation
Gas station
Local grocery store
Topographical orientation using Google Maps

WCPA busy day worksheet
Way finding, map reading and GPS use
Active passenger tasks
Education in sensory regulation strategies
Driving Desensitization
Health Management
Medication management
Pathways OT key class: Medication Management education modules
Pathways medication management self-questionnaire
Pathways medication management: managing a pill box
Memory strategy and organization
Personal care device management: Accu-check
Nutrition management
Nutrition log
Meal and menu planning
Rest and sleep
Structured daily schedule
Sleep hygiene and positioning
Meal preparation and clean-up
Cold meal prep; microwave meal prep; stovetop meal prep
Shopping
Grocery shopping planning and problem-solving tasks
Online grocery shopping- using an app
Safety and emergency maintenance
Kitchen safety
Energy conservation techniques
Work simplification techniques
Adaptive equipment education on use and sourcing
Care of others
Childcare and parenting
Interventions administered face to face in clinic
Simulator Systems (SSI) desktop driving simulator
Splint fabrication
Physical Agent Modalities for electrical stimulation to upper limb