Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults

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August 2023

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Abstract

Social isolation and loneliness are significant problems for our society, especially for homebound older adults with age-related limitations and many acute and chronic illnesses. This Doctor of Nursing Practice (DNP) project is focused on reducing social isolation and loneliness in homebound geriatric patients by allowing interaction with the PARO robot during home visits. PARO is a highly sophisticated simulation robot and a medical device in the form of a baby harp seal. It has visual, tactile, auditory, temperature, and postural sensors, allowing effortless interaction with humans. The Food and Drug Administration (FDA) approved the device and categorized it as a Class II biofeedback machine (Shibata et al., 2021). Homebound adults ages 65 years and older living in Chicago and surrounding suburban areas participated in this project. They were recruited from the patients of Zinger Medical Offices, a primary care practice. Only medically stable and cognitively intact seniors were involved. The subjects received fifteen minutes of interactive sessions with the PARO robot twice a week for eight weeks. The UCLA Loneliness Questionnaire was completed before and after the intervention to evaluate the effectiveness of human-robot interactions. A paired T-test was used for data analysis and showed a significant difference between pre and post-intervention scores ($t(18)=7.1667$, $p < 0.0001$). Therefore, the project's results demonstrated the effectiveness of PARO interactive sessions in reducing social isolation and loneliness in homebound older adults.

Keywords: social isolation, loneliness, older adults, homebound, PARO robot, human-robot interactions, the UCLA Loneliness Questionaries, standardized, primary care.

Dedication

My scholarly work is dedicated to my Lord, Jesus Christ, and his mother, the Virgin Mary, for giving me the power and strength to complete the doctoral education and move forward with helping patients. I am also thankful to my family, especially my parents, husband, and daughters, for their love and support during the most challenging times of this educational journey. My immense respect and gratitude are to my academic advisor, Dr. Lisa Biancalana-Marsh, for her encouragement, teaching, and mentoring, which promoted my emotional, intellectual, and professional growth.

Acknowledgments

The project manager wanted to acknowledge the people who supported this DNP project's development and implementation. Notably, the scholar wanted to recognize Lisa Biancalana-Marsh, DNP, APRN-FPA, FNP-BC, TNS, who served as an academic advisor, mentor, and DNP faculty at Oak Point University, and who provided the student with extensive professional, academic, and personal guidance. My gratitude is extended to Dr. Eduard Zinger, a collaborative physician and clinical advisor, who allowed this project to be completed at Zinger Medical Offices and provided professional recommendations for improving care for homebound older adults. The DNP student is thankful to the patients who participated in the project and contributed to expanding the scientific body of evidence-based knowledge.

Executive Summary

Purpose: The purpose of this DNP project was to reduce social isolation and loneliness in homebound older adults by allowing interaction with the PARO biofeedback device during home visits. PARO is a baby seal robot used in this project as a therapeutic tool to increase the social engagement of patients, elicit their positive emotions, and promote emotional well-being through verbal, tactile, auditory, and visual stimulations.

Background and Significance: Social isolation involves a lack of contact with social support systems, including friends, family members, communities, and society (Henning-Smith et al., 2019). Such isolation affects social relationships, the ability to maintain social connections, and perceived social support. Social isolation and loneliness frequently occur together, yet they are different concepts. Social isolation is an objective state when a person has limited social contact or social relationships (National Academies of Sciences, Engineering, and Medicine, 2020). In contrast, loneliness is a subjective state when an individual feels isolated even despite being around other people. Social isolation and loneliness disproportionately affect older adults, but they are not a normal aging process.

The NASEM (2020) highlighted that one-fourth of the community-living older adults 65 years and older are socially isolated, and 43% of individuals over 60 perceive themselves as lonely. Social isolation contributes to the increased incidence of mental and physical illnesses, poor health behaviors, and frequent healthcare utilization (Lahlou & Daaleman, 2021; Davoodi et al., 2021). The geriatric population is predisposed to social isolation and loneliness due to contributing factors such as chronic illnesses, memory problems, loss of friends or family members, and sensory impairments (NASEM, 2020). Homebound older adults are at a higher

risk for social isolation since they are unable to leave their homes without assistance. They frequently depend on assistive devices, insurance-based or public transportation, and supportive programs due to their complex medical conditions (Bedard-Thomas et al., 2019). Furthermore, many homebound older adults completely restrict themselves from going outside, spending months in their homes with limited or no human contact. This behavior can be considered maladaptive because social isolation and loneliness contribute to multiple problems, including worsening physical health, mental decline, and poor quality of life (NASEM, 2020).

Since many homebound older adults have limited social interactions, visits from home health nurses and providers might be the only venues for these people to socialize (Centers for Disease Control and Prevention, 2021). In Zinger Medical Offices, a primary care practice, no formal approach existed to address social isolation in homebound older adults. If socially isolated patients were identified through the informal assessment, further actions were not taken due to limited information available for employees to address the problem. Therefore, many patients remain isolated and lonely, suffering detrimental consequences associated with isolation and limited social contact.

Methods: Twenty homebound adults ages 65 years and older were recruited from the population of patients of Zinger Medical Offices. The participants resided in a community independently or with their caregivers. They all lived in Chicago or the Northwest Suburbs of Chicago. Only medically stable and cognitively healthy seniors were involved. PARO interactive sessions were conducted twice a week for eight weeks, comprising 16 sessions. Notably, PARO is a medical device in the form of a baby harp seal. It has visual, tactile, auditory, temperature, and postural sensors, allowing effortless interaction with humans. The FDA approved the device and

categorized it as a Class II biofeedback machine (Shibata et al., 2021). The DNP student visited each participant at home to conduct the PARO session. The subjects interacted with PARO through unstructured activities such as greeting, petting, grooming, hugging, and talking. The participants received fifteen minutes of interactive sessions with PARO twice weekly for eight weeks. The UCLA Loneliness Questionnaires were completed before and after the intervention in pen and paper format to evaluate the effectiveness of human-robot interactions.

Findings: Nineteen participants completed the post-intervention UCLA Loneliness Questionnaires after the PARO interactive sessions. A substantial decrease in the post-intervention survey scores was observed. Among the nineteen people, the total score obtained on post-intervention surveys ranged between 24 and 45 points compared to the pre-intervention scores of 30 and 55 points. In addition, the mean value for the post-intervention total scores was 32.7, the median value was 31, and the mode value was 31. In contrast, the mean value for the pre-intervention scores was 42.5, the median value was 42, and the mode value was 48. The post-test total scores' standard deviation (SD) was 5.66 compared to 7.15 pre-intervention.

Moreover, out of nineteen subjects completing the post-intervention surveys, no participant (0%) scored a moderately high degree of loneliness between 50 and 64 points. In contrast, four subjects (21.1%) scored a moderately high degree of loneliness prior to the intervention. In addition, the number of individuals with a moderate level of loneliness between 35 and 49 points decreased from twelve subjects (63.2%) to six subjects (31.6%) on the post-intervention assessment. Furthermore, twelve participants (63.2%) scored a low degree of loneliness between 25 and 34 points compared to three subjects (15.8%) during pre-intervention. One subject scored 24 points, which is below the category of a low degree of loneliness.

Therefore, it was not included in any of the mentioned above categories. As a result, a low degree of loneliness became the most commonly observed on the post-intervention assessment instead of the moderate level of loneliness seen before the project implementation.

Furthermore, a paired T-test was used to detect changes in the pre and post-intervention scores. The differences between the pre and post-intervention scores were calculated by subtracting the post-test value from the pre-test value for each participant. The differences ranged between -1 and 22, with the mean difference being 10.59. The paired T-test showed a significant difference between pre and post-intervention scores ($t(18)=7.1667$, $p < 0.0001$). Therefore, strong evidence of a difference between the pre and post-scores was found. Consequently, this statistical analysis demonstrated that PARO interactive sessions reduced social isolation and loneliness in homebound older adults.

Conclusion: PARO interactive sessions were highly effective in decreasing social isolation and loneliness in homebound older adults, as demonstrated by the significant reduction in the post-intervention UCLA Loneliness scores and the statistical analysis results of the paired T-test. Human-robot interactions elicited positive emotions and joy in geriatric patients, supporting the benefits of using technologies for patient care in this population. Moreover, the UCLA Loneliness Scale can be applied in the clinical setting as a screening tool to identify patients with poor social involvement and detect changes in their degree of social isolation and loneliness. Finally, PARO interactive sessions can potentially be utilized as a therapeutic approach to other patient populations and clinical settings due to the simplicity of the intervention, the substantial benefits seen in this and other evidence-based projects, and the lack of standardized approaches to address the social isolation and loneliness problem in the medical field.

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CHAPTER 1: INTRODUCTION

Utilizing the PARO Therapeutic Device to Decrease Social Isolation in Homebound Older Adults

Social isolation is a significant problem for our society, especially during the COVID-19 pandemic when lockdown policies and mandatory physical distancing prevented people from having unrestricted interaction with others. The National Academies of Sciences, Engineering, and Medicine (2020) highlighted that approximately one-fourth of the community-living older adults ages 65 years and older are socially isolated. In addition, 43% of individuals over the age of 60 perceive themselves as lonely (NASEM, 2020). Poor socialization affects the physical and mental health of individuals, producing many detrimental consequences. The effect of social isolation is significant and similar to the adverse health outcomes associated with obesity or smoking 15 cigarettes per day (Davoodi et al., 2021). Social isolation leads to an increased incidence of heart disease, stroke, high blood pressure, weight gain, and poor immune functioning (National Institute on Aging, 2019). It is associated with more frequent healthcare utilization, emergency room visits, and hospitalizations (NASEM, 2020). Limited social involvement also contributes to mental and cognitive decline, increasing anxiety, depression, and dementia in the affected individuals. Moreover, social isolation augments chronic health conditions, and it predisposes people to disease-related premature death (NASEM, 2020). Therefore, addressing social isolation is an essential task for healthcare providers who strive to improve the quality of patients' lives and health-related outcomes. The purpose of this evidence-based project (EBP) is to identify people at risk for social isolation, recognize the impact of social isolation on physical and mental health, analyze existing evidence on how to mitigate this problem, and offer strategies for providers to reduce social isolation with their patients.

Problem Statement

Social isolation involves a lack of contact with social support systems, including friends, family members, communities, and society (Henning-Smith et al., 2019). Such isolation affects social relationships, the ability to maintain social connections, and perceived social support. Social isolation and loneliness frequently occur together, yet they are different concepts. Social isolation is an objective state when a person has limited social contact or social relationships (NASEM, 2020). In contrast, loneliness is a subjective state when an individual feels isolated even despite being around other people. Social isolation affects older adults disproportionally, but it is not a normal process of aging. The geriatric population is predisposed to social isolation and loneliness due to certain contributing factors such as chronic illnesses, memory problems, loss of friends or family members, and sensory impairments (NASEM, 2020). Furthermore, many homebound older adults completely restrict themselves from going outside, spending months in their homes with limited or no human contact. This behavior can be considered maladaptive because social isolation and loneliness contribute to multiple problems, including worsening physical health, mental decline, and poor quality of life (NASEM, 2020). Therefore, promoting socialization in older adults is an essential duty for healthcare providers.

To combat social isolation, various interventions were developed. Some of them involved facilitating social connectedness and interactions, forming friendships, developing new skills, and participating in leisure activities (Williams et al., 2021). Other approaches integrated psychological therapies, healthcare provision, and animal-assisted therapies. Utilizing animals to reduce social isolation and loneliness was also very successful. Both artificial and real pets showed an equivalent effect on promoting psychological and mental well-being (Williams et al., 2021). Despite having great success in supporting socialization among the general public, these

therapies can be difficult to apply to homebound older adults. In particular, homebound individuals frequently suffer physical and mental limitations, are unable to navigate their communities, have limited financial resources, and lack the manual dexterity to perform complex skills or care for a real pet. Therefore, utilizing technologies can be an alternative intervention to increase their social involvement.

The PARO therapeutic device is a biofeedback baby seal robot created to promote emotional well-being and social engagement in people with dementia, psychosocial disabilities, anxiety, depression, cancer, post-traumatic stress disorder, and brain injuries (Shibata et al., 2021). It is an FDA-approved medical device, and it is used in many countries for therapeutic and recreational purposes. PARO can also reduce social isolation in homebound older adults as its beneficial effect was seen in many other populations. Therefore, this DNP project is focused on utilizing the PARO therapeutic device to promote socialization and emotional well-being in homebound older adults through increased social contact and positive emotions associated with human-robot interaction.

Objectives and Aims

The aim of this DNP project was to reduce social isolation and loneliness in homebound older adults by allowing interaction with the PARO biofeedback device during home visits. The PARO baby seal robot was utilized to increase the social engagement of patients and elicit their positive emotions through verbal, tactile, auditory, and visual stimulations.

The following objectives were developed:

- To identify the perceived level of social isolation and loneliness in homebound older adults by using the UCLA Loneliness Scale

- To promote patient socialization and positive emotional responses through the interaction with the PARO therapeutic device during home visits for fifteen minutes twice a week for eight weeks
- To evaluate the effectiveness of the patient-device interaction in reducing social isolation and associated loneliness as measured by the UCLA Loneliness Scale.

Significance of the Practice Problem

Social isolation is prevalent among the elderly population, as "43% of all community-dwelling older adults report being socially isolated" (Henning-Smith et al., 2019, p. 540). The number of people 65 years and older will increase and override the number of children ages 0 to 18 years by 2023, and it will double by 2050, projecting 83.7 million geriatrics worldwide (Bedard-Thomas et al., 2019; Galea et al., 2919). The expected growth in the geriatric population will increase the prevalence of social isolation since older people are at a higher risk of poor socialization due to family losses, living alone, and health-related problems. Chronic diseases, physical and mental disabilities, and mobility problems negatively influence individual social engagement (Bedard-Thomas et al., 2019). In addition, homebound older adults are at a higher risk for social isolation since they are unable to leave their homes without assistance. They frequently depend on assistive devices, insurance-based or public transportation, and supportive programs due to their complex medical conditions (Bedard-Thomas et al., 2019). The caregivers of homebound older adults are also affected by social isolation and loneliness. This is a common burden associated with providing care to frail and dependent geriatric people (Sun et al., 2019). Both paid and unpaid caregivers frequently miss social activities. They do not have sufficient break times for personal lives as related to supporting physically ill and debilitated vulnerable older adults (Sun et al., 2019).

The global perspective of social isolation is widely recognized. The World Health Organization (2021) emphasized that social isolation in older adults is a growing public threat. Approximately one of every three older adults is socially isolated or lonely. In Europe, 20-30% of the geriatric population feels lonely. A similar prevalence is seen in Latin America and China where 25-32% and 29.6% of older adults lack meaningful social relationships. In contrast, a higher number of isolated older adults is noted in India, comprising up to 44% (WHO, 2021). In addition, loneliness and social isolation affect approximately 25-29% of older adults in the United States and 20-34% of older people in 25 European countries (WHO, 2021).

Loneliness and social isolation are very common concerns that produce many detrimental consequences. Poor social involvement is associated with up to 30% increase in mortality rates, including premature death. The WHO (2021) recognized that social isolation and loneliness predispose people to cardiovascular diseases, diabetes, stroke, high cholesterol, cognitive decline, and mental problems, including depression, anxiety, and suicidal ideation. Moreover, similar detrimental health outcomes are seen with conditions including smoking, obesity, sedentary lifestyle, substance abuse, and inadequate access to healthcare that have been addressed for decades by major health organizations.

Furthermore, trends across the world showed a large increase in loneliness and social isolation (WHO, 2021). Urbanization, immigration, social discrimination, unemployment, and divorce all have increased the incidence of social isolation in the older population. At the community level, disorganized or poorly planned environments, inadequate transportation, remote living, and low socioeconomic status prevent older adults from navigating around their neighborhoods, predisposing them to loneliness and poor social involvement (Galea et al., 2019; WHO, 2021). Some vulnerable groups are particularly at risk, including people with physical and

mental problems, the LGBT population, ethnic minorities, older adults, and immigrants (WHO, 2021).

The lockdown policies and social distancing during the COVID-19 pandemic also increased the incidence of social isolation in older adults (Yu & Mahendran, 2021). People were asked to remain in their homes and limit social gatherings. Meanwhile, some places employed 'no visitor' policies. Many recreational activities and centers were closed, leaving the elderly people without a venue to socialize (Davoodi et al., 2021). Community-dwelling older adults remained in their homes for months suffering isolation, anxiety, and depression. Consequently, many individuals shifted their social interactions to more technology-based communication, yet many older adults were unable to adjust to this change due to limited resources, inadequate knowledge, and poor cognitive or physical skills (Yu & Mahendran, 2021).

Social isolation predisposes older adults to poor health outcomes, making the Medicare program spend $7 billion annually (Henning-Smith et al., 2019). The effect of social isolation is significant, contributing to the increased incidence of mental and physical illnesses, poor health behaviors, and frequent healthcare utilization (Lahlou & Daaleman, 2021; Davoodi et al., 2021). Social isolation diminishes the immune system and increases stress response, leading to higher blood pressure, worsening of depression, increased suicide, poor cognitive functioning, memory decline, and increased risk for Alzheimer's disease (Henning-Smith et al., 2019). Social isolation and loneliness are associated with behavioral problems such as poor eating habits, medication non-adherence, decreased physical activity, higher alcohol consumption, and more smoking (WHO, 2021). Poor social involvement affects the quality and quantity of sleep, negatively influencing the physiological repair processes that occur at night (WHO, 2021). According to the Centers for Disease Control and Prevention (2021), social isolation is associated with an

increased risk of heart problems by 29%, stroke by 32%, dementia by 50%, and premature mortality from all causes. Over the last year, social isolation contributed to the increased mortality rate by 20% in older adults with dementia and Alzheimer's disease (Davoodi et al., 2021). Moreover, older males and females who are socially isolated and lonely are at a higher risk for abuse and violence. In particular, the prevalence of these events increased in the U.S. during the COVID-19 pandemic and was associated with the poor social involvement of the geriatric population (WHO, 2021).

Since many homebound older adults have limited social interactions, visits from home health nurses and providers might be the only venues for these people to socialize (CDC, 2021). This creates a challenge for clinicians who might not have sufficient time or expertise to address social isolation with their patients. In this primary care practice, there was no formal approach to managing social isolation and loneliness in homebound older adults. If socially isolated or lonely patients were identified through the informal assessment, no further actions were taken due to limited information available for employees to address the problem. Therefore, many patients suffered detrimental consequences associated with isolation and limited social involvement. This produced a professional and ethical dilemma for healthcare providers striving to promote patients' health through both physical and psychological well-being.

Synthesis of the Literature

Prevalence of social isolation and loneliness in older adults and contributing factors

Bedard-Thomas (2019) studied the experiences and perceptions of homebound older adults regarding loneliness and social isolation. The researcher stated that the increase in the number of homebound older adults may lead to the worsening of social isolation and loneliness in this group secondary to health-related needs, physical problems, and mental illnesses. This

study involved eight homebound patients ages 55 to 96 years old who received care from a home-based primary practice in the Midwest. Subjects received semi-structured interviews and questionnaires focusing on the social aspects of their life, such as social support, feeling of loneliness, and living circumstances. The results revealed that 85% of subjects experienced social isolation, as was measured by the surveys. The analysis of the interviews showed that 100% of participants were socially isolated and 27% of them were lonely. In addition, Bedard-Thomas (2019) identified that the participants felt socially isolated despite living in a city and residing in senior apartments. Some of the barriers to social engagement included chronic medical conditions, mobility problems, disabilities, and the use of assistive devices. Socialization for these people was limited to phone calls from friends and relatives as their physical limitations and illness prevented their social engagement with others. Moreover, public transpiration was a barrier to socialization on an ongoing basis even though all subjects resided in urban areas. Social isolation was very prevalent and correlated with environmental and physical barriers, such as the need for transportation, assistive devices, disability, and safety. In contrast, loneliness was related to a lack of friends, poor family support, and infrequent interactions with others.

The high prevalence of social isolation among older adults was also noted by Hoffman et al. (2022). This research involved a national online survey administered in January 2021 to adults ages 50 to 80 years old. The purpose of this research was to identify the relationships between social isolation, physical activity and function, and fall episodes as related to the COVID-19 pandemic. Specifically, 2,023 participants completed internet-based surveys. The study discovered the worsening of social isolation during the COVID-19 pandemic. In particular, 45.9% of respondents indicated being socially isolated, and 37.1% of subjects responded having

no companionship. In addition, 36.9% of individuals informed that they decreased their activity levels, and 37.1% of people reduced their walking time since the onset of COVID. Socially isolated individuals were twice as likely to report mobility and physical deconditioning. The relationships between social isolation, reduced physical activity level, and less time spent on feet were analyzed by multivariable regression. The results discovered that this combination contributed to physical decline, worsening of mobility, and a higher risk and fear of falling. Therefore, social isolation that was already prevalent in older adults became even more common during the pandemic. As socially isolated individuals become more restricted in their physical activities and walking, they started to show physical decline and more risk of falling.

Social isolation and its impact on the daily lives of older adults were also examined by Merchant et al. (2020). This cross-sectional observational study explored the prevalence of social isolation and its effect on physical and mental well-being in the geriatric population. The research involved 202 community-dwelling older adults living in Singapore. The surveys were administered to participants and were focused on the aspects of social isolation, functional status, frailty, social-demographic characteristics, chronic illnesses, and medication use. The participants also completed an activity performance test to measure their physical functioning. The results revealed that 45.5% of subjects were at risk for social isolation, with almost half of all respondents lacking a reliable friend with whom they could talk or receive help (Merchant et al., 2020). Moreover, people with impaired gait and poor cognitive health were more likely to rely on others for assistance, and they were more often isolated. In addition, strong associations between gait speed and social isolation were noted. In particular, a slower gait speed was correlated with frailty, muscle wasting, and poor health outcomes. Consequently, people who

were socially isolated were more likely to suffer chronic illnesses and poor general health, leading to higher morbidity and mortality in this age group.

Similar findings were noticed by Hajek et al. (2020), who conducted a systematic review to identify the relationship between social isolation, loneliness, multimorbidity, and social fragility. The following databases were utilized, including PubMed, CINAHL, and PsycINFO. The literature search was performed between July and August 2020. The eight studies published between 2014 and 2019 were selected. The results discovered a strong relationship between loneliness and multimorbidity. In particular, having multiple illnesses affected the quality of connections with others. The poor quality of relationships predisposed people to loneliness and affected their social networks. In addition, decreased physical activity was frequently seen in middle-aged and older adults with multiple chronic illnesses. This low level of physical activity negatively affected the quality of relationships and predisposed the subjects to isolation and loneliness. Hajek et al. (2020) emphasized that poor social relationships are strongly related to multimorbidity and predispose people to social fragility. Therefore, reducing loneliness and social isolation in middle to older adults and people with multiple illnesses can improve their health, well-being, and the quality of their lives.

The applicability of social and companion robots for human-robot interactions

Social isolation and loneliness are extremely prevalent in homebound older adults due to their age-related imitations, multiple chronic diseases, and environmental factors. Consequently, interventions designed to increase socialization in the general population, such as increasing physical activity, attending social gatherings, and joining support groups became difficult or even impossible to employ with older homebound people. As the result, many policymakers and stakeholders shifted their focus to technological interventions as the means to increase

socialization in older adults (Lambert et al., 2020). Social or companion robots are devices that have either human or animal characteristics. They can produce stimulation, interaction, and the exchange of information with people, positively influencing their well-being and quality of life.

A systematic literature review was performed by Shourmasti et al. (2021), who examined the experiences of people using social robots. The literature search was completed across the following databases, including Google Scholar, IEEE Xplore, Springer, ACM Digital Library, and ScienceDirect. The review included 20 studies out of the initial 2303 publications. The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method was used to appraise the publications. The results discovered a shift from using robots as tools to support industrial labor to more public and social applications (Shourmasti et al., 2021). In particular, social robots became commonly utilized in various fields such as healthcare, home setting, education, culture, and social work. They are readily accepted by seniors and are valuable for individuals with special needs, especially older adults and people with dementia (Shourmasti et al., 2021). Social robots assist people with daily tasks, promote communication and interaction, support teaching and learning, and perform commercial work (Shourmasti et al., 2021). Despite the increasing utilization of social robots, some individuals may feel uneasy or unusual during their initial encounters with devices. Shourmasti et al. (2021) found that allowing repeated human-robot interactions helped users to accept robots more readily and appreciate the usefulness of these devices. Furthermore, this systematic review revealed that the evaluation of social robots must be performed regularly to ensure that these devices accomplish their purpose. This can be done by using interviews, surveys, logs, sensors, focus groups, and video recordings (Shourmasti et al., 2021). Moreover, the assessment of human-robot interaction is preferred to be completed in a real-world environment, and it must be focused on the quality of interactions

rather than on the function of devices. This will allow researchers to better understand the expectation of people regarding social robots and their experiences.

Lambert et al. (2020) conducted a systematic review focusing on using social robots for human-robot interaction. This review included 86 studies that were published between 2008 and 2018. The literature search was performed by utilizing online libraries of the Institute of Electrical and Electronics Engineers and the Association for Computing Machinery. In addition, the PRISMA method was used to evaluate the studies, which were classified based on their application and contribution to research. A total of 35 robots were included in the review, such as humanoid robots, animal robots, and other robots not falling into any of the first two categories. The most investigated areas involving social robots were social effects and companionships, followed by a social definition, healthcare, and education. In particular, robots showed a positive effect on the social connection of participants by fostering their communication and companionship. This is especially important for seniors, who are often isolated compared to the general population. In addition, robots became commonly utilized in healthcare and residential facilities to monitor the emotional and physical well-being of individuals and track their health-related changes when providers are not around (Lambert et al., 2020). Moreover, social robots are also used for educational purposes, especially during the early years of life when tutoring and personalized lessons are important. This wide application of robots was also noticed by Shourmasti et al. (2021), emphasizing the value of these devices in supporting the social needs of individuals and their communities. Furthermore, people and robots have different social expectations and priorities (Lambert et al., 2020). Individuals preferred devices with human-like behaviors which promoted engagement and interaction (Lambert et al., 2020). In contrast, robots interacted with subjects, engaged in human-like conversations, and produced decision-making

processes. However, these interactions were based on algorithms, making some people resistant to having human-robot interactions. To overcome the negative attitudes toward robots, Shourmasti et al. (2021) suggested utilizing individualized interactive sessions, which showed to increase the acceptance of social robots by the participants.

Marcos-Pablos and García-Peñalvo (2022) conducted a systematic review focusing on the application of robots for education in healthcare. The authors emphasized that robots are frequently utilized for surgical, rehabilitation, and assistive training. Specifically, robots help imitate the situations of actual surgeries, allow students to master surgical skills and preoperative assessment, and assist with educating patients during rehabilitation. For assistive training, robots also permit students to practice medical techniques and procedures by reproducing humans' physiological and structural properties. However, these devices can also be employed for didactic education beyond the surgical and rehabilitation settings. Therefore, this systematic review aimed to explore the application of robots for healthcare education outside of surgical and rehabilitation settings and examine the usefulness of these devices for teaching-learning processes (Marcos-Pablos & García-Peñalvo, 2022). A literature search was conducted in Scopus and Web of Science databases, containing publications from Cochrane, Embrace, and Medline libraries. The inclusion criteria involved peer-reviewed articles describing the application of robots for healthcare education. However, publications shorter than three pages were excluded due to their limited ability to meet the quality review. A total of 26 studies were selected for this synthesis. The PRISMA method was used to analyze the studies. The qualitative data was extracted by identifying research questions, patterns, and themes. Then, coding was performed.

The results revealed that robots are commonly used for didactic education as human-patient stimulators (Marcos-Pablos & García-Peñalvo, 2022). They can represent a single body

part or the entire human body. In addition, the degree of movement varied between robots, with most devices being able to move at least one joint they were intended to imitate. Moreover, robots were frequently utilized for educating students on treatment and rehabilitation skills, such as joint restoration, mechanical ventilation, and cardiopulmonary resuscitation. Moreover, robots are employed for teaching health assessment techniques, diagnostic procedures, such as colonoscopy or endoscopy, and pain assessment through the changes in the facial expressions of these devices (Marcos-Pablos & García-Peñalvo, 2022).

Furthermore, various healthcare fields utilize robots, including physiotherapy, neurology, gastroenterology, intensive care, and dentistry. Importantly, these devices are used with different learners, such as patients, nursing students, interns, residents, and attending physicians. This signifies the applicability of robots to diverse consumers and healthcare settings. Likewise, the authors noticed a wide range of learning methods that robots can stimulate. For instance, these devices facilitated kinesthetic learning by allowing students to perform manual or hands-on manipulations (Marcos-Pablos & García-Peñalvo, 2022). Robots also promoted audio and visual education by showing facial expressions, enabling direct examination, and demonstrating video lectures. Lastly, robots helped to evaluate learning processes by following a predetermined checklist, recording movements or manual manipulation of medical procedures, and administering voice commands according to students' performance (Marcos-Pablos & García-Peñalvo, 2022). To summarize, this systematic review showed a broad application of robots for education in healthcare and the beneficial effect of these technologies on promoting the teaching-learning processes.

The preferences of older adults regarding social and companion robots

Bradwell et al. (2019) studied the differences in the perceptions of older adults and developers regarding companion robots. This research questioned whether the characteristics of a companion robot can influence the acceptance of the device and its usefulness. This qualitative study involved 17 adults ages 60 years and older and 18 developers. The interaction stations were arranged with eight different robots. The participants were allowed to interact with robots for 10 minutes. They were video recorded and had focused group discussions. The data was evaluated by coding and thematic analysis. The results showed that older people preferred interactive robots capable of providing responses and reactions toward them rather than producing random sounds or movements. Similar findings were noticed by Lambert et al. (2020), who also recognized the preferences of individuals toward interactive robots that kept people engaged. In contrast, non-interactive robots generated negative reactions and feelings of disappointment in the subjects as these devices appeared lifeless (Bradwell et al., 2019). Additionally, older adults preferred animal-like robots, such as cats or dogs, that could respond to their commands and maintain eye contact. Subjects reported that animal robots reminded their real pets, which fostered their reminiscence and memories about the past. Moreover, the features of a device, such as a realistic look, familiarity, or breathing imitations, were perceived beneficial since these characteristics produced real-like experiences for the participants. Subsequently, many older adults named companion robots, signifying the development of human-robot relationships (Bradwell et al., 2019). Notably, animal robots were the most frequently named devices, and geriatric people readily accepted them.

Furthermore, the external appearance of robots was important. Older people favored devices with big eyes and a soft furry covering. The developers also expressed the importance of

interactive robots and a soft outer layer. However, they were more interested in the artificial designs of these devices rather than their animal-like appearance. Lastly, people reported the benefits of having a pet robot due to less care and maintenance as compared to a real pet. This makes animal robots especially suitable for promoting companionship to older adults who may have difficulties maintaining a living animal. In conclusion, robots are valuable tools for providing social interaction and engagement for older adults as these devices promote interaction, stimulate engagement, and foster positive memories.

Chiu et al. (2021) investigated the preferences of middle and older adults for using companion robots. This cross-sectional study was performed from May to June 2018 and involved 273 community-dwelling adults ages 45 years and older living in Taiwan. The questionnaires were used for data collection, focusing on subjects' sociodemographic characteristics, mental and physical health, technology use, and personal experiences using robots and pets. The video presentation was provided and described different companion robots, such as human-like robots, animal robots, and nonbiological devices. The results revealed that 94.2% of participants did not receive animal-assistive therapies, and 82.1% of subjects never used robots. In contrast, 63.6% of people had prior experience with keeping a real pet. Moreover, the acceptance of pets and robots varied among individuals. In particular, 33.8% of participants preferred both pets and robots, 23.3% wished to interact with pets, and 17.5% favored robots. In contrast, 25.4% of subjects accepted neither pets nor robots, suggesting that personal preferences greatly influence the acceptance of animals and robots. Furthermore, people with multiple illnesses and those who had prior technology experience were more likely to accept robots than pets. Individuals who kept a real pet previously favored both animals and robots. Additionally, the appearance of companion robots was evaluated in this research. The results showed that

39.2% of individuals preferred an animal robot, 30% favored an adult-resembling robot, 17.9% wished for an infant-like robot, and 8.9% chose a nonbiological robot. The preference for animal robots was seen in all subjects regardless of their ages.

Moreover, subjects had specific preferences regarding the function of robots. For example, 88% of people wanted companionship robots to provide recreation and skill activities, such as telling the news, dancing, joking, singing, and making expressions (Chiu et al., 2021). Likewise, 77.1% of participants wanted robots to deliver family services, 66.7% preferred interactive functions, 61.3% desired health monitoring, and 60% favored safety monitoring. Thus, recreation and skill activities were the most appreciated, making companion robots valuable for social and interaction purposes. Furthermore, individuals older than 55 favored companion robots with recreation functions compared to younger participants who wanted robots with service-type abilities. Importantly, people who lived alone preferred the interactive features of robots, making these devices helpful for promoting companionship for people with limited social involvement. Ultimately, this study showed that robots are well accepted by middle and older adults, with individual preferences and prior life experiences playing an important role.

Utilizing robots to reduce social isolation and loneliness

Since social robots are utilized to provide companionship to older adults, their usefulness for reducing social isolation and loneliness is explored by researchers. Hudson et al. (2020) evaluated the effectiveness of robotic pets in decreasing loneliness in community-dwelling older adults. This research was the second phase of a large study that explored the health problems of people covered by UnitedHealthcare under AARP Medicare Supplement plans. This qualitative study included 20 individuals ages 65 and older living in their homes in New York. Participants received a robotic cat or a dog, depending on their personal preference. Subjects interacted with

these devices for 60 days. Semi-structured interviews were administered by focusing on the effect of the robot on the daily lives of participants. The research discovered that people valued robotic animals due to less maintenance as compared to keeping real pets. Subjects were curious about technology, especially for the purpose of personal relationships. Some limitations of these devices included the inability of robots to maintain affection, lack of character, and the failure of devices to perform certain tasks, such as walking outdoor (Hudson et al., 2020). These negative reports were likely verbalized by those individuals who recently lost their real pet. In addition, the level of human-robot engagement varied significantly. More independent people were less likely to engage with these devices. Active and independent individuals were prone to give away or borrow the device to others. In contrast, older adults with limited social connections interacted frequently with robotic pets. They kept robots in visible areas and were touching, hugging, and petting the device. The highly engaged individuals were less likely to share their pets.

Moreover, the interactive features of these robots, such as blinking, barking, meowing, and head movement, facilitated human-robot interaction by stimulating physical and verbal contact (Hudson et al., 2020). In response to these stimuli, people were likely to touch the robots or talk to them. The ability of robotic pets to stimulate participants' engagement created opportunities for companionship. For example, when these pets were taken outside, people had more robust interactions with others as these devices stimulated interest and prompted conversations. Lastly, robotic animals positively influenced the emotional well-being of participants. The interactions with robots promoted feelings of relaxation and affection in the subjects. Robotic animals produce a sense of presence in older adults, reducing the perception of loneliness by fostering companionship.

Pu et al. (2019) conducted a systemic review focusing on the effectiveness of using social robots with older adults in terms of physiological, psychological, quality of life, and medication use outcomes. The search utilized eight online databases, including ProQuest, Scopus, PubMed, CINAHL, Medline, Science Direct, Cochrane Library, PsychINFO, and Web of Science. Thirteen publications from eleven RCTs were selected for the review, and they were published between 2008 and 2017. All studies were focused on using social robots with older adults. These RCTs were conducted in assistive living facilities, home settings, daycare centers, and hospitals. The total number of people from all studies was 1,042, with 80% of them having memory impairment. Both human-like and animal robots were used for intervention and involved individual and group interactions. The interactive sessions ranged between 10 to 45 minutes and lasted from 5 to 12 weeks. The results revealed that social robots are effective in reducing agitation and anxiety in older adults (Pu et al., 2019). They have a positive influence on the psychological and social well-being of participants. In particular, social robots increased social interaction and the engagement of the geriatric population, as was seen by direct observations and video recording (Pu et al., 2019). In addition, participants were more involved with robots than with soft toys, and they had robust interactions, communications, and positive expressions during interventions (Pu et al., 2019).

Moreover, human-robot interaction reduced loneliness in the subjects by promoting communication between older adults and devices (Pu et al., 2019). Importantly, individual sessions were preferable to group meetings since they allowed personalized engagement with robots. The importance of having individualized sessions was also noticed by Shourmasti et al. (2021), as these meetings improved the engagement with and acceptance of these devices by geriatric people. Furthermore, the physiological effect of interactions with social robots included

the improvement of sleep, cardiac status, and oxygenation in older people. However, no changes were noticed in the participants' body mass index. These results can be explained by the reduction of stress and anxiety levels which were reported by the participants and measured by their saliva cortisol levels and galvanic skin responses (Pu et al., 2019). Notably, human-robot interactions did not significantly affect depression, apathy, and cognition in older people. In contrast, engagement with social robots helped to reduce the use of psychotropic medications in patients with severe cognitive deficits and the need for pain medicines in the intervention groups (Pu et al., 2019). To summarize, the interactions with social robots produced favorable effects on the physiological, psychological, and social well-being of the geriatric population, along with the reduction of medication use.

Practice Recommendations

The literature synthesis was conducted to explore the significance of social isolation in older adults and identify a potential solution to overcome this problem. The evidence showed the high prevalence of social isolation and loneliness in homebound older adults (Bedard-Thomas, 2019; Hoffman et al., 2022; Merchant et al., 2020). Importantly, the individual characteristics of seniors, such as chronic medical conditions, mobility problems, and functional limitations, all contribute to ineffective social involvement in this population (Bedard-Thomas, 2019; Hoffman et al., 2022). The poor physical and mental health of individuals is found to be related to less social involvement and more frequent isolation of older adults (Merchant et al., 2020). Seniors with impaired gait and poor memory are more likely to rely on caregivers for assistance, and they frequently lack meaningful relationships. Individuals with multiple illnesses are prone to loneliness since multimorbidity negatively affects the quality of relationships with others (Hajek et al., 2020). In addition, the surrounding environment of older adults affects their ability to

engage with others since these individuals are frequently dependent on public transportation and assistive devices to navigate their communities (Bedard-Thomas, 2019). The COVID-19 pandemic created a profound effect on the physical and social lives of older people. Seniors became more socially isolated and less active during the pandemic, leading to the worsening of their well-being, overall health, and higher risks of falling (Hoffman et al., 2022).

The importance of this literature review was to recognize that healthcare providers must address social isolation and loneliness with their patients as these problems are highly prevalent, especially for homebound older adults. Notably, the individual characteristics of seniors, environmental barriers, and pandemic-related restrictions created significant problems for the socialization of this patient population. Consequently, interventions designed to promote social engagement in the general population, such as increasing physical activity, attending social gatherings, and joining support groups, are difficult and sometimes impossible to employ with older homebound individuals. Therefore, the application of social robots for human-robot interaction is now commonly used, including healthcare, home sitting, education, and social work (Shourmasti et al., 2021; Lambert et al., 2020).

The design and functions of a companion robot are important characteristics for accepting these devices (Bradwell et al., 2019). Animal-like robots with recreational and interaction functions are preferred by older adults (Chiu et al., 2021). Interactive robots with pleasant animal-like appearances are shown to promote the engagement of older people, increase their interaction, and foster positive memories (Bradwell et al., 2019). Moreover, seniors who live alone or suffer from multiple diseases enjoy interactions with devices through physical and emotional contact, making the application of social robots particularly useful in providing companionship to this patient population. (Chiu et al., 2021; Hudson et al., 2020). Consequently,

social robots are valuable tools for supporting social interaction in older people, as this evidence was seen across multiple studies presented in this literature synthesis. Therefore, the practice recommendation for this DNP project was to utilize a companion animal-like robot for the purpose of reducing social isolation and loneliness in homebound older adults by increasing their engagement through human-robot interaction.

Evidence-Based Intervention

The PARO therapeutic device was selected as a practice intervention to address social isolation and loneliness in homebound older adults by promoting socialization and positive emotions through human-robot interactions. PARO is a medical device in the form of a baby harp seal. It has visual, tactile, auditory, temperature, and postural sensors, allowing effortless interaction with humans. The device is approved by the FDA and categorized as a Class II biofeedback machine (Shibata et al., 2021). Notably, the evidence highlighted that PARO helps to decrease depression, anxiety, pain, and the use of psychotropic medications (Shibata et al., 2021). It improves mood and reduces both psychological and behavioral symptoms of dementia. Most importantly, PARO illustrates the benefit of eliciting positive feelings and increasing social engagement, including visual contact, verbal interaction, and activity participation, which are the primary goals of this DNP project (Shibata et al., 2021).

CHAPTER 2: THEORETICAL FRAMEWORK

Applicable Nursing Theory

The Adaptation Model of Nursing, developed by Sister Callista Roy, was used to analyze the problem of social isolation in older adults. This theory describes the relationships between individuals and their environment. It incorporates the concepts of a person, environment, health, and nursing. A person constantly interacts with the environment and can be described as an

individual, group, or community. The environment is the surrounding of an individual and involves its circumstances, conditions, and forces that directly affect the behavior. The health of a subject depends on a personal ability to adapt to changes. Lastly, nurses are the facilitators of adaptation and are valuable in supporting positive behavioral changes (Current Nursing, 2020).

The theoretical analysis was started by identifying a person in this scholarly project, the community-dwelling older adult. The Adaptation Model stated that the individual's consciousness, which involves innate and acquired thinking and feeling, influences the ability of a person to adapt to environmental changes (Current Nursing, 2020). Individual factors such as being a female, lower education, poor physical fitness, ineffective sleeping, loneliness, increased depression, and the availability of close relationships influenced social isolation in the geriatric population (Cho et al., 2019; Merchant et al., 2020). Having social support systems such as regular phone calls from friends and families improved the social lives of older people, contributing to more positive behaviors and their well-being (Bedard-Thomas, 2019). Therefore, personal factors greatly influence the ability of older adults to adapt to their environment.

The second concept of the Adaptation Model emphasized that the environment and its forces interact with people, promoting or hindering their adaptation (Current Nursing, 2020). Urbanization and the physical structure of cities bring many challenges. Transportation, including public and insurance-paid, was identified as one of the major barriers to social lives in geriatrics (Bedard-Thomas, 2019). The availability of green spaces, pathways, and safe neighborhoods promoted social interactions among neighbors and improved their social ties (Galea et al., 2019). The lockdown policies during the COVID-19 pandemic restricted the ability of elderly people to engage with their communities, and 'no visitor' policies prevented older

adults from seeing their loved ones. The feeling of isolation was fostered by the inability of a person to leave his or her home even if it was in the city (Bedard-Thomas, 2019).

The health of a person, which is a third concept of the Adaptation Model, influenced the ability of older adults to maintain social connections. This theory defined health as the ability of an individual to effectively cope with his or her limitations but not the freedom from illnesses, stressors, or death (Current Nursing, 2020). This is very applicable to the geriatric population who frequently have multiple acute and chronic illnesses. The dependence on others and the inability to control the extension of someone's assistance was the barrier to social engagement. Chronic health conditions and mobility problems of older adults greatly influenced their ability to interact with others, yet individual characteristics and resilience played an important role in the way people perceived their health (Bedard-Thomas, 2019).

The last concept of the Adaptation Model is the importance of nursing care in promoting adaptation in patients (Current Nursing, 2020). Nurses are perceived as the facilitators for adaptation who can assess patients' behaviors, eliminate poor coping mechanisms, change the way patients react to their environment, and promote adaptation through positive interpersonal relationships (Current Nursing, 2020). Using nurses to facilitate the social involvement of older adults is beneficial because they are the most frequently involved with the geriatric population through their work in hospitals, community centers, medical offices, and home health agencies. As essential workers, nurses continue to maintain close contact with their patients, and they can detect, communicate, and provide necessary interventions when problems are identified.

Roy's Adaptation Model supported this DNP project because it defines humans holistically, explaining that many factors affect the adaptation of a person. The internal and external characteristics and experiences of individuals shape how people perceive social isolation

in the context of personal health and living environment. This allows nurses to promote a positive adaptation in homebound older adults through the manipulation of individual factors and surrounding stimuli.

Change Model

The Diffusion of Innovation theory developed by Rodgers E. M. in 1964 was selected to support the DNP project. This theory was revised multiple times, with its final fifth education published in 2003. The Diffusion of Innovation is a change theory focused on the adaptation of a new idea or innovation to individuals and organizations. Rogers (2003) emphasized that many technological advancements, even those that are beneficial, are adapted very slowly or sometimes never. The uncertainty of using new technologies can be a significant barrier to adaptation. It can be resolved by offering information regarding innovation and answering questions and concerns.

In this EBP project, the PARO therapeutic device is an innovation designed to address social isolation and loneliness in homebound older adults. This robot was never utilized in this primary care practice for treatment or recreational purposes. In addition, patients were unaware of this technology and had never been exposed to it. PARO was used to promote human-robot interaction with the selected population. Since the device was utilized with cognitively intact older adults, the DNP scholar expected that some participants might refuse to engage with PARO. Also, geriatric patients may be resistant to interacting with the robot, or they may develop negative attitudes toward it. Therefore, the Diffusion of Innovation theory was selected as a change model to support the adaptation of the selected patients to the PARO device. As a change agent, the scholar assisted patients during the interactive sessions by providing information regarding the device and using the technology.

The selected theory contains four main elements, including innovation, communication channels, time, and a social system (Rogers, 2003). Innovation is an object, idea, or intervention new to a person or an organization. A person may be unaware of innovation or have general knowledge about it without having any particular attitude to accept or reject it. The second element is communication channels. These channels allow messages to be transferred between individuals. Communication channels involve mass media, such as television, radio, newspaper, and the internet, that are effective in targeting a large number of people. In contrast, interpersonal channels include transmitting information face-to-face between individuals. Sharing and exchanging knowledge between participants through communication channels permits the understanding of new ideas and innovations (Rogers, 2003). Moreover, innovations near always incorporate some uncertainty which entails the availability of alternatives. Rogers (2003) highlighted that uncertainty will be resolved by providing information about innovation, making the desired change more successful. Time is another element of this theory and involves the speed of the adaption of innovation (Rogers, 2003). This will depend on many factors, including the characteristics of an object and the individual qualities of the participants. The last concept of this theory is a social system. It consists of members, such as individuals, organizations, and large structures, who are interrelated and engaged to attain mutual outcomes (Rogers, 2003). They share common goals, work together to resolve problems, and permit communication or diffusion to adapt to innovation.

The Diffusion of Innovation process consists of five stages including knowledge, persuasion, decision, implementation, and confirmation. These stages and their relevance to this DNP project are explained below.

Knowledge

The knowledge stage involves the exposure of a person to innovation to create understanding (Rogers, 2003). This theory explains that the majority of people are passive to new ideas unless they have certain needs. Learning about the innovation's existence can foster the development of a necessity to use it (Rogers, 2003). Therefore, knowledge implies performing a mental activity by an individual to gain familiarity with an object. The DNP student was a change agent for this EBP project, who created awareness and knowledge in the selected patients. During this phase, the scholar exposed the participants to the idea of using the PARO therapeutic device by describing its purpose and intended functions. To reduce the uncertainty regarding the effect of the robot, the student explained how to use the PARO and its safety aspects. Moreover, media channels are very helpful during this phase and can assist a change agent in delivering needed information to recipients (Rogers, 2003). The video presentation about PARO was utilized to enhance the knowledge of the patients and increase their interest in interacting with the robot.

Persuasion

The persuasion phase involves the formation of an attitude by an individual toward innovation (Rogers, 2003). This stage is more focused on the emotional aspects of using a new object. The perception toward a device can be favorable or unfavorable depending on the personal preferences and beliefs of an individual. Rogers (2003) highlighted that during this stage, people mentally apply innovation to their own circumstances. This will influence the decision to try a new idea or not. They may ask for more detailed information about an object, particularly its advantages, disadvantages, and consequences. The media channels are too general to provide this information and are not very useful during this stage (Rogers, 2003). Therefore,

the student fostered positive attitudes in regard to PARO by answering questions about the robot, describing her own personal experience with the device, and revealing favorable therapeutic outcomes, as seen in other studies.

Decision

The decision stage involves engaging an individual in certain activities to influence the adoption of innovation (Rogers, 2003). Adaption includes the willingness to use an object. However, a person may actively or passively reject it. Active rejection is when an individual initially considers adopting an innovation but then refuses (Rogers, 2003). In contrast, passive rejection involves a situation where a person never wants to use a device. To overcome the potential of rejection, the DNP scholar asked participants about any concerns regarding the PARO device, especially those related to their values and beliefs. This helped address any problems with the device, promoting its acceptance for patient-robot interaction.

Implementation

The implementation phase involves using innovation by an individual (Rogers, 2003). The first three stages of the Diffusion of Innovation theory include only mental activities, while implementation is the action phase. During this stage, the participants of the DNP project interacted with the PARO. It is important to note that the PARO sessions lasted fifteen minutes twice a week for eight weeks, comprising sixteen sessions total. The subjects were encouraged to have unstructured activities such as petting, talking, grooming, and hugging to increase their social engagement with the device. Moreover, Rogers (2003) emphasized that during the implementation stage, people frequently ask questions regarding using an object and any operational problems associated with its use. Therefore, the student assisted patients with the technical functions of the device and responded to all related questions.

Confirmation

The confirmation phase includes providing reinforcement to an individual about innovation to prevent relapse (Rogers, 2003). People can refuse to utilize innovation if they are exposed to contradictory messages about the device. They frequently look to obtain support for using innovation and need external reassurance (Rogers, 2003). Therefore, the role of the DNP student during this stage was to provide encouragement about the benefits of interactions with the PARO and instill positive messages about the device. Such reinforcement occurred during each patient visit to support socialization through patient-robot interaction.

CHAPTER 3: PROJECT DESIGN AND METHODS

Organizational Need

The DNP scholar, who worked as a home health nurse with geriatric patients. noticed the problem of social isolation and loneliness a long time ago. However, the intensity and the severity of poor socialization among frail homebound older adults increased significantly with the onset of the COVID-19 pandemic. Social isolation and loneliness that were already present in the lives of many patients became augmented by the restrictive policies that prohibited social gatherings in common areas, no visitor policies, closure of many recreational activities, social distancing of at least six feet from others, facial covering that prevented the visualization of facial expressions, and even the limitation of a number of people that can be in the elevator. Many patients verbalized this worsening of limited social involvement during the routine home visits. A significant decline in their cognitive functioning, physical deconditioning, and mental health was observed. These observations were made by the DNP scholar, a collaborative physician, home health nurses, and family members. The physician noticed this extreme physiological and psychological deterioration that was difficult to explain by the age-related

functional decline in many of our patients, and he confirmed that it is likely due to a social isolation problem. The DNP scholar looked for any existing organizational policies that could address social isolation; however, there were no recommendations or guidelines on how to approach this problem. The DNP scholar made the policy proposal to utilize the PARO biofeedback device to promote human-robot interaction with homebound older adults, improving their social engagement and fostering emotional well-being. The physician verbalized the importance of this policy change and permitted the DNP project to be conducted in this organization.

Organizational Support

The organizational support was received from the director of the primary care practice, Dr. Eduard Zinger. The support letter was obtained and included at the end of this manuscript. Please see **Appendix E – Consent Letter to Perform a Study.**

Project Stakeholders

Since this DNP project was focused on reducing social isolation in homebound older adults, multiple stakeholders were involved. Internal stakeholders included the employees of Zinger Medical Offices – notably the DNP scholar, who works as a Family Nurse Practitioner in this organization, and the collaborative physician. In addition, patients receiving the interventions, their family members, and non-family caregivers were directly affected. The DNP faculty and the scholarly advisor of Oak Point University were also engaged since they dedicated their time and work to guiding this project's development and implementation. The external stakeholders included home health nurses, aides, and physical therapists, who provide patient care but are not employees of this particular organization. This project also impacted the

managers and directors of facilities where patients reside, since social isolation is frequently amplified by restrictive policies that prevent visitors and social gatherings.

Barriers and Facilitators

This DNP project utilized the PARO therapeutic device to reduce social isolation and loneliness in homebound older adults. Some potential barriers to the project implementation included subjects who might prematurely drop from the study due to unwillingness to participate over a two-month period or changes in a patient's health status, such as the worsening of illnesses, hospitalization, or death. In addition, patients and their family members may oppose the PARO interactive sessions. The cost of the device, infection control, and ethical issues of using the robot were also potential barriers to the project implementation.

It is important to note that to overcome these challenges, patients and their caregivers were provided information regarding the length and the purpose of the DNP project. Vulnerable populations, who suffered from any form of dementia, cognitive decline, mental diseases, terminal illnesses, or severe pain, were excluded. Also, patients with chronic diseases poorly controlled by lifestyles or medications, newly admitted patients to Zinger Medical Offices, or people recently discharged from a hospital did not participate in the project. In addition, patients were asked about their willingness to interact with PARO to ensure agreement. The DNP student informed the subjects and their family members regarding the purpose, function, and benefits of using the device to overcome the potential resistance toward PARO. The infection control was maintained by performing hand hygiene before and after the intervention, asking the patients to wear a mask during the visit, and disinfecting PARO after every patient per the cleaning protocol listed by the manufacturer. The DNP scholar submitted a grant application to the Illinois Nurses Foundation (INF) in March 2021 to purchase the PARO for this project. There was no cost to

participants for using PARO during the project. In addition, patients were not billed for receiving PARO interactive sessions during the study. If the intervention was found to be successful, PCPs could prescribe the PARO therapeutic sessions to their patients. Notably, Medicare provides reimbursement to healthcare providers, including physicians, nurse practitioners, psychologists, therapists, and home health agencies, for administering PARO sessions (Petersen, 2018). Medicare Part B covers these services in outpatient settings outside hospitals and skilled nursing facilities. Medicare Part A reimburses clinicians for providing PARO sessions to patients during hospitalization and assisted-living facilities stay (Petersen, 2018). Most importantly, the ethical issue of interacting with the robot was resolved by involving cognitively intact participants and performing intervention only after receiving the patient's agreement and signing informed consent.

Project Schedule

The DNP project was conducted over the last two semesters of the DNP program. The preparation for the DNP project occurred during the first year of the DNP program when the project manager developed a project proposal and completed the PARO training videos. The Evidence-Based Practice (EBP) project proposal submission to IRB occurred in January 2023. The IRB approval letter is provided in **Appendix J**. After receiving IRB approval, participants were recruited, and pre-intervention data was collected before the beginning of the implementation phase, which took two weeks to complete. Then, the project launch occurred, with project implementation conducted between January and March 2023. PARO therapeutic sessions were administered twice a week for eight weeks. Post-intervention data was collected during the final PARO interactive visit at the end of implementation. Data analysis was performed after the project implementation was completed during the final two semesters of the

DNP program. The submission of the manuscript occurred in August 2023. For more detailed information, please see **Appendix C- Project Schedule.**

Resources Needed

This DNP project was conducted in the home health setting. The project manager was responsible for covering the cost of traveling to patients' homes, including driving a personal vehicle, purchasing gas, and conducting car maintenance. In addition, the student performed the PARO therapeutic sessions with homebound patients for fifteen minutes, twice a week for eight weeks. The scholar applied for the INF grant to cover the expenses associated with implementing PARO therapeutic sessions. This DNP project was self-funded since the grant application was under review. The DNP student was the sole owner of the PARO device and retained the ownership of the device after the project was completed. The device was not sold to the company after the project was completed. In addition, no billing occurred to patients. The operation of PARO is reasonably priced. The battery pack of the robot lasts two years, and the performance time of the device is approximately five hours (Interactive Harp Seal PARO Therapeutic Robot MCR-900 MCR-A888 User Manual, n.d.). The battery was not replaced during the project, and the fully charged device was sufficient to interact with scheduled patients for any single day. In addition, PARO was turned off between visits to preserve the battery life. The device was charged twice a week, adding a negligible increase in the electricity bill for the student.

During the pre-intervention visit, patients were presented with a brief video about the PARO device. This was accomplished using the iPad that the project manager owned. The video was available in the public domain free of charge. It was uploaded on the iPad at the student's home before the patients' visits. Therefore, no additional internet service was needed. Moreover, the PARO therapeutic device is a very simple and interactive robot that does not require

specialized training for patients or their return demonstration. In particular, patients were encouraged to have unstructured activities, such as talking, touching, petting, and grooming, to increase their social engagement with the device. However, to ensure safety, the project manager instructed subjects on how to use the robot and assisted with setting up PARO during the initial and subsequent encounters.

The DNP project required additional resources, including cleaning and disinfecting supplies for the device, hand sanitizers, disposable masks, printer paper, pens, folders, and ink for a printer to make copies. The DNP student covered these expenses. Moreover, the project manager performed phone calls to recruit participants and utilized a personal cell phone. No additional telephone expenses occurred since the scholar had unlimited hours for her phone line. In addition, the DNP student prepared a handout for participants with a list of community resources and supportive services to prevent social isolation and loneliness. Please see **Appendix P- List of Community Recourses** for more details. This handout was planned to be distributed to participants along with an educational booklet, "The Social Isolation and Loneliness Outreach Toolkit," developed by the National Institute on Aging (2020).

Furthermore, the COVID testing was planned for patients experiencing any signs and symptoms of COVID-19 infection or recently exposed to a COVID-positive individual. The providers of Zinger Medical Offices utilized a mobile laboratory to perform home COVID testing, and Medicare fully covered these tests. The project manager was prepared to arrange home COVID testing at no cost to the patient if requested. The participants could also visit any local COVID-testing facility for examination.

Moreover, at the end of the project, the DNP student collected information regarding the effectiveness of the PARO therapeutic sessions by using a standardized survey. A skilled

statistician was hired to perform a statistical analysis of the identified data. Lastly, the DNP student did not charge patients for receiving the intervention and did not bill their insurance for these visits. For more information, please see **Appendix I- Budget.**

Project Manager Role

The DNP student was the project manager of this scholarly work. Before the start of the DNP project, the student worked in the primary care practice as a Family Nurse Practitioner (FNP), providing care to the homebound geriatric population. The DNP scholar identified the problem of social isolation and loneliness that became more noticeable during the COVID-19 pandemic. The student decided to start the EBP project, focusing on promoting socialization in these vulnerable individuals. The project manager conducted a clinical question injury, performed a literature search, and synthesized the evidence to ensure that the problem is essential and applicable to the practice setting and the selected population. The DNP student communicated the findings with stakeholders and obtained permission to implement the project.

Moreover, the DNP student worked on developing this scholarly work and identified outcomes, facilitators, barriers, and specific steps for successful project execution. Next, the student was responsible for selecting patients from the population and conducting therapeutic PARO sessions. The DNP scholar ensured timely data collection and gathered participants' feedback on any barriers associated with the project. The student led the implementation phase by addressing obstacles and process-related problems. Finally, the project manager was responsible for disseminating the findings of this quality improvement initiative.

Plans for Sustainability

The DNP scholar will remain working in this primary care practice as the FNP with the homebound geriatric population. Patients will continue to be screened for social isolation and

loneliness by utilizing the UCLA Loneliness Scale. The diagnosis of social isolation and the scores obtained from the standardized scale will be documented in medical records. It is important to note that insurance companies including Medicare do not pay for the PARO robot. However, they reimburse providers for administering the PARO therapeutic sessions (Peterson, 2018). The patients were informed that the PARO treatment could be prescribed to them. In addition, individual patients can purchase the device, but the cost of the robot can be a problem. Therefore, the project manager will keep the PARO robot after completing the DNP project and use a single device with multiple clients. The device will be cleaned between the patients' visits to maintain infection control. Furthermore, patients will be re-evaluated at least quarterly regarding the effectiveness of the PARO therapeutic sessions. This assessment was performed by asking open-ended questions and utilizing the standardized UCLA Loneliness Scale. Lastly, additional PARO devices may be purchased by the director of Zinger Medical Offices if the interactive sessions will continue to benefit the patients and the healthcare organization.

Project Vision, Mission, and Objectives

Project Vision

The vision of this DNP project reflects the importance of socialization and social relationships as essential components of individual health. The World Health Organization (2022) supported this concept by defining health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (n.p.). To achieve optimal health, healthcare providers must address social isolation problems with their patients, which was the primary goal of this EBP project. Therefore, this project aimed to promote socialization in homebound geriatric patients and prevent the worsening of acute and chronic illnesses, emotional distress, and social exclusion of individuals. Zinger Medical Offices supported the

values of this DNP project by providing medical care to patients with physical, behavioral, and mental illnesses, emphasizing the holistic view of human health.

Project Mission

The problem of social isolation and loneliness in homebound older adults requires healthcare providers to implement a targeted approach. However, many established interventions, such as support groups, phone calls, and increased physical activity, are not applicable to these patients due to their age-related limitations. Therefore, the mission of this DNP project was to develop an evidence-based intervention for reducing social isolation and loneliness in the geriatric population that can be easily implanted in a particular healthcare setting. By promoting interaction with the PARO therapeutic device, patients received positive emotions and feelings of social connectedness, improving their overall well-being and quality of life. This mission aligned with the values of Zinger Medical Offices, which strive to support the well-being of older homebound patients by providing primary, secondary, and tertiary care. Moreover, this DNP project offered clinicians an evidence-based approach to social isolation management in other vulnerable groups, supporting the recommendation of policy changes in different healthcare settings. Therefore, the PARO interactive sessions will benefit Zinger Medical Offices in the future by offering a targeted intervention for providers to manage social isolation and loneliness in homebound patients.

Project Objectives

The short-term objectives of this DNP project involved the ability of healthcare providers to identify individuals who are socially isolated and lonely by utilizing the standardized screening tool. Then, these patients received the PARO therapeutic sessions to promote their socialization and emotional well-being. On the other hand, the long-term outcomes of this

project included publishing the DNP manuscript and presenting the project's results on various professional platforms. The evidence obtained from this project was directed to support future research and serve as a foundation for policy changes in different healthcare settings. This scholarly work also increased public awareness regarding social isolation and influenced healthcare decisions when caring for vulnerable groups.

The potential risks and unintended consequences associated with this DNP project involved emotional distress from having to recall the feelings of loneliness and poor relationships with others when taking the questionnaire. This was minimized by allowing participants to skip questions that made them feel uncomfortable, as well as allowing them to discontinue the questionnaire at any time. In addition, subjects might feel uneasy or embarrassed when interacting with the robot, and their family members might oppose the PARO interactive sessions. To overcome this, subjects and their caregivers were informed regarding the purpose, function, and benefits of using PARO. To increase the acceptance of PARO, the DNP student provided education about the robot before the implementation started, presented a video about the device, and distributed the PARO manual for the patients' reference. The subject could also withdraw from the project at any time or may choose not to participate if the PARO robot creates emotional discomfort for them. Moreover, people may become attached to the PARO robot, and discontinuing the interactive sessions may create emotional distress. Participants did not own the PARO robot during the project and after it was completed, but they were privileged to interact with the device during the scheduled sessions of the study. Therefore, participants were informed a week before the last visit that the sessions would be terminated to give them time to adjust. In addition, the PARO therapeutic sessions can be prescribed by healthcare providers since insurance companies reimburse this treatment.

Moreover, the DNP student considered the possibility that the PARO interactive sessions would not produce the desired effect on reducing social isolation and loneliness. Therefore, the project manager developed a list of community resources, inclusive of emergency mental health services, where people could obtain help and assistance to prevent social isolation and loneliness. The printed handout, "Understanding Loneliness, and Social Isolation: How to Stay Connected," published by the National Institute on Aging (2020), was also provided to the participants. This handout contained educational information on social isolation, loneliness prevention, and other external resources.

Additionally, the potential risk of COVID-19 infection existed during the pandemic, especially from the repeated interactive in-person sessions or from sharing the PARO robot between the participants. This was minimized by maintaining infection precautions with hand hygiene, wearing a face mask, and disinfecting PARO between patients' visits. In addition, the PARO sessions were planned to be postponed if a patient or the student developed any signs and symptoms of COVID-19 infection, has been recently exposed to a COVID-positive individual, or received a positive COVID test. The patient or the student was required to be free of symptoms for at least 24 hours and get a negative COVID test to resume the PARO sessions. The project manager would assist the patient with arranging COVID testing if requested. Participants were not responsible for costs associated with COVID testing. The DNP student remained current with the recommended COVID-19 vaccinations to minimize the transmission of infection.

Furthermore, the PARO robot is a biomedical device approved by the FDA. However, it could potentially cause personal injury, fire, or shock if misused (PARO Manual, n.d.). The DNP student instructed participants on using the device before the interactive sessions started and provided them with a printed copy of the PARO manual. PARO was battery-operated according

to the manual to ensure the proper handling and maintenance of the device. An AC/DC wall outlet was not used to avoid a potential fire hazard. In addition, the interactive sessions were conducted in a safe area of the patient's home, such as a living room, away from the bathroom and kitchen. Smoking was also not permitted during the PARO sessions. This eliminated the potential exposure of the device to water or fire sources.

Moreover, the project manager operated PARO and supervised the meetings to ensure the safety of the participants. If PARO started to malfunction during the session, the device would be turned off immediately, and the meeting would be stopped. However, this situation never occurred during this project. The student would refer to the PARO manual for troubleshooting details and contact the PARO representative if any problems persist. It is important to note that the PARO robot is equipped with an anti-electromagnetic wave shield to prevent the interference of the device with the function of pacemakers (PARO Manual, n.d.). However, it is recommended to use PARO away from the chest area for people with pacemakers (PARO Manual, n.d.). For this DNP project, patients with pacemakers and defibrillators were excluded to prevent potential problems with their life-saving devices. Lastly, the breach of confidentiality may pose a risk. However, this was minimized by using encrypted data and protecting the confidentiality of the patients.

PICOT Question

The following PICOT question served as the basis for the proposed DNP project: Does utilizing the PARO therapeutic device reduce social isolation and loneliness (I) in homebound adults ages 65 years and older (P) as evidenced by decreased social isolation and loneliness scores measured by the UCLA Loneliness Scale (O) over the eight-weeks period (T) as compared to pre-intervention (C)?

Population

The participants for this DNP project were selected from the patients of Zinger Medical Offices. The project manager contacted Dr. Eduard Zinger to obtain the list of homebound patients. Then, the medical records were reviewed by applying the inclusion and exclusion criteria to identify the potential subjects. In particular, the inclusion criteria involved being 65 years and older, being homebound, residing in a community, and living in Chicago or the Northwest Suburbs of Chicago. Moreover, patients who spoke English, Ukrainian, Polish, or Russian were recruited. In addition, subjects were cognitively intact, had well-controlled chronic diseases, and remained free from mental and emotional illnesses. Lastly, patients were willing to interact with PARO and met the criteria of loneliness and social isolation as measured by self-report and the UCLA Loneliness scale.

Being cognitively intact, known as cognitively healthy, implies the capacity of an individual to think, remember, and understand (CDC, 2019). “Cognition is a combination of processes in the brain that includes the ability to learn, remember, and make judgments” (CDC, 2019, n.p.). This DNP project included participants who were cogitatively healthy and free from the diagnosis of dementia, as documented in the medical record.

Furthermore, the exclusion criteria included being younger than 65 years of age, being non-homebound or missing the documentation of the homebound status in the medical record, residing in assistive living or rehabilitation facilities, being in a hospital or discharged from a hospital within the last two weeks, and living outside of Chicago and the Northwest Suburbs of Chicago. In addition, patients who were new to Zinger Medical Offices or spoke languages other than English, Ukrainian, Polish, or Russian were excluded. Subjects with poorly controlled chronic diseases, any form of dementia or cognitive deficit, and unstable emotional and mental

statuses were not recruited. People with a terminal diagnosis and poorly controlled severe pain were not involved. Furthermore, the project manager excluded patients with a pacemaker or a defibrillator since PARO might interfere with the electrical current of these devices. Finally, people who were unwilling to participate in the PARO sessions and who did not meet the criteria of loneliness and social isolation were not involved.

After the potential subjects were identified, the project manager contacted them over the phone and introduced the topic of the DNP project. Please see **Appendix K- Letter of Introduction** for further details. The pre-intervention screening included asking an open-ended question if a person feels socially isolated and lonely. A positive response indicated that the patient was eligible to participate in the project. Then, subjects were provided with information regarding the purpose of the scholarly work, its length, and the expected outcomes. In situations where patients lived with their families, the respective caregivers were contacted to obtain permission. The verbal agreement indicated the willingness to participate in the study. Signed informed consent was required to participate in the project. Consent to participate in the project is included in **Appendix L,** and consent for video and pictures is in **Appendix M**. Next, the list of the selected individuals was created. The project manager grouped these individuals into areas of close proximity to reduce the time needed for traveling between patients. The DNP scholar developed a schedule to accommodate twice-a-week individual visits with each patient.

Afterward, subjects were contacted over the phone to schedule a pre-intervention visit. This visit included providing full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. The participants signed informed consent. In addition, the UCLA Loneliness questionnaire was administered to the participants in paper and pen format. Next, the patients were provided with a folder containing the PARO

manual and a printed calendar to list the dates and times of the subsequent encounters. For more information, please see **Appendix O- Calendar to Schedule PARO Visits**. Participants were asked to place the calendar in a visible area, such as hanging it on the wall, to keep visual reminders of upcoming visits. The picture of PARO was attached to the folder to provide visual reminders about the device. The phone number of the project manager was also given to the patients if the PARO session should be rearranged. It is important to note that the anticipated sample size was 20 subjects.

Intervention

Chen et al. (2022) highlighted that technological advancement allows the provision of social, physical, and mental care to older adults. Robots are broadly classified as rehabilitation robots, which provide physical assistance, and social robots designed for companionship and communication. Social robots can engage older adults in social activities, provide company, and allow mental stimulation. PARO is a social robot in the form of a baby harp seal. It can show emotional reactions and has five sensors including touch, sound, temperature, posture, and light. PARO can open its eyes and move flippers and a tail in response to tactile stimuli (Wang et al., 2022). It can also reveal emotions by reacting to petting or sounds. The PARO was created to promote emotional well-being and social engagement in people with dementia, psychosocial disabilities, anxiety, depression, cancer, post-traumatic stress disorder, and brain injuries (Shibata et al., 2021). It is an FDA-approved medical device and is used in many countries for therapeutic and recreational purposes. PARO can also reduce social isolation in homebound older adults as its beneficial effect was seen in many studies.

Study I: The ability of PARO to promote socialization and positive experiences in older adults

Chen et al. (2022) conducted a qualitative study to identify the perception and experiences of Taiwanese older adults when interacting with the PARO device. This research involved 26 participants ages 65 years and older who received therapeutic sessions with the PARO device for 60 minutes three times per week for a total of eight weeks. The results of semi-structured interviews revealed that the PARO therapeutic robot helps to improve the social bonds of older adults (Chen et al., 2022). The attractiveness of the PARO stimulated curiosity not only among patients but other individuals around, increasing the socialization of subjects, their families, visitors, and other involved people. Therefore, the PARO robot helped to build interpersonal relationships and provided the opportunity for engagement. In addition, the PARO device acted as a comfort companion for many participants. It helped to foster the feeling of safety, security, and comfort by being present with the subjects. "Interaction with Paro is a very good experience. It has a companionship function, then I felt it has a little warmth, felt like we were together, had a sense of presence, another kind of spiritual interaction, a higher level of the interaction with soul" (Chen et al., 2022, p. 133). The PARO robot also fostered affection and closeness in the participants, building an emotional attachment and belonging among them. Moreover, the interaction with PARO helped to relieve emotional distress and decrease loneliness, and it reduced the feeling of boredom. The PARO device stimulated play and social interaction in an individualized way. To summarize, the PARO robot had positive effects on social interactions and the quality of life of older adults by increasing their social engagement and interpersonal relationships. The PARO device acted as a catalyst for social engagement by allowing people to enhance their social contact, communication, and sense of belonging.

Study II: The beneficial effect of PARO on improving seniors' health and quality of life

A systematic review conducted by Wang et al. (2022) evaluated the effect of using the PARO device on older adults. The PARO device is frequently described as a social, companion, or seal robot. It is the most commonly used companion robot, showing superior benefits over other animal robots due to its unfamiliar baby seal look. It can be utilized when animal-assisted therapies are impossible such as when a real pet is not allowed due to the restrictive policies of certain facilities, the risks of allergies, injury to staff, patients, and visitors, the inability to support the animal's needs, or the cost associated with keeping a pet. This systematic review of randomized control trials (RCTs) involved nine articles whose studies were performed between 2003 and 2020. The patients included older adults residing in care facilities. The result revealed that the PARO therapeutic device has a positive effect on improving the quality of life, especially in people with dementia and Alzheimer's disease (Wang et al., 2022). PARO helped to control biopsychological conditions such as depression, apathy, agitation, anxiety, and wandering. The interaction with the PARO robot also decreased the use of medications, particularly those that influenced sleep, pain, and psychoactive activity (Wang et al., 2022). Therefore, the interaction with the social PARO robot improved the physical, mental, and general well-being of older adults, positively influencing the quality of their lives.

Study III: The usefulness of PARO for promoting social engagement and feelings of joy

McGlynn et al. (2017) investigated the effect of using PARO on cognitively intact and independent older adults. The authors suggested that older people, both cognitively impaired and mentally healthy, require social-emotional support. Using robots is an alternative option to live animals in promoting socialization and positive emotional responses. This mixed qualitative and quantitative study involved 30 older adults selected from the Human Factors and Aging

Laboratory Participant Registry at the Georgia Institute of Technology (McGlynn et al., 2017). The subjects were videotaped during the interaction with PARO and received various questions such as a single open-ended question regarding their initial perception of the robot, pre- and post-interaction interviews, the Perceived Ease of Use, and Perceived Usefulness surveys, and the Positive Affect Negative Affect Schedule. The result showed positive responses toward using PARO. The fur of the device was one of the most enjoyable characteristics of the robot (McGlynn et al., 2017). The 27 participants rated the robot as easy to use and 23 of them reported that the device will be beneficial for people. Out of 30 subjects, 15 people preferred having PARO instead of a live animal because it is easier to maintain, is allergy-free as compared to real pets, and can be kept in residencies with animal restrictions. People who preferred real animals reported that PARO has limited interaction abilities, is less mobile, and is costly. The perceived benefits of using the robot included social presence, interaction, social facilitator, relaxation, and enjoyment (McGlynn et al., 2017). The interaction was one of the most useful aspects of utilizing PARO. During the intervention, 29 out of 30 people actively engaged with the device, and no negative interactions were noticed. The individuals who were more actively involved with PARO received more positive emotions afterward. In conclusion, cognitively healthy older adults perceived PARO as beneficial, easy to use, and would keep it at home since it allows social engagement and fosters feelings of joy.

The Description of the Intervention

Preparing materials

After receiving the IRB approval, the DNP student purchased needed supplies for the project, including printer paper, ink, pens, paper calendars, disinfecting supplies, and face masks. In addition, the PARO robot was bought during this time. The project manager uploaded the

PARO video presentation from the PARO Therapeutic Robot (2014) website on her personal iPad. The project manager created a list of community resources for social isolation and loneliness prevention to distribute to participants. The printed handout, "Understanding Loneliness and Social Isolation: How to Stay Connected", was ordered from the National Institute on Aging website (2020). The informed consent, the list of community resources created by the DNP student, and the PARO manual were printed for the patients. Furthermore, the student adjusted her work schedule to accommodate two working days for the project implementation.

Recruitment of participants

After IRB approved implementation, the DNP student started the recruitment of participants. The project manager contacted Dr. Eduard Zinger to obtain the list of homebound patients. Then, the medical records were reviewed by applying the inclusion and exclusion criteria to identify the potential subjects. Next, the scholar contacted the patients over the phone and introduced the topic of the DNP project. The pre-intervention screening included asking an open-ended question if a person feels socially isolated and lonely. A positive response indicated that the patient was eligible to participate in the project. Then, subjects were provided with information regarding the purpose of the EBP project, its length, and the expected outcomes. In situations where patients lived with their families, the respective caregivers were contacted to obtain permission. The verbal agreement indicated the willingness to participate in the study. Next, the list of the selected individuals was created. The project manager grouped these individuals into areas of close proximity to reduce the time needed for traveling between patients. The DNP scholar developed a schedule to accommodate twice-a-week individual visits with each patient.

Afterward, subjects were contacted over the phone to schedule a pre-intervention visit. This visit included providing full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. The participants signed informed consent. During this visit, the DNP scholar provided verbal instructions about the PARO device and presented a brief video about the robot. The patients also received a copy of the PARO manual for their reference. After that, the UCLA Loneliness questionnaire was administered to the participants in paper and pen format. Next, the patients were provided with a folder containing the PARO manual and printed calendar to list the dates and times of the subsequent encounters. The picture of PARO was attached to the folder to provide visual reminders about the device.

Implementation of the EBP Project

The project launch occurred after IRB approval. The project manager called patients one day before the visit to confirm the scheduled meeting and provide a reminder. The two-hour window was specified to subjects to cover possible delays associated with traveling between patients. The PARO device was charged in the office the day before the visit. The DNP student tested the functioning of PARO after charging was completed to ensure its safe performance. PARO was transported in the carrier provided by the manufacturer. During transportation, the device was turned off and placed in the car's trunk away from extreme heat and light sources. The project manager drove a car to visit participants on the scheduled day.

After entering the patient’s home, the DNP student and the patient performed hand hygiene with an alcohol-based hand sanitizer, or soap and water. Facemasks were provided to a subject at the beginning of each visit to ensure infection control. Then, the scholar reinforced information about the PARO device presented during the pre-intervention visit and introduced

the robot. Specifically, PARO was placed on a hard surface, such as a table or a chair, in front of the patient. The DNP student turned on the device. The timer on the watch was set for fifteen minutes. The participant was encouraged to have verbal, visual, and tactile contact with PARO. The interaction involved unstructured activities such as grooming, petting, hugging, greeting, and talking. The project manager encouraged human-robot interactions and answered any pertinent questions. At the end of the session, the DNP student turned off the PARO and disinfected it with a PDI Super Sani-Cloth Germicidal Disposable Wipe. The device was placed in the carrier. Both the project manager and the patient washed their hands with an alcohol-based hand sanitizer or soap and water. Then, the DNP student reviewed the upcoming visits with the patient and adjusted the schedule if the modification was requested. The scholar rescheduled the meeting for another day or time within the same week if a patient made a request. Afterward, the DNP scholar continued to travel between scheduled participants to provide individual PARO sessions per the listed above protocol.

The interactive PARO sessions involved twice-a-week visits and lasted eight weeks, comprising sixteen meetings. A week before the last visit, patients were informed about the end date of the project. They were provided the handout, “Understanding Loneliness and Social Isolation: How to Stay Connected,” obtained from the National Institute on Aging (2020), and the list of community resources created by the DNP student. During the final visit, patients had the PARO interactive session and completed the UCLA Loneliness questionnaire in paper and pen format.

Analysis of Data

Pre- and post-intervention scores obtained from the UCLA Loneliness questionnaires were used to evaluate the effectiveness of the PARO interactive sessions related to the

established project outcomes. Descriptive and inferential statistics were utilized. Descriptive statistics explained the differences in pre- and post-interventions. The inferential statistical procedure, specifically paired T-test, was used to answer the question of whether the PARO therapeutic device's effect on reducing social isolation and loneliness is statistically significant or due to a chance.

Comparison

In the current medical practice, there was no intervention to address social isolation in homebound older adults. Pre- and post-intervention scores obtained from the UCLA Loneliness Scale were used for the purpose of comparison.

Outcome

The outcome of this DNP project is to reduce social isolation and loneliness in homebound older adults through positive interaction with the PARO therapeutic device. In addition, this scholarly work serves as a foundation for other providers to manage social isolation problems with their patients by offering evidence-based recommendations.

The identified outcomes were measured by the UCLA Loneliness Scale questionaries, completed before and after the intervention. This survey took less than ten minutes to complete and was administered in a paper-pen format. The UCLA Loneliness Scale consists of 20 questions. It measures subjective feelings of loneliness and social isolation. The UCLA scale is reliable and a simple instrument as was tested and analyzed in many studies. “Results indicated that the measure was highly reliable, both in terms of internal consistency (coefficient alpha ranging from .89 to .94) and test-retest reliability over a 1-year period (r = .73). Convergent validity for the scale was indicated by significant correlations with other measures of loneliness. Construct validity was supported by significant relations with measures of the adequacy of the

individual's interpersonal relationships, and by correlations between loneliness and measures of health and well-being" (Russell, 1996, n.p.). The permission to utilize the UCLA scale was obtained from the developer, Daniel W. Russell, and included in **Appendix G**.

Time frame

This DNP project was completed over ten weeks. The IRB proposal was submitted in January 2023. The recruitment of participants, obtaining informed consent, and administering the pre-intervention UCLA questionnaire occurred prior to implementation after the IRB approval was obtained and took two weeks to accomplish. Then, the project launch occurred, with project implementation conducted between January and March 2023 after IRB approval and included performing the PARO interactive sessions twice a week for eight weeks. The post-intervention data collection was performed during the final PARO session at the end of the intervention phase, fitting the DNP project into the 10-week period.

Feasibility

This DNP project was completed over ten weeks and fulfilled the timeframe requirements of Oak Point University. The recruitment of participants and conducting the pre-intervention visit to obtain informed consent occurred before the implementation phase after the IRB approval was obtained. The start of the project implementation occurred in January 2023. The PARO interactive sessions were performed with each individual patient for 15 minutes twice a week for eight weeks. The UCLA Loneliness questionnaire was administered to the participants during the final PARO visit after human-robot interaction to collect the post-intervention data. The PARO sessions were terminated at the end of week eight of the intervention.

One of the barriers that the scholar encountered was the need to maintain a regular and consistent schedule of therapeutic sessions with participants. Patients had some medical

appointments or personal plans for specific days or times that overlapped with the scheduled meetings. The project manager informed subjects about the project length and number of visits during the recruitment. The DNP student provided patients with a printed calendar of the scheduled visits for their reference and communicated with them weekly regarding upcoming meetings. In addition, individuals unwilling to participate in meetings for the dedicated timeframe were excluded from the study. Moreover, the project manager rescheduled the therapeutic session for another day or time within the same week if it overlapped with a patient's medical appointment.

Traveling between patients was another challenge for the DNP scholar. Since the patient population of Zinger Medical Offices is dispersed throughout the Chicago area, it was time-consuming to travel between subjects who lived far from each other. Therefore, the project manager arranged patient visits per their location by placing people who lived nearby on the same schedule. This arrangement of meetings by the area of patients' residencies allowed the student to more effectively utilize time, reduce the commute interval, and save some gasoline due to shorter traveling distances.

In addition, participants or family members might oppose the PARO interactive sessions. To overcome this, the project manager instructed subjects and their caregivers on PARO's purpose, function, and benefits. The DNP scholar asked participants and their caregivers about concerns regarding the PARO device, especially those related to individual values and beliefs. The project manager addressed their concerns and provided ongoing reinforcements. Moreover, participants were informed that they could withdraw from the project at any time or might choose not to participate in sessions if the PARO robot is distressing. Importantly, signed

informed consent was required to join the project. Lastly, patients who refused to interact with PARO were excluded.

Furthermore, the COVID-19 pandemic was another barrier to project implementation. The potential risk of COVID-19 infection existed during the repeated interactive in-person sessions or from sharing the PARO robot between the participants. To ensure infection precautions, disposable masks were provided to subjects and worn by all individuals during the visits. Hand hygiene with an alcohol-based hand sanitizer or soap and water was performed at the beginning and at the end of the meeting. The PARO device was disinfected per manufacture protocol with a PDI Super Sani-Cloth Germicidal Disposable Wipe. In addition, if a patient or the student developed any signs and symptoms of COVID infection, has been recently exposed to a COVID-positive individual, or received a positive COVID test, then the PARO sessions would be postponed per the current CDC regulations until the patient or the student was free of symptoms for at least 24 hours and received a negative COVID test. The project manager was willing to assist the patient with arranging COVID testing if requested. Participants were not responsible for costs associated with COVID testing. Moreover, the DNP student remained current with the recommended COVID-19 vaccination to minimize the transmission of infection.

The language barrier was an additional obstacle to the implantation of this scholarly work. The project manager is fluent in English, Ukrainian, Polish, and Russian. The patients who spoke these particular languages were recruited. The DNP student communicated to participants in their native language during the visits and translated the surveys for them if needed. In addition, the PARO device used animal sounds rather than human vocabulary. This eliminated the language barrier during human-robot interactions.

Furthermore, another potential problem that the DNP student anticipated was the premature drop-off of the subjects from the project due to the worsening of their illnesses, declining health, or death. Since the therapeutic sessions were completed over eight weeks with homebound older adults, certain patients' health conditions might worsen during this period. Unfortunately, this decline was impossible to foresee. However, the DNP student recruited only medically stable older people to reduce the likelihood of sudden drop-off of unstable patients. If any subject could not complete the intervention, this information was documented, and the data for statistical analysis was adjusted accordingly.

Sample and setting

Description of the Setting of Zinger Medical Offices

The DNP project was conducted in the community setting with older homebound adults. MedicareInteractive.org (2022) defined homebound individuals as people who have difficulty navigating their communities, rely on caregivers for help, or require assistive devices such as a cane, walker, or wheelchair. In addition, these people frequently have medical conditions that may worsen when they leave their homes. Therefore, they receive needed medical services and treatments without going outside to prevent the deterioration of their health. Subsequently, the providers of Zinger Medical Offices visit their patients in their homes, apartments, or family residencies to conduct medical visits. These appointments last approximately 30 minutes and are conducted monthly. During the visit, providers obtain a health history, conduct a physical exam, order tests, prescribe medications, perform would care, administer injections, educate patients and caregivers, provide referrals, and evaluate medical treatments. The documentation is also performed during the visit.

Description of the Clients of Zinger Medical Offices

The typical clients who receive healthcare services from Zinger Medical Offices are homebound males and females 65 years and older. This patient population frequently resides alone or with their families who help them with daily tasks. The majority of the patients of this primary care practice live in Chicago and the Northwest Suburbs of Chicago. Therefore, these geographic locations were the primary focus of this scholarly work. In addition, the English, Ukrainian, and Russian-speaking patients are the most commonly seen, constituting up to 95% of the overall patient population. However, a small number of individuals speak Spanish, Polish, Romanian, Chinese, and Indian languages.

In addition, this patient population frequently has multiple comorbidities, acute illnesses, and chronic diseases. Some commonly treated conditions in these clients include Hypertension, Diabetes, Hyperlipidemia, Arrhythmia, Coronary Artery Disease, Anemia, Asthma, Bronchitis, Osteoarthritis, and other various skin conditions. Many homebound patients have cognitive deficits related to Dementia and Alzheimer's disease. They may require tube feeding due to difficulty swallowing or wound care due to poor mobility and subsequent pressure ulcer development. Oftentimes, these subjects have severe movement problems and require extensive assistance from a caregiver with daily needs.

Moreover, the providers of Zinger Medical Offices also manage more complex health conditions, such as end-stage renal disease, cancer, and heart failure. These clinicians collaborate with many home health agencies and specialty providers to ensure the continuity of care for their patients. They provide care even to people who are at the end of their lives and receive hospice services. Therefore, a typical client of Zinger Medical Offices is a homebound older adult who is

dependent on assistive devices or a caregiver, has multiple acute and chronic illnesses, and requires regular medical care to prevent the deterioration of health conditions.

Vision of Zinger Medical Offices

The vision of Zinger Medical Offices implies a holistic view of human health. Specifically, the organization believes that the health of an individual consists of multiple components, including physical, mental, social, and emotional well-being. Each element significantly impacts a person's overall health and must be addressed when providing medical interventions. Therefore, the providers of Zinger Medical Offices deliver primary, secondary, and tertiary care to people with various acute and chronic diseases, addressing all components of holistic human health. In addition, this organization's mission is to promote individuals' well-being and prevent the deterioration of their health through patient-centered care. This is achieved by taking an individualized approach and following evidence-based recommendations and practice guidelines. This in turn ensures safe and effective medical care designed for each individual patient.

Organizational Structure of Zinger Medical Offices

Furthermore, the organizational structure of Zinger Medical Offices consists of two primary care providers, the medical doctor and the family nurse practitioner, a DNP student. Additionally, two medical assistants, the receptionist, and the biller are also employed. This medical practice has two offices, including the Chicago downtown and Lincolnwood locations. People who are mobile and can visit the providers are seen in these offices to receive health-related services. However, most patients managed by the providers of this organization are homebound geriatric people. The nurse practitioner works with homebound older adults and conducts monthly home visits, also known as house calls. The physician also visits homebound

patients and is affiliated with Weiss Memorial Hospital and AMITA Health Saint Joseph Hospital in Chicago. The physician assistants help in the office with tasks such as obtaining vital signs, preparing exam rooms, and calling patients regarding upcoming visits. The receptionist assists with scheduling office visits and answering phone calls. The biller prepares all billing documents and monitors coding system changes.

Organizational Culture of Zinger Medical Offices

The organizational culture involves team collaboration and open communication between employees. The providers frequently consult with each other regarding complex cases of their patients and decide on the best plan of care. This communication occurs over telephone, emails, or in-person meetings. The atmosphere of teamwork and partnership allows providers to work effectively and deliver safe, efficient, and patient-centered care.

Implementation Plan/Procedures

Pre-intervention

During the pre-intervention phase, the DNP student identified the problem of social isolation and loneliness in homebound older adults. The scholar performed a preliminary literature review to determine the significance and applicability of the problem. The director of Zinger Medical Offices, a collaborative physician, was contacted to confirm the problem. The clinical practice issue was discussed with the DNP faculty and a scholarly advisor at the beginning of the DNP program. Next, the project manager developed the PICOT question, conducted the literature review, and identified the planned intervention. The selected intervention involving the PARO device was communicated with the DNP faculty and a scholarly advisor for approval. The DNP student contacted the director of Zinger Medical Offices regarding the planned scholarly work with the consent to conduct a study obtained

during that time. The project manager continued to work on the project manuscript, developing a plan for implantation, informed consent, and a list of community resources for the patients. Then, the DNP student completed the PARO video training and purchased the PARO device. The DNP project application was submitted to IRB and was approved in January 2023 before implementation.

After receiving the IRB approval, the DNP student started the recruitment of participants. This was performed before the project implementation. The scholar contacted Dr. Eduard Zinger to obtain the list of homebound patients. Then, the medical records were reviewed by applying the inclusion and exclusion criteria to identify the potential subjects. Next, the DNP student contacted the patients over the phone and introduced the topic of the DNP project. The pre-intervention screening included asking an open-ended question if a person feels socially isolated and lonely. A positive response indicated that the patient was eligible to participate in the project. Then, the project manager provided the subjects with information regarding the purpose of the scholarly work, its length, and the expected outcomes. In situations where patients lived with their families, the respective caregivers were contacted to obtain permission. The verbal agreement indicated the willingness to participate in the study. Next, the scholar created a list of the selected individuals. The project manager grouped these individuals into areas of close proximity to reduce the time needed for traveling between patients. The DNP scholar developed a schedule to accommodate individual visits with each patient twice a week.

Meanwhile, the DNP student purchased needed supplies for the project, including printer paper, ink, pens, calendars, folders, hand sanitizer, disinfecting wipes, and face masks. The PARO robot was bought during this time. In addition, the project manager uploaded the PARO video presentation from the PARO Therapeutic Robot (2014) website on her personal iPad. The

handout “Understanding Loneliness and Social Isolation: How to Stay Connected” was ordered from the National Institute on Aging website (2020). The student printed the informed consent, the list of community resources, and the PARO manual for the patients.

Afterward, subjects were contacted over the phone to schedule a pre-intervention visit. This visit included providing full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. The participants signed informed consent. In addition, during this visit, the DNP scholar provided verbal instructions about the PARO device and presented a brief video about the robot. The patients also received a copy of the PARO manual for reference. After that, the UCLA Loneliness questionnaire was administered to the participants in paper and pen format. Next, the patients were provided with a folder containing a printed calendar to list the dates and times of the subsequent encounters. The subjects were asked to place the calendar in a visible area, such as hanging it on the wall, to keep visual reminders of upcoming visits. The student provided her phone number to the patients if the PARO session needed to be rearranged.

Intervention

The project implementation occurred in January 2023 after IRB approval. The project manager called patients one day before the visit to confirm the scheduled meeting and provide a reminder. The two-hour window was specified to subjects to cover possible delays associated with traveling between patients. The student charged the PARO device in the office before the visit. The DNP student tested the functioning of PARO after the setting was completed to ensure its safe performance. PARO was transported in the carrier provided by the manufacturer. During transportation, the device was turned off and placed in the car's trunk, away from extreme heat and light sources. The project manager drove a car to visit participants on the scheduled day.

After entering the patient's home, the DNP student and the patient performed hand hygiene with an alcohol-based hand sanitizer, or soap and water. Facemasks were provided to a subject at the beginning of each visit to ensure infection control. Then, the scholar reinforced information about the PARO device presented during the pre-intervention visit and introduced the robot. Specifically, PARO was placed on a hard surface, such as a table or a chair, in front of the patient. The DNP student turned on the device. The timer on the watch was set for fifteen minutes. The participant was encouraged to have verbal, visual, and tactile contact with PARO. The interaction involved unstructured activities such as grooming, petting, hugging, greeting, and talking. The project manager encouraged human-robot interaction and answered any pertinent questions. At the end of the session, the DNP student turned off PARO and disinfected it with a PDI Super Sani-Cloth Germicidal Disposable Wipe. The device was placed in the carrier. Both the project manager and the patient washed their hands with an alcohol-based hand sanitizer or soap and water. Then, the DNP student reviewed the upcoming visits with the patient and adjusted the schedule if the modification was requested. The scholar rescheduled the meeting for another day or time within the same week, if a patient made a request. Afterward, the DNP scholar continued to travel between scheduled participants to provide individual PARO sessions per the listed above protocol.

The interactive PARO sessions involved twice-a-week visits and lasted eight weeks, comprising sixteen meetings. Patients were informed of the project's end date a week before the last visit. They were provided the handout, "Understanding Loneliness and Social Isolation: How to Stay Connected," obtained from the National Institute on Aging (2020), and the list of community resources created by the DNP student. During the final visit, patients completed the

PARO interactive session and answered the UCLA Loneliness questionnaire in paper and pen format.

Post-intervention

Pre- and post-intervention scores received from the UCLA Loneliness scale were used for the data analysis, utilizing the SPSS software. The inferential statistical procedure, specifically paired T-test, was utilized to answer the question of whether the PARO therapeutic device's effect on reducing social isolation and loneliness was statistically significant or due to a chance. The statistical analysis was performed initially by the DNP student and then confirmed by a statistician with whom the scholar consulted. Then, the results of the statistical analysis were documented in the DNP project manuscript.

Data Collection Procedures

The UCLA Loneliness Scale

The UCLA Loneliness Scale Version 3 was an instrument utilized to collect pre- and post-intervention data. This version was selected since it involves easier-to-understand words and applies to various populations, including older adults. The UCLA Loneliness scale consists of 20 questions focusing on subjective perceptions of social isolation and loneliness (Russell, 1996). The four possible responses to questions are denoted by the numbers 1 through 4 on the four-point Likert scale. The number 1 indicates “Never”, 2 means “Rarely”, 3 represents “Sometimes”, and 4 indicates “Always” (Russell, 1996, p. 23). The UCLA Loneliness scale includes eleven negatively worded questions and nine positively worded questions marked with an asterisk. “Items that are asterisked should be reversed (i.e., 1=4, 2=3, 3=2, 4=1), and the scores for each item then summed together. Higher scores indicate greater degrees of loneliness” (Russell, 1996, p. 23). The scale was administered as a paper

and pen test to produce ordinal data. This data was quantitative and presented numerically into the assigned categories (Merrill, 2013).

Statistical Analysis of the Data

This EBP project was focused on decreasing loneliness and social isolation in homebound older adults by utilizing the PARO interaction sessions over eight weeks. The indicator of the effectiveness of the intervention was the reduction in the scores on the UCLA Loneliness scale compared to pre-intervention. The paired T-test is a statistical analysis that is used to compare the differences between the means of pre- and post-intervention scores. This method is frequently utilized to evaluate whether a significant difference exists between paired data obtained from the same person or object after administering the intervention (Kent State University, 2023). Therefore, the paired T-test was selected for this project to detect the differences between the pre and post-intervention scores related to the PARO interaction sessions. The data obtained from the questionnaires was organized in the tables for visual display.

The paired T-test analysis included the following steps. First, the hypotheses were formulated (Kent State University, 2023). The null hypothesis for the project was that the PARO interaction sessions would not reduce social isolation and loneliness in homebound older adults. The alternative hypothesis was that the PARO interactive sessions would reduce social isolation and loneliness in homebound older adults. Next, the data obtained on the pre and post-test UCLA Loneliness Questionnaires was entered into the columns in SPSS. Notably, the data set-up was paired in the same row for every participant to detect changes in the scores (Kent State University, 2023).

Moreover, the paired sample T-test included the following test statistics: sample mean of differences, sample standard deviation of differences, sample size, and estimated standard error of the mean (Kent State University, 2023). Using SPSS, the paired sample T-test was run, specifying paired variables. "The calculated t value is then compared to the critical t value with df = n - 1 from the t distribution table for a chosen confidence level" (Kent State University, 2023, n.p.). The significance level used to decide whether to accept or reject the null hypothesis was set at 0.05. The p-value corresponded to the obtained t-value of the paired T-test analysis. The null hypothesis would be rejected if the p-value was less than 0.05. This would prove that the reduction of loneliness and social isolation was related to the PARO sessions and was statistically significant.

Furthermore, a Pearson correlation coefficient was calculated to assess the linear relationship between the age of participants and the degree of social isolation measured b y the total score on the pre and post-test assessment (Kent State University, 2023). "The bivariate Pearson Correlation produces a sample correlation coefficient, r, which measures the strength and direction of linear relationships between pairs of continuous variables" (Kent State University, 2023, n.p.). The Pearson Correlation allowed the project manager to identify any significant relationships between the subjects' age and their social isolation and loneliness scores on both pre and post-intervention tests. This analysis provided further information about the collected data and the potential changes in the scores from the project implementation.

Control of Extraneous Variables and Confounders

Furthermore, extraneous variables are confounders that can affect the relationships between the data studied and threaten the validity of the results (Merrill, 2013). To control

extraneous variables, randomization is one of the possible solutions. However, the subjects for this EBP project were selected from the cohort of homebound older adults with strict inclusion and exclusion criteria. This significantly decreased the number of qualified individuals who could participate in this scholarly work, making randomization impossible. Therefore, matching was employed to control confounders. Matching ensured that participants had similar characteristics (Merrill, 2013). This was achieved by decreasing the differences between subjects, such as selecting only older adults and physically and mentally stable individuals. In addition, situational confounders may involve interrupting the PARO interactive sessions by caregivers or phone calls. To control the environmental confounders, individualized meetings were conducted with participants, caregivers were informed about the scheduled sessions, and phones were placed in silent mode during the meeting. In addition, the scholar asked the subjects to keep adequate lighting during the intervention by opening the curtains or turning on the light, limiting the differences in the environment. The researcher variable can also influence the project. Having multiple researchers or conducting sessions differently can affect the validity of outcomes (Merrill, 2013). Therefore, only the DNP scholar conducted the PARO interactive session, and every meeting was performed similarly per the established protocol. Finally, the data selection and analysis method can influence the project's validity. The UCLA Loneliness scale was used to collect the data before and after the intervention, and this instrument was not changed or modified during the project.

Project Preparation

During the pre-intervention phase, the DNP student recognized the problem of social isolation and loneliness in homebound older adults. A preliminary literature review was performed and discussed with the academic faculty and the director of Zinger Medical Offices.

Next, the project manager developed the PICOT question, conducted the literature review, and identified the planned intervention, which the DNP faculty and the scholarly advisor approved. The consent to conduct a project was obtained from Dr. Eduard Zinger. The project manager continued to work on the project manuscript, developing a plan for implantation and informed consent. During the middle of the DNP program, the student completed the PARO training video and purchased the PARO device. Following this, the submission of the EBP project to IRB occurred in January 2023.

After receiving the IRB approval, the DNP student recruited the participants. The project manager contacted Dr. Zinger to obtain the list of homebound patients. Then, the medical records were reviewed by applying the inclusion and exclusion criteria to identify the potential subjects. Next, the DNP student contacted the patients over the phone and introduced the topic of the DNP project. The pre-intervention screening included asking an open-ended question if a person feels socially isolated and lonely. A positive response indicated that the patient was eligible to participate in the project. Then, the scholar provided the subjects with information regarding the purpose of the scholarly work, its length, and the expected outcomes. In situations where patients lived with their families, the respective caregivers were contacted to obtain permission. The verbal agreement indicated the willingness to participate in the study. Next, the scholar created a list of the selected individuals. The project manager grouped these individuals into areas of close proximity to reduce the time needed for traveling between patients. The DNP scholar developed a schedule to accommodate individual visits with each patient twice a week.

Meanwhile, the DNP student purchased needed supplies for the project, including printer paper, ink, pens, calendars, folders, hand sanitizer, disinfecting wipes, and face masks. The PARO robot was bought during this time. In addition, the project manager uploaded the PARO

video presentation from the PARO Therapeutic Robot (2014) website on her personal iPad. The printed handout, “Understanding Loneliness and Social Isolation: How to Stay Connected,” was ordered from the National Institute on Aging website (2020). The informed consent, the list of community resources created by the DNP student for social isolation and loneliness prevention, and the PARO manual were printed for the patients.

Afterward, the project manager contacted the subjects over the phone to schedule a pre-intervention visit. This visit included providing full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. The participants signed informed consent. In addition, during this visit, the DNP scholar provided verbal instructions about the PARO device and presented a brief video about the robot. The patients also received a copy of the PARO manual for their reference. After that, the UCLA Loneliness questionnaire was administered to the participants in paper and pen format. Next, the patients received a folder containing a printed calendar to list the dates and times of the subsequent encounters. They were asked to place the calendar in a visible area, such as hanging it on the wall, to keep visual reminders of upcoming visits. The project manager provided her phone number to the patients if the PARO session needed to be rearranged.

Project Implementation

The project launch occurred in January 2023 after IRB approval. The DNP scholar called each individual patient a day before the visit to confirm a meeting and provide a reminder. The two-hour window was specified to subjects to cover possible delays associated with traveling between patients. The student charged the PARO device in the office before the visit. The DNP student checked the functioning of PARO after the setting was completed to ensure its safe performance. PARO was transported in the carrier provided by the manufacturer. During

transportation, the device was turned off and placed in the car's trunk, away from extreme heat and light sources. The project manager drove a car to visit participants on the scheduled day.

After entering the patient's home, the DNP student and the patient performed hand hygiene with an alcohol-based hand sanitizer or soap and water. Facemasks were provided to a subject at the beginning of each visit to ensure infection control. Then, the scholar reinforced information about the PARO device presented during the pre-intervention visit and introduced the robot. Specifically, PARO was placed on a hard surface, such as a table or a chair, in front of the patient. The DNP student turned on the device. The timer on the watch was set for fifteen minutes. The participant was encouraged to have verbal, visual, and tactile contact with PARO. The interaction involved unstructured activities such as grooming, petting, hugging, greeting, and talking. The project manager encouraged human-robot interaction and answered any pertinent questions. At the end of the session, the scholar turned off the PARO robot and disinfected it with a PDI Super Sani-Cloth Germicidal Disposable Wipe. The device was placed in a carrier supplied by the manufacturer. Both the project manager and the patient washed their hands with an alcohol-based hand sanitizer or soap and water. Then, the DNP student reviewed with the patient the upcoming visits and adjusted the schedule if the modification was requested. The scholar rescheduled the meeting for another day or time within the same week if a patient made a request.

Afterward, the DNP scholar continued to travel between scheduled participants to provide individual PARO sessions per the listed above protocol. The interactive PARO sessions involved twice-a-week visits and lasted eight weeks, comprising sixteen meetings. A week before the last visit, patients were informed of the project's end date. They were provided the list of community resources created by the DNP student and the handout obtained from the National

Institute on Aging (2020). During the final visit, patients had the PARO interactive session and completed the UCLA Loneliness questionnaire.

Data Analysis

Pre- and post-intervention scores received from the UCLA Loneliness scale were used for the data analysis. The inferential statistical procedure, specifically paired T-test, was utilized to answer the question of whether the PARO therapeutic device's effect on reducing social isolation and loneliness was statistically significant or due to a chance. The statistical analysis was performed initially by the DNP student and then confirmed by a statistician with whom the scholar consulted. The statistical analysis results were documented in the DNP project manuscript.

Recruitment and Selection

The participants were recruited from the population of patients receiving care from the providers of Zinger Medical Offices. The DNP student obtained the list of homebound patients from Dr. Zinger and reviewed medical records by applying the inclusion and exclusion criteria. In particular, the inclusion criteria involved: being 65 years and older; of any gender; having a homebound status as documented in the medical record; living in a community alone, with their families, or with caregivers; living in Chicago or the Northwest Suburbs of Chicago since the majority of the patients of Zinger Medical Office reside in these areas; speaking English, Ukrainian, Polish, or Russian as the DNP student is fluent in these languages; having chronic diseases well controlled with lifestyles or medications; being cognitively intact; having stable mental and emotional status free from anxiety, depression, or psychosis; being willing to participate in the PARO sessions and sign informed consent, and meeting the criteria of loneliness and social isolation as measured by self-report and the UCLA Loneliness scale.

Being cognitively intact, known as cognitively healthy, implies the capacity of an individual to think, remember, and understand (CDC, 2019). “Cognition is a combination of processes in the brain that includes the ability to learn, remember, and make judgments” (CDC, 2019, n.p.). This DNP project included participants who were cogitatively healthy and free from the diagnosis of dementia as documented in the medical record.

Furthermore, the exclusion criteria included: being younger than 65 years of age; being non-homebound or missing the documentation of the homebound status in the medical record; residing in assistive living or rehabilitation facilities; being in a hospital; living outside of Chicago or the Northwest Suburbs of Chicago; not being fluent in English, Ukrainian, Polish, or Russian; having poorly controlled chronic diseases; having documented any form of dementia or cognitive deficit; having unstable emotional and mental status, including depression, anxiety, and psychosis; having a terminal diagnosis due to the vulnerability of the condition; having a pacemaker or a defibrillator since PARO may interfere with the electrical current of these devices; having severe pain poorly-controlled by pharmacological and nonpharmacological treatments due to the difficulty participating the PARO sessions; being discharged from the hospital within the last two weeks since the time is needed for providers to medically stabilize patients; being a new patient to Zinger Medical Offices because the extra time is required for initial treatments and the establishment of patient-provider relationships; being unwilling to participate in the PARO sessions or to sign informed consent; and not meeting the criteria of loneliness and social isolation as measured by self-report and the UCLA Loneliness scale.

The quantitative project design was selected for this scholarly work. In particular, a quasi-experimental method involving pre-test and post-test research with a single group of subjects was utilized. This method was selected because it can be used with representatives of a

population, is convenient and easy to implement, allows the assessment of intervention instantly, and permits the statistical analysis of data. Since the participants were non-randomly selected from the population of patients of Zinger Medical Office, the lack of randomization made this project quasi-experimental (Stratton, 2019).

Pre-test and post-test research involve measuring a dependent variable before and after the intervention with an independent variable (Stratton, 2019). The independent variable for this DNP project was the interactive sessions conducted with the PARO device. In contrast, the dependent variable involved changes in the participant's level of social isolation and loneliness, as measured by questionnaires. The project manager used a pre-test and post-test to identify the effect of the PARO interactive sessions on the outcomes of loneliness and social isolation. Specifically, the UCLA Loneliness scale was administered at the beginning and the end of the intervention, eight weeks later. The formative assessment criteria involved having conversations between the project manager and subjects during every visit regarding barriers, problems, or any new emotions related to human-robot interactions. The summative assessment criteria examined the scores of social isolation and loneliness obtained from the UCLA Loneliness post-intervention questionnaire.

The statistical analysis with the paired T-test was applied to measure the outcomes of the intervention. The null hypothesis for the project was that the PARO interaction sessions would not reduce social isolation and loneliness in homebound older adults. The alternative hypothesis was that the PARO interactive sessions would reduce social isolation and loneliness in homebound older adults. The level of significance was set at 0.05 to accept or reject the null hypothesis. The null hypothesis was rejected if the p-value was less than 0.05.

Therefore, if the analysis showed that the reduction in the post-intervention scores was statistically significant, then the selected intervention was effective.

Data Analysis Plan

This EBP project investigated the effectiveness of the PARO therapeutic sessions in reducing social isolation and loneliness in homebound older adults. The UCLA Loneliness Scale was utilized to collect the data at the beginning and the end of the intervention. Descriptive and inferential statistics were used for the data analysis. Descriptive statistics explained the differences in pre- and post-intervention scores (Merrill, 2013). The SPSS software was utilized to conduct statistical analysis. The mean, median, mode, skewness, and kurtosis were used to determine if the sample was in a good distribution. For this project, the mean and medium values were approximately 10 to 20% of each other, kurtosis ranged between -2 and +2, and skewness was between -2 and +2. This made the sample broadly similar (National Institute of Standards and Technology U.S. Department of Commerce, n.d.).

In addition, the inferential statistical procedure, specifically paired T-test, was utilized to answer the question of whether the PARO therapeutic device's effect on reducing social isolation and loneliness was statistically significant or due to a chance. The null hypothesis for the project was that the PARO interaction sessions would not reduce social isolation and loneliness in homebound older adults. The alternative hypothesis is that the PARO interactive sessions would reduce social isolation and loneliness in homebound older adults. The significance level used to decide whether to accept or reject the null hypothesis was 0.05. Therefore, the null hypothesis was rejected if the p-value was less than 0.05. If the analysis showed that the reduction in the post-intervention scores was statistically significant, then the selected intervention was effective.

Instrumentation

The UCLA Loneliness Scale Version 3 is an instrument selected to collect the data for this DNP project. The project manager contacted Daniel W. Russell, the developer of this scale, and obtained permission to utilize it in this EBP project, included in **Appendix G.** The UCLA Loneliness Scale was administered as paper and pen surveys. This scale consists of 20 questions focusing on subjective perceptions of social isolation and loneliness (Russell, 1996). The four possible responses to questions are denoted by the numbers 1 through 4 on the four-point Likert scale. The number 1 indicates "Never", 2 means "Rarely", 3 represents "Sometimes", and 4 indicates "Always" (Russell, 1996, p. 23). The UCLA Loneliness Scale includes eleven negatively worded questions and nine positively worded questions marked with an asterisk. "Items that are asterisked should be reversed (i.e., 1=4, 2=3, 3=2, 4=1), and the scores for each item then summed together" (Russell, 1996, p. 23). The possible score ranges from 20 to 80, with a greater number indicating a higher degree of loneliness. The UCLA Loneliness Scale is a highly reliable and valid tool as described in the section below.

Instrument Reliability and Validity

The UCLA Loneliness Scale is an instrument that was tested and validated in many studies (Russell, 1996). This scale has high reliability and internal consistency with coefficient alpha (α) running between 0.89 and 0.94 (Russell, 1996). In 2010, the American Association of Retired Persons (AARP) distributed the UCLA Loneliness Scale Version 3 to a national sample of 3012 individuals ages 45 to 109 years (Anderson, 2020). The collected data was provided to Russell in 2015. According to Russell (2017), the reliability of the UCLA Loneliness Scale Version 3 seen in the AARP study was $\alpha = 0.935$. The standard deviation for this sample was

10.75, and the average score was 40 (Russell, 2017). The mean and median scores were similar, indicating even distribution of the scores without significant skewness.

In addition, this instrument also showed strong validity. “Convergent validity for the scale was indicated by significant correlations with other measures of loneliness. Construct validity was supported by significant relations with measures of the adequacy of the individual's interpersonal relationships, and by correlations between loneliness and measures of health and well-being” (Russell, 1996, n.p.). Furthermore, Russell (2017) suggested that a score of one standard deviation above the mean would indicate a moderately high loneliness level, and a score of two standard deviations above the mean would signify an extremely high level of loneliness (Russell, 2017). For the complete UCLA Loneliness Scale Version 3 and all correspondence, please see **Appendix D**.

Ethics and Human Subjects Protection

The project manager ensured the protection of human rights. Emotional distress may occur in participants from having to recall the feelings of loneliness and poor relationships with other people when taking the questionnaires. This was minimized by allowing subjects to skip questions that made them uncomfortable and discontinue the questionnaire at any time. In addition, patients may feel uneasy or embarrassed when interacting with the robot. To overcome this, they were informed about the purpose, function, and benefits of using PARO. In addition, participants could withdraw from the DNP project at any time or choose not to participate if the PARO robot created emotional discomfort. Only those people who agreed to interact with PARO were included, and they signed informed consent. Moreover, medically unstable individuals who suffered from mental and cognitive deficits, psychiatric or terminal illnesses, or experienced

severe pain were excluded from the project. This safeguarded the protection of vulnerable populations from using technology for human interaction.

Besides, patients may become attached to the PARO robot, and discontinuing the interactive sessions may create emotional discomfort. Therefore, subjects were informed a week before the last visit that the sessions would be terminated to give them time to adjust. In addition, the PARO therapeutic sessions can be prescribed to patients by their healthcare provider. Furthermore, it is possible that the PARO interactive sessions might not produce the desired effect on reducing social isolation and loneliness. Therefore, the DNP student provided a list of community resources to all participants where they can obtain further information and help with social isolation and loneliness prevention. Specifically, this comprehensive outreach community toolkit contained information on recreational and daycare centers, various supportive organizations, medical supply companies, food delivery services, transpiration companies, home health agencies, local pharmacies, governmental agencies, mental health services and resources, internet links, and emergency helplines. In addition, the printed handout "Understanding Loneliness, and Social Isolation: How to Stay Connected," published by the National Institute on Aging (2020), was distributed to participants. This handout contained educational information on social isolation, loneliness, and additional external resources.

Likewise, the potential risk of COVID-19 infection existed during the pandemic, especially from the repeated interactive in-person sessions or from sharing the PARO robot between the participants. To ensure infection precautions, disposable masks were provided to patients and worn by all individuals during interactive sessions. The project manager and patients performed hand hygiene with an alcohol-based hand sanitizer or soap and water at the beginning and the end of visits. In addition, the PARO device was disinfected per manufacture protocol

with a PDI Super Sani-Cloth Germicidal Disposable Wipe. The DNP student remained current with the recommended COVID-19 vaccination to minimize the transmission of infection. If the student or a patient developed any signs and symptoms of COVID infection, has been recently exposed to a COVID-positive individual, or received a positive COVID test, the PARO interactive visits would be canceled. The student or the patient would require quarantining per CDC guidelines, remain free of symptoms for at least 24 hours, and have a negative COVID test before the PARO visits resume.

Protection of Health Information and Data Security

This project was conducted with the patients of Zinger Medical Offices. The participants were informed that their involvement in the project was anonymous. The student did not release any names of subjects to maintain confidentiality. The project manager maintained data security and protection. The scholar reviewed the medical records of the patients for the purpose of identifying the potential subjects. The student assessed medical records in the restricted office area, away from coworkers and patients. The scholar conducted phone calls to recruit participants in the private room of the office and behind a locked door. The demographic data was collected while recruiting participants and included the subjects' age, gender, race, ethnicity, and language. This information was used to describe the characteristics of a sample.

The breach of confidentiality may pose a potential risk. However, this was reduced by using encrypted data. Importantly, patient-specific information was de-identified. The subjects were assigned coding numbers. The project manager created a list with the coding numbers. This list was stored in a secure file in the locked cabinet in the medical office. While traveling between patients, the list was kept with the DNP student at all times in a separate and locked section of the medical bag. In addition, the coding numbers were listed on the UCLA Loneliness

questionnaires to conduct pre and post-intervention testing and to ensure a proper follow-up of the subjects. The completed UCLA Loneliness surveys and demographic information were kept in the locked cabinet in the medical office. Upon completing the project, the project manager entered data into the SPSS software for analysis. The SPSS file and the computer are password-protected and restricted to everyone except the project manager. For the next five years, the printed reports will be stored in a locked cabinet in the medical office, and the electronic data will be saved in a secure file on a password-protected computer. After that, all data will be destroyed by shredding the written records and permanently deleting the electronic files.

CHAPTER 4: RESULTS AND DISCUSSION OF DNP PROJECT

Social isolation and loneliness are common problems for homebound older adults due to their multiple comorbidities and functional limitations (NASEM, 2020). With the onset of the COVID-19 pandemic, the DNP student, a primary care provider at Zinger Medical Offices, identified worsening social isolation and loneliness in homebound patients. Notably, patients experienced a decline in their mental and physical functioning, psychiatric disturbances, and deterioration in overall well-being related to limited social involvement. Moreover, the collaborative physician, Dr. Eduard Zinger, also observed similar findings and supported the need to develop an evidence-based intervention to promote socialization in this patient population. Therefore, this DNP project was designed to reduce social isolation and loneliness in homebound older adults through interaction with the PARO biofeedback device during home visits.

Summary of Methods and Procedures

This DNP project was implemented over an eight-week period after the IRB approval, from January 23, 2023, through March 16, 2023. Sixteen PARO interactive sessions lasting

fifteen minutes were conducted with the participants. The PARO visits were performed twice weekly. Patients have interacted with the PARO robot through verbal, tactile, auditory, and visual contact. The effectiveness of these human-robot interactions was evaluated by the subjects completing the pre and post-intervention UCLA Loneliness questionnaires in a paper and pen format. The collected data were entered into the SPSS software for statistical analysis.

Furthermore, the PICOT question inquired: Does utilizing the PARO therapeutic device reduce social isolation and loneliness (I) in homebound adults ages 65 years and older (P) as evidenced by decreased social isolation and loneliness scores measured by the UCLA Loneliness Scale(O) over the eight-weeks period (T) as compared to preintervention (C)? The inferential statistical procedure, specifically paired T-test, was utilized to answer the question of whether the PARO therapeutic device's effect on reducing social isolation and loneliness was statistically significant or due to a chance. The null hypothesis for the project was that the PARO interaction sessions would not reduce social isolation and loneliness in homebound older adults. The alternative hypothesis was that the PARO interactive sessions would reduce social isolation and loneliness in homebound older adults. The significance level used to decide whether to accept or reject the null hypothesis was 0.05. Therefore, the null hypothesis was rejected if the p-value was less than 0.05.

Summary of Sample and Setting Characteristics

The project manager recruited subjects from the population of patients of Zinger Medical Offices. Twenty-one patients were contacted to participate in the project, with 20 subjects enrolled and signed informed consent. One patient refused to join the project due to unwillingness to answer the UCLA Loneliness questionnaire. The demographic data were collected during the recruitment, including the subjects' age, gender, race, ethnicity, and

language. All participants (100%) identified themselves as being White and Caucasian. Of 20 patients, five subjects (25%) identified as males, and 15 (75%) identified as females. The age of the participants ranged between 70 and 95 years. There were four patients (20%) between the ages of 70 and 80, 11 patients (55%) between the ages of 81 and 90, and five patients (25%) between the ages of 91 and 95. The mean age of the subjects was 85 years, the median was 85 years, and the mode was 82 and 85. In addition, six subjects (30%) spoke Russian as their primary language, twelve subjects (60%) were fluent in both Ukrainian and Russian, and two subjects (10%) spoke Polish. Eleven patients (55%) were also fluent in English, in addition to other languages. Furthermore, all participants resided in their homes, with 15 subjects (75%) living alone, two subjects (10%) living with a family member, and three subjects (15%) living with a 24-hour caregiver. During the third week of the project implementation, one of the patients unexpectedly passed away, reducing the sample size to 19 subjects.

Major Findings

For this DNP project, the pre and post-intervention UCLA Loneliness questionnaires were utilized to identify the changes in the degree of social isolation and loneliness in homebound older adults. In addition, the inferential statistics procedure paired T-test was used to detect if the identified changes were due to the effect of the PARO interactive session or due to chance. A detailed description of the pre and post-intervention data and a statistical analysis are provided below.

Pre-Intervention UCLA Loneliness Questionnaire: A total of twenty subjects completed the pre-intervention UCLA Loneliness questionnaire before the PARO interactive sessions were conducted. The surveys consisted of twenty questions. The response rate was 100% without missed or skipped questions. Notably, the four possible responses to questions

were denoted by the numbers 1 through 4 on the four-point Likert scale. The number 1 indicated "Never," 2 designated "Rarely," 3 represented "Sometimes," and 4 signified "Always" (Russell, 1996, p.23). The UCLA Loneliness scale included eleven negatively worded questions and nine positively worded questions marked with an asterisk. The questions with an asterisk, precisely the questions 1, 5, 6, 9, 10, 15, 16, 19, and 20, were reversed (i.e., 1=4, 2=3, 3=2, 4=1). The total possible score can range between 20 and 80 points, with higher numbers indicating greater loneliness and social isolation (Russell, 1996).

The total score was calculated by summing the scores of all questions. The data obtained from nineteen subjects were utilized to ensure the accuracy of statistical analysis and proper follow-up. The results revealed the total score ranging between 30 to 55 points. The mean value for the pre-intervention score was 42.5, the median value was 42, the mode value was 48, and the standard deviation (SD) was 7.15. The response data of the UCLA Loneliness questionnaire are listed in Table 1.

Table 1. Pre and post-intervention responses data

Participants	Age *(years)*	Pre-intervention UCLA Loneliness score	Post-intervention UCLA Loneliness score	Test difference
1	85	33	31	3
2	90	42	36	6
3*	90	-	-	-
4	92	55	40	15
5	85	41	31	10
6	87	50	35	15
7	82	48	32	16
8	84	38	28	10
8	76	39	29	10
10	95	48	36	12
11	80	40	26	14
12	94	33	32	1
13	73	30	31	-1
14	82	52	45	7
14	70	50	31	19

16	85	48	44	4
17	93	43	33	10
18	94	35	31	22
19	82	46	24	22
20	82	36	26	10

* Participant 3 (deceased) was exuded from the project.

Notably, no clear cut-off scores can differentiate the degree of social isolation and loneliness. However, multiple studies employed the following score breakdown: a low level of loneliness between 25 and 34, a moderate level of loneliness between 35 and 49, a moderately high level of loneliness between 50 and 64, and a high level of loneliness between 65 and 80 (Deckx et al., 2014). Therefore, during the pre-intervention assessment, three participants (15.8%) scored a low degree of loneliness, twelve subjects (63.2%) had a moderate level of loneliness, and four participants (21.1%) had a moderately high degree of loneliness during the pre-intervention assessment. Importantly, none of the subjects was rated as having a high level of loneliness.

Moreover, the most frequent category seen among the respondents was the moderate level of loneliness. It included only one participant below the age of 80, eight subjects between the ages of 81 and 90, and three people older than 90. Therefore, the data displayed that a moderate level of loneliness occurred most frequently in people ages 81 and 90 years compared to other age groups. Additionally, a Pearson correlation coefficient was calculated to assess the linear relationship between the age of participants and the degree of social isolation on the pre-test assessment. The correlation between the two variables was weak and not significant, $r(17)=0.047$, $p=0.85$.

Furthermore, questions 5, *'How often do you feel part of a group of friends?'* and 14, *'How often do you feel isolated from others?'* showed the highest sum of scores among the

twenty questions, 55 and 58 points, respectively. In contrast, question 1, *'How often do you feel that you are "in tune" with the people around you?'* and question 9, *'How often do you feel outgoing and friendly?'* scored the lowest sum of scores out of all items, specifically 30 and 29 points, respectively. Besides, question 4 asked, *'How often do you feel alone?*, with the following responses received: four subjects (21.1%) confirmed that they always feel alone, eights participants (42.1%) reported sometimes feeling lonely, and seven people (36.8%) responded they either rarely or never feel lonely. Moreover, question 14 asked about the frequency of social isolation, with eight subjects (42.1%) reporting being always socially isolated, four participants (21.1%) sometimes socially isolated, and seven people (36.8%) rarely isolated. As a result, no responses indicated a complete absence of social isolation. Consequently, all subjects (100%) identified themselves as socially isolated to a certain degree.

Post-Intervention UCLA Loneliness Questionnaire: Nineteen participants completed the post-intervention UCLA Loneliness questionnaires after the PARO interactive sessions. The DNP student noticed a substantial decrease in the post-intervention survey scores. Among the nineteen people, the total score obtained on post-intervention surveys ranged between 24 and 45 points compared to the pre-intervention scores of 30 and 55 points. In addition, the mean value for the post-intervention total scores was 32.7, the median value was 31, and the mode value was 31. In contrast, the mean value for the pre-intervention scores was 42.5, the median value was 42, and the mode value was 48. The post-test total scores' standard deviation (SD) was 5.66 compared to 7.15 in pre-intervention. Table 1 lists the pre and post-intervention response data, while Table 2 provides the descriptive statistics.

Table 2. Descriptive statistics of the pre and post-intervention data

	Pre-test	**Post-test**
Mean	42.5	32.7
Median	42	31
Mode	48	31
Standard Deviation (SD)	7.15	5.66
Minimum score	30	24
Maximum score	55	45

In addition, 18 participants (94.7%) showed reduced social isolation and loneliness scores on the post-intervention questionnaires. The most significant reduction in the total scores was observed in two patients, #18 and #19, scoring 22 points less on the post-intervention questionnaires. Moreover, the average reduction in the scores on the post-intervention surveys was 10.8 points. A minor decrease was seen in participant #12, whose score dropped from 33 to 32 points on the post-test. In addition, participant #13 did not respond positively to the PARO sessions, with the post-intervention score increasing from 30 to 31 points. This increase in the post-intervention score was observed only in one participant out of 19 subjects.

Furthermore, the most considerable reduction in the sum of scores on the post-intervention survey was observed in question 14, '*How often do you feel isolated from others?'* by displaying a decrease of 28 points from pre-intervention, depicted in Table 3. This indicated that the PARO interactive sessions strongly influenced the reduction of social isolation in the selected participants.

Table 3. The UCLA Loneliness Questionnaire - question responses breakdown

UCLA Loneliness Questionnaire	**Pre-test response (sum of scores, n=19)**	**Post-test response (sum of scores, n=19)**	**Difference**
1. How often do you feel that you are "in tune" with the people around you?	30	27	3
2. How often do you feel that you lack companionship?	51	37	14
3. How often do you feel that there is no one you can turn to?	39	31	8
4. How often do you feel alone?	49	33	16
5. How often do you feel part of a group of friends?	55	41	14
6. How often do you feel that you have a lot in common with the people around you?	37	32	5
7. How often do you feel that you are no longer close to anyone?	33	22	11
8. How often do you feel that your interests and ideas are not shared by those around you?	49	36	13
9. How often do you feel outgoing and friendly?	29	23	6
10. How often do you feel close to people?	38	27	11
11. How often do you feel left out?	32	22	10
12. How often do you feel that your relationships with others are not meaningful?	37	35	2
13. How often do you feel that no one really knows you well?	42	26	16
14. How often do you feel isolated from others?	58	30	28
15. How often do you feel that you can find companionship when you want it?	33	34	-1
16. How often do you feel that there are people who really understand you?	33	31	2

17. How often do you feel shy?	48	48	0
18. How often do you feel that people are around you but not with you?	47	39	8
19. How often do you feel that there are people you can talk to?	32	23	9
20. How often do you feel that there are people you can turn to?	35	24	11

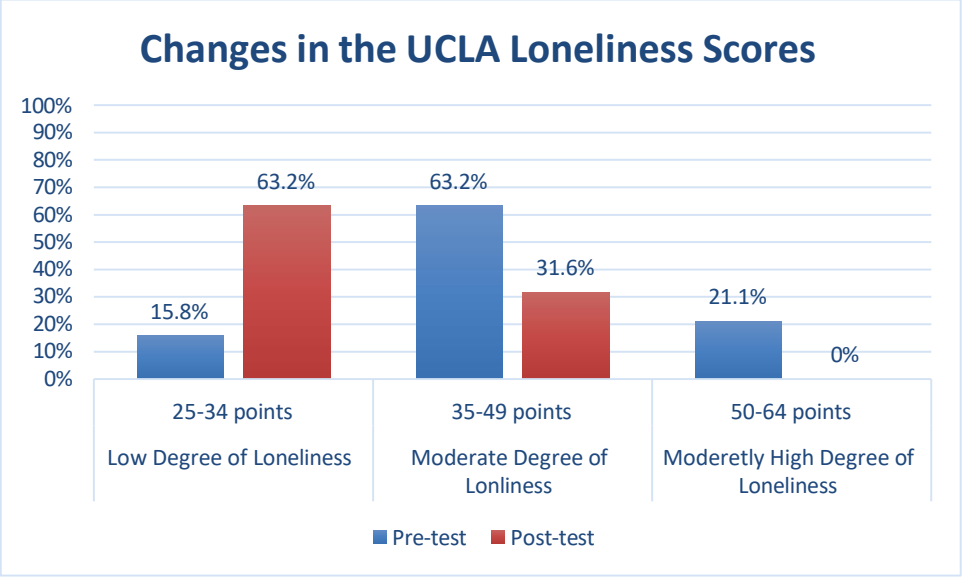
Based on the sum of the scores of nineteen participants, question 4, *'How often do you feel alone?'* and question 13, *'How often do you feel that no one really knows you well?'* demonstrated a reduction in the post-intervention scores by 16 points. Besides, questions 2, '*How often do you feel that you lack companionship?'* and 5, *'How often do you feel part of a group of friends?'* focus on the perception of companionship and social connectedness. These questions displayed a decrease in the post-intervention sum of scores by 14 points from the pre-intervention. In addition, question 17, *'How often do you feel shy?'* was not affected by the PARO sessions, displaying a sum of scores of 48 points on both the pre and post-intervention surveys. Lastly, question 15, '*How often do you feel that you can find companionship when you want it?'* showed a slight increase in the post-intervention sum of scores from 33 to 34 points.

Furthermore, a Pearson correlation coefficient was calculated to assess the linear relationship between the age of participants and the degree of social isolation measured by the total score on the post-test assessment. The correlation between the two variables was weak and not significant ($r(17)=0.028$, $p=0.25$). Compared to the corresponding correlation for the pre-test analysis ($r(17)=0.047$, $p=0.85$), the correlation increased in the post-test analysis, but still, no significant relationship was found.

The DNP student also noticed changes in the severity of social isolation and loneliness among the participants. Out of nineteen subjects completing the post-intervention surveys, no

participant (0%) scored a moderately high degree of loneliness between 50 and 64 points. In contrast, four subjects (21.1%) scored a moderately high degree of loneliness prior to the intervention. In addition, the number of individuals with a moderate level of loneliness between 35 and 49 points decreased from twelve subjects (63.2%) to six subjects (31.6%) on the post-intervention assessment. Furthermore, twelve participants (63.2%) scored a low degree of loneliness between 25 and 34 points compared to three subjects (15.8%) during pre-intervention. One subject scored 24 points, which is below the category of a low degree of loneliness. Therefore, it was not included in any of the mentioned above categories. As a result, a low degree of loneliness became the most commonly observed on the post-intervention assessment instead of the moderate level of loneliness seen before the project implementation. Figure 1 visually represents the UCLA Loneliness scores and changes in the pre and post-test responses.

Figure 1. Changes in the UCLA Loneliness Scores



Statistical Analysis: A paired T-test was used to detect changes in the pre and post-intervention scores. The null hypothesis for the project was that the PARO interaction sessions

would not reduce social isolation and loneliness in homebound older adults. The alternative hypothesis was that the PARO interactive sessions would reduce social isolation and loneliness in homebound older adults. The differences between the pre and post-intervention scores were calculated by subtracting the post-test value from the pre-test value for each participant. The differences ranged between -1 and 22, with the mean difference being 10.59. The paired T-test showed a significant difference between pre and post-intervention scores ($t(18)=7.1667$, $p < 0.0001$). Therefore, strong evidence of a difference between the pre and post-scores was found. Consequently, this statistical analysis demonstrated that PARO interactive sessions reduced social isolation and loneliness in homebound older adults.

CHAPTER 5: IMPLICATIONS IN PRACTICE AND CONCLUSIONS

Implications for Nursing Practice

This EBP project is focused on reducing social isolation and loneliness in homebound older adults by allowing interaction with the PARO robot during home visits. It is a quality improvement scholarly work intended to improve the well-being of homebound people through increased socialization from human-robot interactions during standardized therapeutic visits. Importantly, the American Nurses Association (2015) developed the *Code of Ethics for Nurses* to guide individual nurses in their professional responsibilities that must be in congruence with the ethical principles of the nursing profession. This DNP project reflects the *Code of Ethics* to assure that patient care is safe, high-quality, and based on ethical standards. Through the extensive scholarly work conducted by the DNP student, involving the ethical principles of autonomy, beneficence, and nonmaleficence, this EBP project was accomplished, promoting socialization and well-being in the selected patient population. Therefore, this DNP project has multiple implications for nursing and healthcare, which are discussed below.

Increasing public awareness

This DNP project offers insight into the problems of social isolation and loneliness, especially their impact on older adults' physical, emotional, cognitive, and social well-being. This scholarly work emphasizes the fact that nurses and other healthcare providers must recognize the problem of poor socialization in their patients to prevent detrimental short and long-term outcomes, including higher morbidity, mortality, and healthcare utilization (Davoodi et al., 2021; NASEM, 2020). The importance of this EBP project is supported by the CDC (2021), NIH (2019), and WHO (2021), which highlighted that social isolation and loneliness are recognized as priority public threats, substantially affecting the geriatric population worldwide. Consequently, these problems were included in the *United Nations Decade of Healthy Aging 2021-2030*, requiring healthcare officials and policymakers to take urgent actions to promote socialization to improve public health (WHO, 2021). Therefore, this DNP project allows providers, nursing leaders, and stakeholders to recognize the significance of social isolation and loneliness as contributing factors to poor patient outcomes.

Evidence-based approach for clinical care

This EBP project offers an evidence-based approach to address social isolation and loneliness in a clinical setting. The scholarly work provides a template for identifying patients with poor social involvement using the UCLA Loneliness Questionnaire, recommends a detailed plan for implementing the PARO therapeutic sessions, suggests strategies for follow-up, and highlights safety precautions when robotic-led therapy is implemented. This scholarly work is built on the existing evidence and multiple research studies that support the usefulness of PARO in managing various illnesses, such as anxiety, depression, agitation, chronic pain, post-traumatic stress disorder, and dementia symptoms (Shibata et al., 2021; Shourmasti et al., 2021; Wang et

al., 2022). However, this EBP project expands the applicability of PARO therapeutic sessions for social isolation and loneliness management by stimulating patient engagement and emotional well-being. Notably, the positive outcomes obtained from human-robot interaction were demonstrated by a reduction in the participants' post-intervention UCLA Loneliness scores and confirmed by the statistical analysis of a paired T-test ($t(18)=7.1667$, $p < 0.0001$). Consequently, this DNP project provides an evidence-based approach for addressing patients' poor social involvement, offering a standardized approach to clinical care.

Addressing gaps in access to care services

This scholarly work helps to reduce the gap in access to healthcare services. In particular, this DNP project was implemented at patients' homes due to the limited ability of homebound individuals to obtain outside medical services. Therefore, the DNP student employed an alternative in-home care delivery strategy to reduce social isolation and loneliness in the selected population. Lizano-Díez et al. (2022) emphasized that providing in-home therapies has many benefits to patients, such as increased self-confidence, control, knowledge, and adherence to medical treatment. In-home care delivery also improves family involvement, enhances patient education, and reduces the need for patient traveling. Most importantly, delivering medical care at patients' homes improves health-related outcomes and reduces medical expenses due to better patient monitoring and prevention of health deterioration, hospitalization, and readmission (Lizano-Díez et al., 2022).

In addition to targeting home care, PARO therapeutic sessions also apply to other healthcare settings. Chen et al. (2022) conducted a study showing a positive impact of PARO sessions on participants residing in long-term care facilities. A systematic review by Wang et al. (2022) supported the usefulness of PARO sessions for people living in care facilities by

displaying the applicability of robotic-assisted therapies for long-term care and community settings. Moreover, the DNP student carried PARO to the buildings with animal-restrictive policies, making this robotic therapy especially useful for healthcare institutions prohibiting real pets. Consequently, this DNP project helps reduce the healthcare delivery gap by allowing the PARO therapeutic session to be conducted in locations most suitable for patients and providers.

Targeting vulnerable populations

This DNP project is designed to target vulnerable populations, predominantly homebound seniors with limited access to healthcare services. Notably, this scholarly work involved medically stable and cognitively healthy older adults whose social isolation and loneliness significantly improved after implementing the PARO therapeutic sessions. However, PARO is also widely utilized with other underprivileged groups, including people with dementia, Alzheimer's disease, cancer, psychosocial disabilities, post-traumatic stress disorder, and brain injuries (PARO Therapeutic Robot, 2014). PARO is also employed for palliative care, improving the quality of patients' lives through positive emotions elicited from human-robot interactions (PARO Therapeutic Robot, 2014). Moreover, PARO sessions are reimbursed by Medicare and Medicaid, making this therapeutic intervention particularly valuable for patients covered under public health insurance (Petersen, 2018). Therefore, PARO's applicability is extensive, which makes it especially useful for vulnerable and underprivileged groups.

Utilizing PARO for simulating animal-assisted therapy

PARO therapeutic robot can be utilized for simulating animal-assisted therapy. In particular, pet therapy involves using animals, like cats, dogs, or horses, for therapeutic purposes to improve patients' mental and physical health and enhance social, occupational, and communication skills (Husson University, 2022). However, animal-assisted therapy has certain

risks since pets may exhibit unpredictable behaviors, scare, bite, or hurt a patient, pose infection risks, and induce allergies (Husson University, 2022; Petersen et al., 2017). In contrast, robotic pets are a great alternative to pet therapy by simulating the real-like behavior of an animal while omitting the adverse risks of keeping a real pet. Notably, in this DNP project, patients interacted with PARO and were amazed by its lifelike responses. "Covered in artificial fur, the robotic creature has a hard inner skeleton under which there are dual processors that control software for behavior generation and voice recognition. PARO, as a result, imitates animal behavior, but also responds to light, sound temperature, touch and posture and, over time, due to its artificial intelligence capability, develops its own "character" (Peterson et al., 2017, n.p.). Consequently, PARO shows a comparable effect to animal-assisted therapy on older adults' emotional and social well-being, as was also seen in this DNP project, effectively substituting traditional pet therapy with fewer risks to patients and healthcare providers (Peterson et al., 2017).

Using PARO as a buddying technology

This DNP project supported the applicability of PARO for improving patients' social engagement through human-robot companionship. When patients have difficulty maintaining social relationships due to being homebound or suffering from physiological, psychological, or cognitive disabilities, receiving friendship from a buddying technology, such as PARO, can be a wise alternative (Hung et al., 2019). Notably, PARO can learn its name and respond to the environment according to how it is stimulated (PARO Manual, n.d.). It is also equipped with diurnal activity variations, being more active during the day and sleeping at night. “PARO has sensors for sight, hearing, and touch as well as the ability to move autonomously. Through this interaction between PARO and a person, PARO can react as if PARO has emotions and a warm heart, and develop a character which changes the ways it responds and cries" (PARO Manual,

n.d., p.15). These spontaneous responses allow the robot to react to human stimulation, making PARO especially suitable for providing companionship and social engagement. As a result, many studies, including this DNP project, display the effectiveness of PARO and similar technologies in promoting patients' socialization and interaction (Chiu et al., 2021; Hung et al., 2019; Hudson et al., 2020).

Applicability of PARO to mental health

It is important to consider the usefulness of the PARO therapeutic sessions for providing mental health. This DNP project was specifically focused on promoting socialization in homebound seniors. This scholarly work demonstrated that human-robot interactions fostered patients' joy and well-being, as was observed through participants' smiling, hugging the robot, relaxed facial expressions, and positive comments about the device. PARO is a biofeedback device that helps to elicit human relaxation and a positive mental effect, reducing stress and anxiety, which are particularly common in patients receiving mental health treatments (PARO Therapeutic Robot, 2014). Therefore, PARO therapeutic sessions effectively support psychological well-being and social engagement in people with dementia, psychosocial disabilities, anxiety, depression, cancer, post-traumatic stress disorder, and brain injuries (Shibata et al., 2021). Interactions with social robots also help to reduce the use of psychotropic, anxiety, and pain medications, making robot-assisted therapies especially beneficial for mental health when pharmacological treatments are contraindicated or risky (PARO Therapeutic Robot, 2014; Pu et al., 2019). Consequently, PARO therapeutic sessions help address mental health needs, allowing healthcare providers to deliver technology-driven, evidence-based patient care.

Using PARO to support nursing education

The PARO robot can also be applied for nursing education. Robotic therapies are frequently used for simulation, allowing students to experience hands-on learning before providing direct patient care (Marcos-Pablos & García-Peñalvo, 2022). Notably, PARO is designed to act independently and purposefully, according to the stimulation it receives from the environment. "PARO can learn to behave in a way that the user prefers, and to respond to its new name. For example, if you stroke it every time you touch it, PARO will remember your previous action and try to repeat that action to be stroked. If you hit it, PARO remembers its previous action and tries not to do that action. By interaction with people, PARO responds as if it is alive, moving its head and legs, making sounds, and showing your preferred behavior" (PARO Therapeutic Robot, 2014, n.p.). Therefore, PARO provides stimulation through physical interaction, producing real-life experiences. Consequently, PARO can help teach nursing students various treatment skills, such as behavioral management, nonpharmacological treatments, and social skills improvement.

Utilizing Artificial Intelligence to advance the nursing profession and healthcare

Lastly, this DNP project supports the application of technology to advance the nursing profession and healthcare to improve population health. The American Nurses Association Center for Ethics and Human Rights (2022) made a position statement, discussing the implication of using Artificial Intelligence (AI) and similar techniques by nurses. "The continually evolving of advanced digital technologies such as AI must be adopted or integrated into nursing practice within these nursing and ethical care elements so that nursing practice remains relevant in the changing landscape" (ANA Center for Ethics and Human Rights, 2022, p.5). However, the position statement also emphasized that AI and similar technologies should

not impede human relationships and interactions, which are crucial for nursing (ANA Center for Ethics and Human Rights, 2022).

This DNP project supports the value of using new technologies for clinical practice as it utilizes the PARO robot to improve patient outcomes. Notably, human-robot interactions did not substitute nursing care but rather augmented patient care quality. Specifically, the robot was a therapeutic tool to promote the patients' socialization and well-being. Still, the DNP student was the mediator of such interactions by administering targeted intervention, providing patient education, addressing any concerns, and answering questions during the therapeutic visits. Patients were always supported during these visits and had ongoing student-patient contact. This significantly strengthened the relationships between the scholar and participants as they were more relaxed and open to conversation. Consequently, PARO interactive visits reduced social isolation and loneliness in homebound older adults, strengthened patient-provider relationships, and created a feeling of trust, making these technology-driven sessions patient-centered and genuinely unique.

Recommendations

This DNP project was conducted with homebound individuals recruited from the population of patients of Zinger Medica Offices. This primary care practice serves underprivileged homebound older adults in Chicago and nearby suburbs. The PARO interactive sessions were conducted with the participants to promote their socialization and emotional well-being. The interactive visits were highly effective in reducing social isolation and loneliness, as was measured by the UCLA Loneliness Scale and confirmed by the statistical analysis of a paired T-test. Therefore, some specific recommendations can be drawn from this EBP project.

First, healthcare providers, policymakers, and stakeholders must be aware of social isolation and loneliness's high prevalence and significance on the population's health. The evidence shows that one in every four community-living adults ages 65 years and older is socially isolated, and up to 43% of individuals over 60 perceive themselves as lonely (NASEM, 2020). The high prevalence of social isolation and loneliness in older adults further complicates geriatric individuals' already vulnerable and frequently frail health. Notably, all central healthcare authorities confirmed the detrimental effect of poor socialization and loneliness on human health. In particular, the CDC (2021) reported that social isolation is associated with an increased risk of heart problems by 29%, stroke by 32%, dementia by 50%, and premature mortality from all causes. Moreover, WHO (2021) recognized that social isolation and loneliness predispose people to cardiovascular diseases, diabetes, stroke, high cholesterol, cognitive decline, and mental problems, including depression, anxiety, and suicidal ideation. Importantly, similar detrimental health outcomes are seen with conditions including smoking, obesity, sedentary lifestyle, substance abuse, and inadequate access to healthcare that have been addressed for decades by major health organizations. Therefore, healthcare providers, major stakeholders, and policymakers must realize the significance of social isolation and loneliness and take urgent actions to combat these public threats.

Secondly, individual healthcare organizations, such as Zinger Medical Offices, must establish organizational policies and standardized protocols for providers to address poor socialization and loneliness in the clinical setting effectively. This includes assessing at-risk patients, performing interventions, and conducting follow-ups. Specifically, this DNP project is a template for managing social isolation and loneliness in the primary care setting. Healthcare institutions can utilize this EBP project to support the implementation of a new policy or change

the existing one. For this scholarly project, the patient's medical records were used only to identify potential subjects. However, with the implementation of the standardized protocol in the clinical setting, clear guidelines must be in place for documenting loneliness and social isolation to allow clinicians to detect changes over time and be reimbursed for services provided. The UCLA Loneliness Scale was utilized in the project, effectively identifying socially isolated and lonely individuals. This assessment tool was easy to apply with older people and showed high reliability and validity in other studies (Russell, 1996). Using a standardized assessment, such as the UCLA Loneliness Scale, allows healthcare providers to detect the poor social involvement of their patients and conduct a proper follow.

Moreover, the PARO therapeutic sessions were conducted to promote socialization in the selected population. The PARO robot is especially helpful as a buddying technology for providing companionship and social engagement in homebound and underprivileged patients. Importantly, the most commonly recommended therapeutic approaches for managing social isolation and loneliness are difficult to apply to these patient populations due to mobility problems, cognitive limitations, a lack of transportation, dependence on caregivers or assistive devices, and financial constraints. In addition, underserved populations, minority groups, people living in rural areas, and individuals residing in poorly structured urban environments frequently have difficulty forming social bonds (Galea et al., 2019; WHO, 2021). Therefore, this EBP project offers an alternative social-engagement approach for older adults and vulnerable individuals through human-robot interaction. Despite a relatively short implementation phase of sixteen sessions, the PARO therapeutic visits were highly effective in reducing social isolation and loneliness. PARO helped people to maintain interaction and kept them engaged, supporting patients' emotional and social well-being. Consequently, the PARO interactive sessions are

beneficial for managing social isolation and loneliness in clinical settings, especially when there is a limited ability to conduct other types of interventions.

Third, this DNP project supports the recommendations for using technologies to solve world health dilemmas, particularly pertaining to mental health. Due to the shortage of mental health providers and a surge of psychiatric and behavioral problems in the population of the U.S., providing accessible and evidence-based mental health services is imperative (Association of American Medical Colleges, 2022). "The U.S. had too few psychiatrists even before COVID-19 increased rates of anxiety and depression. From partnering with primary care providers to innovative digital tools, leaders are stepping up with a range of creative solutions" (AAMC, 2022, n.p.). Importantly, this DNP project demonstrates that PARO therapeutic sessions promoted patients' engagement, social interaction, positive emotions, relaxation, and joy. Other studies recognized these benefits, supporting the usefulness of robotic technologies for mental health care. Specifically, the evidence shows that PARO and similar technologies help to control symptoms of depression, anxiety, behavioral problems, and dementia-related agitation (PARO Therapeutic Robot, 2014; Pu et al., 2019; Shibata et al., 2021). Therefore, this DNP project offers individual providers and healthcare organizations a template for conducting PARO sessions in a clinical setting and methods to ensure patient protection, ethical considerations, infection control, and safety precautions while using technologies. It is also essential to note that the PARO sessions are easy to implement in various healthcare settings, including home health, allowing providers to reach even the most vulnerable and underprivileged groups.

Furthermore, current healthcare is technology-driven, requiring leaders and policymakers to consider adapting technical advancements to improve patient care and population health. The PARO robot was developed in Japan in 1993 and was approved in the U.S. in 2009 as a Class II

biofeedback machine (Shibata et al., 2021). Since the origination of PARO, its practicality for patient care has been recognized worldwide, with more than 7,000 PARO robots being utilized in at least thirty countries by July 2021. In addition, the Centers for Medicare and Medicaid Services (CMS) recognized the effectiveness of PARO and its applicability in the clinical setting. Notably, with the assistance of CMS, fifty PARO robots were incorporated into long-term care facilities by 2021 (Shibata et al., 2021). Therefore, this EBP project supports the benefit of using technologies, particularly the PARO robot, to promote the population's health nationally and internationally.

This DNP project also generates specific questions and the need to conduct further research. In particular, it is essential to identify the long-term outcomes of using PARO and similar technologies on human health and well-being. The outcomes of not having any intervention must also be studied. Also, it is important to conduct qualitative research to explore the experiences and beliefs of patients, caregivers, and providers in using PARO therapeutic sessions to promote socialization in a clinical setting. In addition, healthcare providers may also be affected by social isolation and loneliness as certain sensitive and uneasy topics may arise while assessing their patients' poor social involvement. Furthermore, more research is necessary to identify the effectiveness of using the UCLA Loneliness Scale in the medical field, especially related to using technological interventions. Moreover, exploring the applicability of the PARO interactive sessions to other healthcare settings, such as hospitals, long-term care, and palliative care, is important. The PARO robot may also be adapted for educational settings, especially for simulation and student learning, with more research needed in this field.

Lastly, it is necessary to consider the usefulness of PARO with other patient populations. The DNP student is an immigrant from Ukraine, where the Russian invasion started on February

24, 2022. In Ukraine and other countries, many people of all ages and genders, especially children and the military, have significant war-related physical and emotional trauma. PARO interactive sessions can be utilized for individuals recovering from war-related trauma to promote their emotional well-being, relieve psychological and physiological distress, and reduce the experience of fear.

Discussion

The results of this DNP project demonstrated the effectiveness of PARO interactive sessions for reducing social isolation and loneliness in homebound older adults. In particular, human-robot interaction promoted socialization and emotional well-being in the subjects. Notably, the reduction in the severity of social isolation and loneliness among the participants was seen through changes in the post-intervention UCLA Loneliness Questionnaire scores. Specifically, among the nineteen people, the total score obtained on post-intervention surveys ranged between 24 and 45 points compared to the pre-intervention scores of 30 and 55 points. In addition, a moderate degree of loneliness, with scores between 35 and 49 points, was the most commonly observed category in 63.2% of subjects before the intervention. This category was reduced to 31.6% after the PARO sessions, indicating a considerable improvement in the socialization of the participants. Moreover, a low degree of loneliness between 25 and 34 points became the most common on the post-intervention assessment, with 63.2% of subjects falling into this category.

Notably, the most severe category of loneliness, a moderately high degree between 50 and 64 points, was eliminated on the post-intervention assessment since no subjects received these high scores. After PARO therapeutic sessions, one participant scored less than the lowest loneliness category, indicating substantial improvement in socialization and emotional well-

being. Furthermore, the importance of these results was confirmed by a statistical analysis of the paired T-test with $p < 0.0001$, indicating a significant difference from pre to post-test scores. Therefore, the project's results demonstrated outstanding outcomes on participants' emotional and social well-being by reducing their social isolation and loneliness from human-robot interactions.

Importantly, other studies supported the results of this EBP project. Hudson et al. (2020) evaluated the usefulness of robotic pets in decreasing loneliness in community-dwelling older adults. This research found that interactions with robots promoted feelings of relaxation and affection in the subject and reduced their perception of loneliness through companionship with robots (Hudson et al., 2020). In addition, a systemic review by Pu et al. (2019) discovered that social robots positively influenced participants' psychological and social well-being through interaction, communication, and engagement. Chen et al. (2022) noted that the PARO device acted as a comfort companion for many participants since it helped to foster the feeling of safety, security, and comfort by being present with the subjects. The perceived benefits of using PARO were also reported by McGlynn et al. (2017), who noticed that this robot promotes social presence, interaction, social facilitation, relaxation, and enjoyment. Similarly, this DNP project contributed to the body of existing evidence by emphasizing the applicability of robots for the socialization of homebound geriatric patients and fostering their feelings of joy.

This EBP project was developed based on the quantitative quasi-experimental study design, demonstrating statistical significance using the paired T-test. However, it is essential to discuss observations made by the DNP student during the implementation of the project, which may be important for other providers during the replication of this scholarly work or for conducting further research. Specifically, at the beginning of the DNP project implementation,

the student was challenged to schedule therapeutic sessions. This is due to homebound patients having multiple daily activities, such as cooking, cleaning, showering, changing linens, walking, or taking a mid-day nap. Despite being homebound, these patients had relatively busy schedules, making it difficult for the project manager to incorporate twice-a-week PARO sessions. Notably, the problem with scheduling was never experienced by the DNP student who conducted regular medical visits with these patients as a nurse practitioner. Therefore, a problem with scheduling was a highly unexpected finding. Consequently, the project manager was required to modify the traveling between subjects to accommodate each patient's daily task to ensure the completion of all sixteen sessions. However, when the patients perceived the benefit of interacting with PARO, they changed their daily plans and willingly accommodated the visit without any request from the student. This was a significant change in the patients' daily lives as they appreciated PARO therapeutic sessions and human-robot interactions.

In addition, the project manager also noticed changes in the perception of geriatric patients toward PARO over time. During the first interactive sessions, participants were curious about the structure and function of the robot. They asked the DNP student multiple questions about the device and needed more prompts for human-robot interaction. Once the participants became familiar with PARO, they felt more relaxed and eager to engage with the device. The DNP student observed positive human-robot interactions as subjects greeted PARO, talked to the device, patted it, and hugged the robot. Participants were highly engaged with the robot, frequently smiled, and expressed joy. Similar results were reported by Chen et al. (2022), who found that the PARO therapeutic robot helped seniors improve their social bonds, stimulated curiosity, and increased the socialization of subjects, their families, and other involved people.

Moreover, at the end of the second week of the intervention, many subjects started to name the robot and respond to the device as to someone familiar. Interestingly, the personalized names given to PARO varied greatly among participants but remained unchanged for each patient till the end of the therapeutic sessions. In addition, the DNP student noticed that PARO sessions stimulated reminiscence as subjects recalled their past, including memories of their deceased pets, which brought up joy and relaxation to them. Bradwell et al. (2019) supported the results of this EBP project by showing that older adults preferred animal-like robots that reminded their real pets and fostered their memories. Subsequently, many older adults named companion robots, signifying the development of human-robot relationships, which was also observed in this DNP project (Bradwell et al., 2019).

Furthermore, the project manager noticed a significant advantage of using PARO due to its biofeedback capacity. The robot mimicked the rhythm of the patient's interaction by responding at the same frequency as it was stimulated. For example, when patients vigorously interacted with PARO, the robot had reciprocal rapid movements and vocalizations. In contrast, when subjects used a soft voice and calmly patted the device, it was quieter and more peaceful. In addition, one of the subjects was resistant to touching PARO at the beginning of the intervention. The patient explained that she feels uncomfortable petting the robot due to the fear of getting an infection, as this device is shared between multiple participants. The student emphasized that strict infection control is maintained but did not force the subject to contact the robot physically. Clearly, PARO showed superior performance in the ability to stimulate human engagement. When the robot sensed a voice, even without being touched, it opened its eyes, waved flippers, and turned its head toward the sound, stimulating patient engagement and entertainment. Subsequently, all participants, including the DNP scholar, were amazed by

PARO's real-like appearance and behavior, making even the most resistant patient engage with the robot over time.

Additionally, the PARO interactive sessions resembled physiotherapeutic sessions used to combat mental health problems. The robot stimulated positive memories and pleasurable emotional responses in participants, promoting their psychological and emotional well-being. Notably, the applicability of human-robot interaction for improving patient outcomes was confirmed by other studies. Wang et al. (2022) emphasized that using the PARO device on older adults helps to control biopsychological conditions such as depression, apathy, agitation, anxiety, and wandering. The interaction with the PARO robot also decreased the use of medications, particularly those that influenced sleep, pain, and psychoactive activity (Wang et al., 2022). Therefore, the interaction with the social PARO robot improves older adults' socialization, and physical, mental, and emotional well-being, positively influencing the quality of their lives. As a result, the applicability of the PARO robot extends beyond managing social isolation and loneliness in homebound seniors into promoting their mental and physical health.

Some of the limitations of this DNP project involved having a small sample size. Initially, twenty subjects were recruited, but one participant passed away during the third week of implementation. In addition, convenience sampling was utilized to recruit participants because strict inclusion and exclusion criteria were applied to involve only physically, psychologically, and cognitively stable older adults. This helped to protect vulnerable populations from undue harm since most patients of Zinger Medical Offices suffer from multiple diseases and comorbidities. Moreover, only white males and females were involved, limiting the generalizability of the results to people of color. Similarly, only geriatric patients 65 years and older participated in the DNP project, questioning the applicability of the results to other age

groups. Furthermore, the presence of the DNP student during the PARO sessions could potentially introduce bias to the results. However, the student maintained limited interaction with the subjects besides answering questions about the robot and providing reinforcement for human-robot interactions.

Despite the identified limitations, this DNP project expands evidence-based knowledge to advance the nursing profession and healthcare. It increases public awareness regarding the significant impact of social isolation and loneliness on human health and offers a step-by-step approach for healthcare providers to promote patients' socialization in a clinical setting. In addition, this scholarly work helps to reduce the gap in access to healthcare services by suggesting strategies for utilizing robotic-led therapy in primary care, such as Zinger Medical Offices and other healthcare settings. Notably, this project's strength lies in the simplicity and universality of the PARO therapeutic sessions since chosen intervention can be applied to patients living in urban and rural areas. As a result, this DNP project targets vulnerable and underprivileged groups, including homebound seniors, who have difficulty accessing medical services. Other studies support the benefits of PARO sessions for different patient populations, including people with dementia, Alzheimer's disease, and psychosocial disabilities, making this therapeutic approach applicable to people with various medical needs (PARO Therapeutic Robot, 2014). Furthermore, this DNP project supports the usefulness of PARO to other healthcare fields, including providing mental health services, supporting nursing education, simulating animal-assisted therapy, and serving patients as buddying technology for promoting companionship, socialization, and emotional well-being. Lastly, this EBP project demonstrates that human-robot interactions effectively improved socialization in homebound seniors,

supporting the importance of AI and similar technologies for enhancing patient care and healthcare outcomes.

Plans for Dissemination

The DNP project was disseminated on various platforms to expand evidence-based knowledge. First, the student communicated the results with the project's participants, their relatives, caregivers, and other patients. In particular, the project manager developed an e-poster of the scholarly work that she uploaded on her iPad. The scholar presented this e-poster during routine medical visits, which she continued to conduct with homebound patients as a nurse practitioner.

Next, the student submitted the project abstract to the *Open Nursing Journal*. This peer-reviewed and open-access journal publishes research studies, reviews, and letters in all areas of nursing (The Open Nursing Journal, n.d.). It is also freely available to readers worldwide, making it particularly useful for wide-range dissemination. Notably, the editorial office reviewed the DNP project abstract and sent it to the Editor-in-Chief for initial approval. After approval, it was transferred to the Author Support Services department for the initial appraisal of the manuscript, ensuring that the manuscript is prepared for submission for peer review (The Open Nursing Journal, n.d.). The DNP student received a response from the journal that the DNP project abstract was approved, and the manuscript is awaiting publication.

The EBP project was also shared using social media. In particular, the DNP student was selected as one of eighteen finalists of the "Built to Be a Nurse" contest running by Oak Point University from May to June 2023 (Oak Point University, 2023, n.p.). To become a grand prize winner, finalists received public voting from June 12 to June 23 on various social platforms. To maintain public interest and allow people to recognize the importance of nursing, the DNP

student wrote daily posts describing her professional journey and shared them on Facebook and Instagram. These posts were written in English and Ukrainian to accommodate more readers. One post was explicitly dedicated to the importance of doctoral education and the focus of the DNP project on promoting socialization in homebound older adults through human-robot interaction. Many people, especially Ukrainians who relocated to other countries due to the current war in Ukraine, commented on this post, supporting the DNP scholar and her academic work.

In addition, the results of the EBP Project were disseminated nationally. The DNP student presented a poster describing her scholarly work at the National Nurse Practitioner Symposium, which occurred in Keystone, Colorado from July 20 to July 23, 2023. "The 4-day symposium consists of approximately 100 sessions and workshops, offering over 40 CE hours for Nurse Practitioners, Nurse Midwives and Physician Assistants, through Joint Accreditation (ACCME, ACPE, ANCC) and AANP, with acceptance of pertinent content by AAPA, ACNM and NAPNAP" (National Nurse Practitioner Symposium, n.d., n.p.). The symposium's audience included nurse practitioners, nurses, and other healthcare providers who wanted to expand their knowledge and skills, network with other professionals, and obtain continuing education hours.

Moreover, the DNP project was presented at Zinger Medical Offices on July 28, 2023, a primary care practice where the scholarly work was implemented. The DNP student displayed the poster in the main office and invited Dr. Eduard Zinger and other employees to attend. The scholar discussed the project's methodology, results, and implications for clinical practice, followed by open discussion and peer feedback.

Furthermore, the scholarly project was presented at the Oak Brook campus of Oak Point University during the Wide Assessment Day on August 8, 2023. The printed poster was

displayed. The intended audience for this presentation included faculty and the university's employees, students, and visitors. Subsequently, the digital DNP Project defense occurred on August 14, 2023, during which the student presented a PowerPoint presentation of her scholarly work to the DNP faculty and the Oak Point University academic community. Notably, the project defense was transmitted via Zoom, allowing other students, colleagues, family members, and friends to join.

Following a successful DNP Project defense, the project manager presented a poster of her scholarly work at the Mix and Mingle meeting at Oak Point University on August 17, 2023, to the university faculty, employees, and current and prospective DNP students. This EBP project was also presented during the university days to the entire campus of Oak Point University, including educational faculty, leaders, and non-academic employees, on August 30, 2023. Moreover, the Illinois Society of Advance Practice Nurses (ISAPN), a professional organization advocating for APRNs, accepted this EBP project to be displayed as the e-poster at the APRN Midwest Conference in October 2023. Finally, the completed project manuscript was published at the Oak Point University repository and DNP.org, contributing to the expansion of evidence-based knowledge and serving as a reference point for further research.

Conclusions and Contributions to the Profession of Nursing

The evidence showed a high prevalence of social isolation and loneliness in older adults, negatively affecting their physical, psychological, and cognitive health (Davoodi et al., 2021; NASEM, 2020). Therefore, central healthcare authorities, including the CDC (2021), NIH (2019), and WHO (2021), emphasized the need to address social isolation and loneliness at all levels of healthcare to prevent detrimental outcomes on public health. Consequently, taking an

urgent approach to address social isolation and loneliness in a clinical setting becomes a priority, making this DNP project particularly important for promoting population health.

Using robots for therapeutic purposes has been studied extensively. In particular, the PARO robot and similar technologies have been previously utilized to manage various illnesses like anxiety, depression, chronic pain, agitation, and symptoms associated with dementia (Shibata et al., 2021; Shourmasti et al., 2021; Wang et al., 2022). This DNP project, however, further expanded on the applicability of robotic-assisted therapy for patient care by using PARO to promote patients' socialization and emotional engagement. Specifically, this EBP project asked whether utilizing PARO therapeutic sessions would reduce social and loneliness in homebound older adults. The results of this quantitative project demonstrated that PARO interactive sessions were highly effective in reducing social isolation and loneliness in homebound geriatric patients, as measured by the UCLA Loneliness Questionaries and statistically confirmed by a paired T-test. The outcomes of this DNP project demonstrated that PARO interactive sessions stimulated patients' joy and feelings of well-being secondary to human-robot interactions, positively promoting participants' social bounds.

Therefore, this scholarly work has important implications for advancing nursing and healthcare. This EBP project increases public awareness about the significance of social isolation and loneliness on human health. It suggests a standardized approach to address patients’ ineffective social involvement in primary care and other healthcare settings. For this purpose, the DNP student developed a template for identifying at-risk patients using the UCLA Loneliness Questionnaire, provided recommendations to conduct PARO sessions, and suggested proper follow-up. This scholarly work also supports the needs of vulnerable populations by addressing

gaps in healthcare, mainly for homebound individuals, with limited access to medical care, underprivileged groups, and people living in rural or poorly planned urban areas.

Moreover, PARO therapeutic sessions are beneficial in settings with limited providers and resources since social robots effectively assist people with daily tasks, promote communication and interaction, and support teaching and learning (Shourmasti et al., 2021). Likewise, this EBP project offers insight into the applicability of buddying technology for patient care as robotic therapies become more commonly utilized to promote companionship and social engagement (Chen et al., 2022; Wang et al., 2022). The results of this project support the relevance of PARO to other healthcare settings, including simulation of animal-assisted therapy, support of nursing education, and provision of mental health services, with further research needed in these areas (Marcos-Pablos & García-Peñalvo, 2022; Wang et al., 2022).

Most importantly, this DNP project explains that people must have meaningful relationships regardless of age, living arrangement, and medical conditions to remain healthy and well. Therefore, the nursing profession and healthcare overall play a crucial role in addressing socialization as one of the essential health determinants. Consequently, individual providers, nursing leaders, policymakers, and stakeholders should consider strategies to effectively integrate PARO and similar technologies into clinical settings to improve patient care and population health, while preserving core elements of human relationships and ethics.

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Appendices, Tables, and Figures

Appendix A

Summary of Primary Research Evidence- Evidenced-Based Table

Citation	Question or Hypothesis	Theoretical Foundation	Research Design (include tools) and Sample Size	Key Findings	Recommendations/ Implications	Level of Evidence
Davoodi et al. (2021)	Does watching the interactive TV program *Room with a View* engage older adults at risk for social isolation and loneliness?	Not listed	An observational study done in 2020 in Rhode Island and southern Massachusetts. Sample: older adult adults residing in long-term care facilities, assistive-living facilities, senior budlings, and in the communities. Sample size is not listed. Interactive TV program *Room with a View* consisting of 25 episodes, lasting 30 min., was developed and presented to participants during 10 weeks from Monday to Friday, and two episodes during each Sunday.	-there were 240,747 viewers for 10 weeks. -approximately 4,000 viewers per each episode. -number of viewers differed per each episode. -highly rated was long-running food episode.	*Room with a View* TV show was able to target a large number of population, making it very useful to engage many older adults who are at risk for social isolation and loneliness.	Level IV

			Each episode addressed physical, social, and psychological health. Nielsen's rating evaluated the viewership of the program along with the actual average of people who viewed the program. No pre- and post-test was done.			
Bedard-Thomas (2019)	What are the experiences and perceptions of homebound older adults regarding loneliness and social isolation?	Not listed	A mixed qualitative and quantitative pilot study involving semi-structured interviews and questionaries using a 6-item De Jong Gerveld loneliness scale. -8 homebound individuals ages 55 to 96 were recruited by the convenient sampling from the patients of a home-based primary practice in the Midwest.	-85% of subjects experienced social isolation as measured by the surveys. -the interviews showed that 100% of participants were socially isolated and 27% of them were lonely. -participants felt socially isolated despite living in a city and residing in senior apartments. -chronic medical conditions, transpiration, and environmental factors all contribute to social	Healthcare providers must address social isolation and loneliness with their patients as these problems are extremely prevalent, especially for homebound older adults. The individual characteristics of a patient, such as illnesses or mobility problems, can create barriers to socialization. Incorporating regular screenings and assessments of social isolation and	Level IV

				isolation and loneliness.	loneliness can help to identify people at risk.	
Henning-Smith et al. (2019)	What are the differences in social isolation between people living in rural and urban areas?	Not listed	The U.S. national survey of geriatric people and their significant others, the Wave 2 of the National Social Life, Health, and Aging Project. Sample size: 2,439 Differences between rural and urban residents were measured using social relationship (ex. marital status, close relatives, children, and grandchildren), loneliness (ex. left out, isolated, lack companionship), social relationship (attending a group, a church/worship, or socialized). Rural-Urban Commuting Area (RUCA) codes were used to assess rurality. Multivariable analysis was conducted along	-people living in rural areas had more social relationships and more relied on their family. -metropolitan rural residents were less lonely and less likely reported deficiency in companionship. -non-Hispanic black and noncore rural individuals were more likely to be lonely. -higher perception of loneliness was associated with worse health outcomes. -attending groups was correlated with better health.	People living in metropolitan and noncore rural areas are less isolated as compared to urban residents.	Level IV

			with t-test and chi-square test.			
Sun et al. (2019)	What are the differences in social isolation burden between paid and unpaid caregivers of homebound older adults?	Not listed	A mixed qualitative and quantitative study done in a hospital-affiliated geriatric house call program in the U.S. Sample: 21 paid and 22 unpaid caregivers of homebound older adults. Measuring tools: Caregiver Burden Inventory evaluated the caregiver' burden, Berkman-Syme Social Index to identify a level of social isolation, the UCLA 3-item Loneliness Scale to assess loneliness. Also, semi-structured interviews were used to collect qualitative data.	-42% of caregivers assisted with 5+ ADLs. -58% caregivers helped with 5+ iADLs. -unpaid caregivers missed life activities more. - Paid caregivers missed time for break from caregiving. -44% of caregivers were socially isolated. -14% of caregivers felt lonely. -phones were tools to relieve loneliness.	Paid and unpaid caregivers of homebound older adults are at high risk for social isolation and loneliness. Therefore, promoting socialization is need for this population.	Level IV
Yu & Mahendran (2021)	What are the changes that the COVID-19 pandemic brought on dynamics between older adults?	Not listed	A longitudinal quantitative study done in Singapore. Data was collected before and during the COVID pandemic from	-people stayed home more during the pandemic due to lockdown policies, not personal choice or depression.	The COVID pandemic brought a deterioration in mental health, including worsening nervousness, depression, and	Level IV

			February 2018 to January 2020 and from May to June 2020. Sample size 614 individuals, 419 completed two sets of data collection; people with dementia were excluded, mean age was 69 years. Online or paper-pen questionnaires were utilized: Geriatric Depression Scale (GDS), Geriatric Anxiety Inventory, the friendship scale (TFS). Paired T - test and partial correlation was utilized.	-decreased participation in activities led to worsening depression. -people became more upset and nervous during the pandemic. -social isolation negatively impacted their affective symptoms and well-being.	social isolation in older adults. A targeted approach is needed to address these problems to prevent detrimental health outcomes.	
Hoffman et al. (2022)	What are the relationships between social isolation, physical activity and function, and fall episodes as related to the COVID-19 pandemic?	Not listed	The U.S. National online survey administered in January 2021 to adults ages 50 to 80 years old. -2,023 participants completed internet-based surveys. Multivariable regression used to analyze the relationships.	-45.9% of respondents were socially isolated. -37.1% had no companionship. -36.9% decreased their activity levels. -37.1% reduced their walking time since the onset of the COVID. -social isolation, reduced physical activity level, and less time spent on	COVID-19 pandemic created a profound effect on physical and social lives of older adults. Seniors became more socially isolated and less active, leading to the worsening of their well-being, overall health, and safety concerns as related to falling. The policymakers	Level IV

				feet, contributing to physical decline, worsening of mobility, and a higher risk and fear of falling.	and stakeholders must address social isolation and healthy lifestyles across all levels to prevent detrital consequences associated with the pandemic.	
Merchant et al. (2020)	What is the prevalence of social isolation and its effect on physical and mental wellbeing in older adults?	Not listed	A cross-sectional observational study involving 202 community-dwelling older adults living in Singapore. Questionaries used: 6-item Lubben Social Network Scale, FRAIL scale, Geriatric Depression Scale, EuroQol EQ-5D-5L survey with EQ Visual Analogue Scale, Chinese Mini Mental State Exam, the physical level was assessed with gait speed and physical performance battery test.	- 45.5% of subjects were at risk for social isolation, with almost half of all respondents lacking a reliable friend. - people with impaired gait and poor cognitive health were more likely to rely on others for assistance, and they were more often socially isolated.	Social isolation correlates with poor physical and mental health in older adults. This requires policymakers to create initiatives and supportive environments for social engagement of the geriatric populations to improve their heath and quality of life.	Level IV

Bradwell et al. (2019)	What are the differences in the perceptions of older adults and developers regarding companion robots?	Almere model of acceptability of social robots.	A qualitative study involved 18 developers of robots and 17 adults ages 60 years and older residing in a supported-living facility in Southwest England. The interaction stations were arranged with eight different robots. The participants were allowed to interact with robots for 10 minutes. They were video recorded and had focused group discussions. Coding and thematic analysis were performed.	- older people preferred interactive robots with animal-like appearances. - non-interactive robots generated negative reactions. - animal robots reminded their real pets and fostered reminiscence. - the realistic characters of a device were important for participants. - pet robot required less care and maintenance compared to a real pet.	Interactive robots with pleasant animal-like appearances promote the engagement of older adults, increase their interaction, and foster positive memories.	Level IV
Hudson et al. (2020)	Can robotic pets reduce loneliness in older adults?	Not listed	A cross-sectional qualitative study involved 20 individuals ages 65 and older living in their homes in New York. Participants received a robotic cat or a dog, depending on their preference. Subjects interacted with	-people valued robotic animals due to less maintenance as compared to keeping real pets. -limitations of robots included the inability to maintain affection, lack of character, and the failure to perform certain tasks	Robotic animals are beneficial for reducing loneliness, especially in isolated and less active older adults, by fostering companionship and a sense of presence.	Level IV

			these devices for 60 days. Semi-structured interviews were administered that were audiotaped and transcribed.	-more independent people were less likely to engage with these devices. In contrast, older adults with limited social connections interacted frequently with robotic pets. -the interactive features, such as blinking, barking, meowing, and head movement, facilitated human-robot - robotic animals promoted relaxation, affection, and a sense of presence.		
Chen et al. (2022)	Can social robots provide social stimulation, companionships, and mental stimulation in older adults?	Human-robot interaction.	A qualitative research involving a quasi-experimental study. -8 weeks of interaction with PARO -3 sessions per week lasting 60min. -26 participants ages 65 and older living in long term care facilities in Taiwan.	-PARO help to build emotional attachment. -improve a sense of belonging. -relieve emotional distress. - reduce boredom.	PARO has positive effects on social interactions and the quality of life of older adults by increasing their social engagement and interpersonal relationships.	Level III

			- Data was collected using the Geriatric Depression Scale and semi-structured interviews.			
McGlynn et al. (2017)	Hypothesis: Older adults who are healthy and independent would benefit from using PARO.	Models of Technology Acceptance.	A mixed qualitative and quantitative study. Tools used in the study: -Perceived Usefulness and the Perceived Ease of Use scales to assess the attitudes toward using PARO -Single item questions in the pre- and post-interaction interviews. -Pet experience interview. -Positive Affect Negative Affect Schedule. -Robot Familiarity Questionnaire. Sample size included 30 older adults selected from the Human Factors and Aging Laboratory Participant Registry at the Georgia Institute of	- cognitively intact older adults perceived the PARO device as enjoyable and easy to use. -the benefits of using the robot included interaction, social presence, social facilitator, relaxation, and enjoyment. -the participants were neutral in terms of usefulness of the device.	Using PARO can support the needs of older adults by promoting interaction, socialization, and relaxation through engagement and happiness.	Level II

			Technology in the U.S.			
Chiu et al. (2021)	What are the preferences of middle and older adults regarding using companion robots?	Theory of planned behavior.	A cross-sectional study was performed from May to June 2018 and involved 273 community-dwelling adults ages 45 years and older living in Taiwan. The questionnaires were focused on sociodemographic characteristics of subjects, mental and physical health, technology use, and personal experiences using robots and pets. The video presentation was provided describing different companion robots, such as human-like robots, animal robots, and nonbiological devices.	-94.2% of participants did not receive animal-assistive therapies, 82.1% never used robots, and 63.6% had prior experience with keeping a real pet. -33.8% of subjects preferred both pets and robots, 23.3% wished to interact with pets, 17.5% favored robots, and 25.4% of subjects accepted neither pets nor robots. -people with multiple illnesses and those who had prior technology experience were more likely to accept robots than pets. -subjects preferred animal robots the most regardless of their age. -recreation and skill activities provided by social robots were the most appreciated.	Companion robots are well accepted by middle and older adults, with individual preferences and prior life experiences playing an important role. Animal-like devices with recreation and interaction functions are the most preferred by the participants, emphasizing the importance of these robots in the provision of companionship. Older individuals who live alone or who suffered multiple diseases were more likely to accept robots and favor interactions with devices, making the application of social robots particularly valuable for these populations.	Level IV

Lizano-Díez et al. (2022)	What are patient support services and their impact on patient outcomes and healthcare savings?	Not listed	An integrative literature review of studies published between 2009 and 2019 worldwide. -studies included original publications, guidelines, reviews, and meta-analyses that were focused on illnesses requiring parenteral administration or special support. PRISMA method was used to review studies. -54 studies were included.	-the review identified 64 home-assistive care services provided worldwide. -most services were provided by nurses (73.4%). -35.9% utilized telepharmacy -34.4% addressed cancer care. -home-based care services positively influenced the quality of patient life, medication adherence, and patient satisfaction. -21.9% of these services reported a significant cost saving from home therapy.	Home-care services are helpful for supporting patient needs, especially for managing complex conditions such as cancer or multiple sclerosis. These therapies are also useful for improving patient adherence and reducing healthcare costs.	Level III
Hung et al. (2019)	What are the applications of PARO robotic therapy and its impact in care settings?	Not listed	A scoping review involving studies focusing on care setting, people with dementia, and the PARO robot. -29 publications were included, with 24 of them being quantitative studies. Articles were published in the	-the benefits of PARO therapies include improving socialization, reducing behavioral problems and negative emotions, and promoting positive emotions, mood, and quality of care. -the barriers to using PARO	PARO has multiple positive effects on patient outcomes, including reduction of behavioral problems, improving emotional well-being, and promoting social engagement. However, certain barriers, such as	Level III

			U.S., Australia, Japan, and Canada.	include cost, infection control, ethical issues, workload, and stigma.	cost and infection control, can challenge the usefulness of PARO in healthcare.	

Appendix B

Summary of Systematic Reviews (SR)

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
Williams et al. (2021)	What interventions are effective to reduce social isolation and loneliness during COVID pandemic?	Six databases were searched, including Embase, Medline, Web of Science, Cochrane Database of Systematic Reviews, PsycINFO, and SCOPUS - 13 non-randomized controlled trials and 45 RCTs were included.	Inclusion criteria: people of all ages living outside of hospital setting, interventions to reduce loneliness or social isolation applicable during COVID-19 and social distancing, a control group, and quantitative changes in social isolation, loneliness, and social support. Exclusion criteria is not listed.	The Downs and Black checklist was used to screen and extract the data Tow authors screened the studies	The following interventions are effective during COVID 19 pandemic for social isolation management: psychological therapies, meditation, robotic pets, mindfulness, friendship lessons, software that facilitate socialization. -animal-assisted therapies are not applicable during COVID -real dog and robotic dog have similar effect -robot-assisted therapies	There are many interventions that facilitate socialization involving cognitive, communication, and educational components. These interventions must be aligned with COVID restrictive policies.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
					significantly improved the UCLA scores.		
Hajek et al. (2020)	What are the relationships between social isolation, loneliness, multimorbidity, and mental health?	Online databases were searched: PubMed, CINAHL, and PsycINFO. -8 studies were included.	Inclusion criteria: Cross-sectional and longitudinal observational studies that were focused on frailty, loneliness, social isolation, and multimorbidity; studies written in English and German languages, published in peer-reviewed journals; studies measured variables such as social isolation. Exclusion criteria: studies that did not explore the link between on frailty, loneliness, social isolation, and multimorbidity; publications involving populations with a specific illness; not observational studies; studies in which variables	The data were extracted by one reviewer and then cross-checked by another reviewer. If a disagreement occurred, the third-party reviewer was involved. The NIH Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies was used to evaluate the quality of studies.	A strong relationship between loneliness and multimorbidity was noted. -having multiple illnesses affected the quality of connections with others. -The poor quality of relationships predisposed people to loneliness and affected their social networks. -decreased physical activity was frequently seen in middle-aged and older adults with multiple chronic illnesses. -a low level of physical activity negatively affected the quality of relationships and predisposed the	Poor social relationships are strongly related to multimorbidity and predisposed people to social fragility. Reducing loneliness and social isolation in middle and older adults and people with multiple illnesses can improve their health, well-being, and the quality of their lives.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
			were inappropriately measured.		subjects to loneliness.		
Shourmasti et al. (2021)	What are the experiences of people using social robots?	Following databases were searched: Google Scholar, IEEE Xplore, Springer, ACM Digital Library, and ScienceDirect. -20 studies were included.	Inclusion criteria: reports, articles, thesis, white paper, and book, studies focusing on social robots, experiences of users, methods used to assess social robots, benefits, and challenges in evaluating social robots, and studies within the last 10 years. Exclusion criteria: publications without the full text, written in languages other than English, and studies not focusing on social robots.	PRISMA method was used to appraise the studies. Zotero was used to extract the information, including the design of studies, data type, author(s), title, and demographics.	Social robots are utilized in various fields such as healthcare, home setting, education, culture, and social work. -robots assist with daily tasks, promote communication and interaction, support teaching and learning, and perform commercial work. -social robots are well accepted by seniors and help individuals with special needs, especially older adults and people with dementia. -allowing repeated human-robot interactions helps users to accept robots. -regular evaluation of human-robot	The application of social robots increased across different areas, especially in those fields involving social and supportive services. By conducting repeated human-robot interactions, social robots become appreciated and accepted by individuals. Importantly, the assessment of human-robot interaction must be conducted regularly to ensure that these interactions are effective and beneficial. By focusing on the quality of human-robot interaction rather than the	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
					interaction must be conducted.	function of devices, developers can identify the preferences of consumers regarding the performance of devices.	
Lambert et al. (2020)	What is the effect of social robots on human-robot interaction?	Online libraries included: the Institute of Electrical and Electronics Engineers and the Association for Computing Machinery -86 studies were included.	Inclusion criteria: only English publications, studies involving social and personal robots. Exclusion criteria: publications prior to 2008, studies not designed to test, implement, or understand social robots, duplicate publications of the same results but published in different formats, studies that are done on the industrial robots.	PRISMA method was used to evaluate the studies. Studies were classified based on their contribution including healthcare, education, companionship, social definition, and social effect. The average citation count for each study was calculated. Studies were described based on their design, data type, a research topic, and demographics.	Individuals preferred devices with human-like behaviors. -robots showed a positive effect on the socialization of people. -robots are often utilized in healthcare to monitor emotional and physical well-being and track health-related changes. -social robots are used for education. -robot interactions are based on algorithms and different from human decisions.	Social robots are useful in many areas such as companionship, healthcare, and education. These robots are capable to promote companionship and social presence, positively influencing the well-being of individuals.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
Marcos-Pablos and García-Peñalvo (2022)	Can robots benefit healthcare education outside of surgical and rehabilitation settings? What is the effect of robots on teaching-learning processes?	A literature search was performed in Scopus and Web of Science databases, containing publications from Cochrane, Embrace, and Medline libraries. -26 studies were selected.	The inclusion criteria involved articles describing the application of robots for healthcare education that were published in peer-reviewed conferences, books, workshops, or journals. However, publications shorter than three pages were excluded due to their limited ability to meet the quality review.	The PRISMA method was used to analyze the studies. The qualitative data was extracted by identifying research questions, patterns, and themes. Then, coding was performed.	Robots are commonly utilized for didactic education as human-patient stimulators. -the degree of movement varied between robots, with most devices being able to move at least one joint they were intended to imitate. -the teaching goals of using robots were most frequently centered around treatment and rehabilitation. -robots are helpful for teaching health assessment techniques, diagnostic procedures, and pain assessment. -these devices are used in various settings and with different learners, such as nursing students, interns, residents, and	This systematic review showed a broad application of robots for education in healthcare and the beneficial effect of technologies for promoting the teaching-learning processes.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
					attending physicians. -a wide range of learning methods robots can stimulate, such as kinesthetic, visual, and audio. -robots were found to help evaluate learning processes through the timely feedback.		
Pu et al. (2019)	Does using social robots with older adults affect physiological, psychological, quality of life, and medication use outcomes?	Online databases included: ProQuest, Scopus, PubMed, CINAHL, Medline, Science Direct, Cochrane Library, PsychINFO, and Web of Science. The search involved RCTs focusing on using social robots with older adults in healthcare. -13 studies were included.	Inclusion criteria: studies with older adults 55 years and older, only RCTs, using social robots of any type, and English language publications. Exclusion criteria: studies with children and young adults, nonrandomized studies, reviews, case studies, study protocols, cross-sectional studies, observational studies, research without a control group, qualitative	The studies were selected based on their characteristics, descriptions of participants, interventions, control, outcome measurements, and results. ANCOVA statistical analysis was utilized. The differences between studies were measured by the Chi-square test. The mean difference was set at a 95% confidence interval. A	Social robots have the following effects on older adults: -reduce agitation and anxiety. -improve psychological and social well-being. - -increase social interaction and engagement. -reduce loneliness and the use of pain and psychotropic medications. -improve physiological health, cardiac status, and oxygenation.	Social robots can positively influence the physical, psychological, and social well-being of older adults. They reduce loneliness and the need for certain medications, improving the well-being and quality of life of the geriatric population.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
			studies, and conference abstracts.	subgroup analysis of group and individual interventions was conducted.			
Deckx et al. (2014)	What are the risk factors and severity for loneliness in adults with cancer?	The following databases were searched: PubMed, PsycINFO, Embase, CINAHL, and Cochrane Library. -studies were searched using combination of social isolation and neoplasm, or loneliness and neoplasm. -15 quantitative studies published before September 23, 2013, were included with 13 of them used UCLA Loneliness Scale.	Inclusion criteria: quantitative study, adult patient 18 years or older who reported to be lonely, studies with or without a control group, onliness to be measured by a validated scale. Exclusion criteria: studies with a single measuring question, when loneliness was due to other factors such as face deformity, wound, cultural barriers, language barriers, or needed a palliative care, and studies that measured loneliness before cancer diagnosis.	Two independent reviewers performed data extraction, including Patient characteristics and study design, the scale used to measure, the severity of loneliness, and loneliness risk factors. The random effects adjusted inverse variance was used to calculate mean scores. CI was 95%.	Level of loneliness increases with time from the cancer diagnosis -inadequate social support was related to increased loneliness. -type of cancer, stage, or treatment were not associated with degree of loneliness. -the weighted mean for loneliness was 38.26, indicating a moderate degree of loneliness.	Addressing loneliness for patients with cancer is essential, as the severity of the loneliness correlates with the length of diagnosis.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
Wang et al. (2022)	What is the effect of using the PARO device on older adults?	Online databases were searched including PubMed, EMBASE, Web of Science, Cochrane Library, CINAHL, and Chinese database SinoMed. -9 randomized controlled studies published between 2003 and 2020 were included.	The Cochrane collaboration tool was used to evaluate the quality of studies. Inclusion criteria: studies involving older people living in assistive facilities, intervention involving PARO, the results of studies provided a detailed report about the effect of PARO, studies published in Chinese or English, and only randomized control trials. Exclusion criteria: studies with young adults and children, studies other than randomized control trials, studies that did not contain a full text, and studies that did not focus on the	The PRISMA method was used to analyze the studies. EndNote X9 eliminated the duplications. The information extracted included: the author, type of intervention, country and year of publication, the mean age of subjects, follow up time, and the outcomes achieved. Standardized mean difference with 95% CI was used. The I^2 method was employed to identify heterogenicity, and $I^2 > 50\%$ indicated significant heterogenicity. The fixed-effects model was utilized with less heterogenic data, and the random-effects model was	The PARO social robot showed the following effect: -improves the quality of life of older adults -helps to control biopsychological conditions, such as depression, apathy, agitation, anxiety, and wandering -decreases the use of psychotropic, pain, and behavioral medications.	The interactive PARO session can be utilized as an effective tool to improve the physical, mental, and general well-being of older adults, positively affecting the quality of their lives.	Level I

Citation	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Recommendation/ Implications	Level of Evidence
			effect of PARO on older adults.	used with significantly heterogenic data. For statistical calculations, the RevMan 5.4 was used and $p < 0.05$ indicated statistically significant results.			

Appendix C

Project Schedule

Activity	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Meet with faculty/preceptor	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐
Meet with academic advisor	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐	☒	☐
Perform the chart review to select potential subjects- conducted after the IRB approval (pre-intervention)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Recruit participants over the phone- completed after the IRB approval (pre-intervention)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Conduct the pre-intervention visit to obtain informed consent and administer the UCLA questionnaire- done after the IRB approval (pre-intervention)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Review PARO training videos	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Call participants to schedule the initial PARO visit	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Launch the project	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Charge PARO and verify its functioning	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
Prepare/refill supplies (ex. masks and hand sanitizers) and fuel a car	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
Call participants the day before the visit to confirm the meeting	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
Conduct PARO visit x 2 per week	☒	☒	☒	☒	☒	☒	☒	☒	☐	☐	☐	☐	☐	☐	☐	☐
Instruct participants regarding the termination of PARO visit next week	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
Distribute the Social Isolation and Loneliness Outreach Community Resources and Understanding Loneliness and Social Isolation: How to Stay Connected Handouts	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
Administer the UCLA Questionnaire to collect post-intervention data	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
Terminate the project	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
Analyze the data using SPSS (post-intervention)	☐	☐	☐	☐	☐	☐	☐	☐	☒	☒	☒	☒	☐	☐	☐	☐
Submission of manuscript (post-intervention)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐

Appendix D

Data Collection Tool for Evaluation: The UCLA Loneliness Scale Version 3

Instructions: The following statements describe how people sometimes feel. For each statement, please indicate how often you feel the way described. Here is an example:

How often do you feel happy?

If you never felt happy, you would respond "never"; if you always feel happy, you would respond "always".

NEVER	RARELY	SOMETIMES	ALWAYS
1	2	3	4

*1. How often do you feel that you are "in tune" with the people around you?
2. How often do you feel that you lack companionship?
3. How often do you feel that there is no one you can turn to?
4. How often do you feel alone?
*5. How often do you feel part of a group of friends?
*6 How often do you feel that you have a lot in common with the people around you?
7. How often do you feel that you are no longer close to anyone?
8. How often do you feel that your interests and ideas are not shared by those around you?
*9. How often do you feel outgoing and friendly?
*10. How often do you feel close to people?
11. How often do you feel left out?
12. How often do you feel that your relationships with others are not meaningful?
13. How often do you feel that no one really knows you well?
14. How often do you feel isolated from others?
*15. How often do you feel you can find companionship when you want it?
*16. How often do you feel that there are people who really understand you?
17. How often do you feel shy?
18. How often do you feel that people are around you but not with you?
*19. How often do you feel that there are people you can talk to?
*20. How often do you feel that there are people you can turn to?

Scoring:

Items that are asterisked should be reversed (i.e., 1=4, 2=3, 3=2, 4=1), and the scores for each item then summed together. Higher scores indicate greater degrees of loneliness.

(Russell, 1996, p. 23).

Appendix E

Consent Letter to Preform Study

EDUARD A. ZINGER, MD
Internal Medicine
4433 W.Touhy Av, ste 235, Lincolnwood, IL 60712
Lic: 036-103202 DEA: BZ 5696856

Ph 773.412.6123 • **Fx** 812.961.5829 • **E** edzinger@hotmail.com

To whom it may concern,

I give permission to Iryna Lyuta to implement her DNP project in the primary care practice at Zinger Medical Offices.

Project Title: Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults.

This approval is valid from September 1, 2022, until August 31, 2023.

Sincerely,

E. Zinger, MD

Appendix F

SWOT Analysis

Strengths:

- Strong collaboration between employees
- Loyalty of patients
- User-oriented device: PARO is easy to operate and has no language barrier
- Robust evidence supporting PARO sessions

Weaknesses:

- The cost of PARO during the initial purchase
- Tight schedule of providers
- Limited human resources to conduct PARO sessions
- Resistance of employees, patients, and family members

Opportunities:

- Social isolation prevention initiatives supported by the major healthcare organizations
- Offers the unique therapeutic approach for homebound older adults and other patient populations
- PARO sessions are reimbursed by Medicare

Threats:

- Inability to conduct PARO sessions due to the COVID-19 pandemic
- Potential increase in the cost of the device
- Cut off the reimbursement for PARO sessions
- Alternative or less expensive products are available

Appendix G

Permission Letter to Utilize the UCLA Loneliness Scale

Russell, Daniel W [HD FS] <drussell@iastate.edu>

To: Iryna Lyuta

Wed 10/26/2022 2:31 AM

Iryna:

You have my permission to use the UCLA Loneliness Scale in your research project. I have attached an unpublished paper that provides normative data for the measure that may prove helpful to you in interpreting your results.

I would appreciate seeing a summary of your results. Good luck with your research project.

Dan

Daniel W. Russell, PhD
Professor, Department of Human
Development & Family Studies
Iowa State University
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Ames, IA 5011-1084
(515) 294-4187
Fax: 294-2502

Appendix H

Plan for Educational Offering

OBJECTIVES	CONTENT (Topics)	TEACHING METHODS	TIMEFRAME	EVALUATION METHOD
Increase the knowledge of participants regarding the PARO device	Information about the purpose, function, risk, and benefits of PARO. Instruction on the proper handling of the device	- Provide verbal instructions about PARO during the pre-intervention visits. - Distribute the PARO manual to support verbal instructions. - Present the PARO video available from the PARO website: http://www.parorobots.com/training.asp - Provide demonstration on how to use the PARO device	verbal instructions and demonstration on using PARO will last 25 minutes during the pre-intervention visit and a video PARO presentation will take 5 minutes.	Ask open-ended questions regarding the purpose, function, risk, and benefits of PARO. Request return demonstration on using PARO
Increase the awareness of the organization's employees about the benefits of PARO for homebound patients.	Evidence-based information about the benefits of PARO obtained from the literature review and the DNP project. Specific DNP project outcomes achieved from using PARO with homebound older adults	- Perform individual interactions with coworkers about PARO and its usefulness for the organization and patients. - Conduct a meeting with the organization's employees to disseminate the results of the DNP project. The meeting will involve a video presentation, discussions, and the distribution of printed handouts.	-brief interactions with individual employees will be 5-10 minutes. -a formal meeting will take 30 minutes	Ask open-ended questions. Conduct group discussions. Administer surveys.

Appendix I

Budget

EXPENSES		**REVENUE**	
Direct		Billing	$0
Salary and benefits	$0	Grants (Pending)	$0
PARO Device	$2089.99	Institutional budget support	$0
Supplies: - PDI Super Sani-Cloth Germicidal Disposable Wipes (2 boxes of 160 count) - Purell Hand sanitizer (4 bottles of 12 fl. oz) - Disposable masks (4 boxes of 100 count) - Copy paper for printing consents, calendars, questionnaires, and handouts (3 reams of 500 sheets) - Printer ink - Pens BIC Black ink (60 count) - Folders with pockets(30 count) Supplies total	 $24 $18 $40 $25 $25 $8 $30 $170		
Statistician	$400		
Services	$0		
Travel/Gas/Car Maintenance	$320		
Indirect			
Overhead	$0		
Total Expenses	$2979.99	Total Revenue	$0
Net Balance $2949.99			

Appendix J

IRB Approval Letter

Date: January 11, 2023

To: Iryna Lyuta

From: IRB

Subject: Research Approval

Please be advised that on January 11, 2023, your request and application of the study listed below was approved:

- Project Number: 20221211.01
- Project Title: Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults
- Principal investigator(s) Iryna Lyuta

This approval is for one year from the date of approval and will require continuation on an annual basis if needed. Note: any changes to the protocol must be submitted for approval.

An annual review and status report is due prior to January 10, 2024. Changes to the protocol must be submitted to the IRB immediately, before data collection can continue. If the study will continue past the year approved, the IRB Committee must be notified three weeks before the expiration of approval, December 20, 2023. Closure of the study is to be reported upon completion of the project. The appropriate forms are on the University website.

Cc: IRB File

Appendix K

Letter of Introduction (Verbal)

Dear patient,

My name is Iryna Lyuta. I am a Family Nurse Practitioner at Zinger Medical Offices and a Doctor of Nursing Practice student at Oak Point University. I am working on the project "Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults." This project is a required component of my doctoral education.

You are invited to participate in this project because you are a patient of Zinger Medical Offices who receives care from home-visiting providers. This scholarly work focuses on reducing social isolation and loneliness in homebound older adults by allowing interaction with the PARO robot during home visits. PARO is a medical device in the form of a baby harp seal. It has multiple sensors, allowing effortless interaction with humans. The Food and Drug Administration approved the device and categorized it as a biofeedback machine. The evidence shows that PARO helps decrease depression, anxiety, and pain. Most importantly, PARO promotes positive feelings and increases social engagement, including visual contact, verbal interaction, and activity participation, which are the primary goals of this project.

For this project, homebound adults ages 65 years and older will be recruited. Only medically and mentally stable seniors will be involved. A total of 20 patients will be selected. The participants will receive fifteen minutes of interactive PARO sessions in their homes. These visits will be conducted twice a week for eight weeks. The UCLA Loneliness questionnaires will be administered to participants before and after the intervention to evaluate the effectiveness of human-robot interactions.

To be eligible to participate in the project, you must identify yourself as being socially isolated or lonely. Social isolation involves a lack of contact with social support systems, including friends, family members, communities, and society. In contrast, loneliness is when individuals feel isolated despite being around others.

Do you feel socially isolated or lonely?

- ***Yes*** - Your positive response indicates that you are eligible to participate in the project *(proceed to the next section)*

- ***No*** - Since you did not identify yourself as socially isolated or lonely, you are ineligible to participate in the project *(do not proceed to the next section but terminate the conversation. Ex. Thank you for your time and consideration. However, you are not meeting the recruitment criteria).*

The next step involves scheduling the pre-intervention visit at your home. I will contact you over the phone within the next two weeks to schedule the day and time of the visit. This visit will last less than 30 minutes and will include providing you with full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. You will sign informed consent. In addition, you will receive instructions about the PARO device and watch a brief video about the robot. You will also receive a copy of the PARO manual for your reference and a printed calendar to list the dates and times of the subsequent meetings. After that, the UCLA Loneliness questionnaire will be administered to you in paper and pen format. If you need help with completing the questionnaire, I will assist you. The questionnaire will take less than 10 minutes, but you may take as much time as needed.

Importantly, you will not receive any financial compensation for participating in this project. Your involvement in the project is anonymous, and your name will not be identified or shared. Taking part in this project is voluntary. You do not have to participate, and you can stop at any time. If you decide not to participate in this project or withdraw from participating at any time, you will not be penalized.

You can join this project and have positive inactions with the PARO robot. Other people will also benefit since your contribution to this project will generate evidence-based information to address policy changes for social isolation and loneliness management in homebound older adults and other populations.

If you agree to participate in the project, I will contact you within the next two weeks to schedule the pre-intervention visit.

If you have any questions, please call me at the number 312-479-3477 or send an email to iryna.lyuta@oakpoint.edu

Thank you for your consideration,

Iryna Lyuta, MSN, FNP-BC

Appendix L

OAK POINT UNIVERITY
CONSENT TO BE PART OF A PROJECT

1. KEY INFORMATION ABOUT THE RESEARCHERS AND THIS PROJECT

Project title: Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults

Principal Investigator: Iryna Lyuta, MSN, FNP-BC, and the current Doctor of Nursing Practice (DNP) student at Oak Point University

Faculty Advisor: Lisa Biancalana-Marsh, DNP, APRN-FPA, FNP-BC, TNS

You are invited to take part in a DNP project. This form contains information that will help you decide whether to join the project.

1.1 Key Information

Things you should know:

The purpose of the project is to decrease loneliness and social isolation in homebound older adults by utilizing the PARO device for human-robot interactions.

The terms "DNP Scholar," "Project Manager," "Student," and "Principal Investigator" are synonymous and are used interchangeably.

If you choose to participate, you will be asked to interact with the PARO robot during scheduled home visits. PARO is a robot in the form of a baby harp seal. It has a soft covering and five sensors, including touch, sound, temperature, posture, and light, allowing interaction with people. PARO can open its eyes and move flippers and a tail in response to touch. It can also reveal emotions by reacting to petting or sounds. PARO is a medical device approved by the Food and Drug Administration (FDA). It reduces stress, improves mood, and decreases the need for pain medications. It helps to promote emotional well-being and social interaction in people with memory problems, anxiety, depression, cancer, and brain injuries. It can stimulate interactions and increase the social engagement of individuals, which is the focus of this project.

Before the project begins, this student will contact you over the phone to schedule the pre-intervention visit. During this visit, you will receive information about the DNP project, instructions about the PARO, and watch a brief video about the robot, which will take approximately 20 minutes. This student will answer any questions that you may have about the

project and the PARO device. You will also fill out a paper survey consisting of 20 questions about your level of loneliness and social relationships with other people. The survey questions will take less than 10 minutes to complete, but you can take as much time as you need. This student will assist you with translating the survey if requested. Your responses will be confidential, and we do not collect identifying information such as your name or email address.

Then, the PARO sessions will be performed with you at your home twice a week for eight weeks. You will be asked to remain at your home on scheduled days and times for interactive PARO sessions. The visit will last 15 minutes, but you will be requested to stay at home for the scheduled two hours to accommodate the time needed for the student to travel to your home. In addition, you will be provided with a printed calendar to write the PARO visits for your reference. If you are unwilling or unable to accommodate any of the meetings, you may cancel or reschedule the visit without penalties. If you want to reschedule the visit, you will be provided with the student's phone number to make the adjustment. You will receive a phone call from this student a day before each visit to remind you of the upcoming PARO session.

This will take approximately eight weeks or sixteen sessions.

Risks or discomforts from this project include emotional distress from having to recall the feelings of loneliness and poor relationships with other people when taking the questionnaire. This will be minimized by allowing you to skip questions that make you feel uncomfortable, as well as allowing you to discontinue the questionnaire at any time. In addition, you may feel uneasy or nervous when interacting with the robot. To overcome this, you will be informed regarding the purpose, function, and benefits of using PARO. You can withdraw from the project at any time or choose not to participate if the PARO robot creates emotional discomfort for you.

Moreover, you may become attached to the PARO robot, and discontinuing the interactive sessions may create emotional distress. Importantly, you will not own the PARO robot during the project and after it is completed but are privileged to interact with the device during the scheduled sessions of the study. You will be informed a week before the last visit that the sessions will be over to give you time to adjust. In addition, the PARO device can be prescribed to you by your healthcare provider if you meet the eligibility criteria and if your insurance covers the device. Notably, Medicare provides reimbursement to healthcare providers, including physicians, nurse practitioners, psychologists, therapists, and home health agencies, for administering PARO sessions. Medicare Part B covers these services in outpatient settings outside hospitals and skilled nursing facilities. Medicare Part A reimburses clinicians for providing PARO sessions to patients during hospitalization and assisted living stay.

Likewise, the PARO interactive sessions may not produce the desired effect on reducing social isolation and loneliness. Therefore, this DNP student will provide you with a list of community resources, inclusive of emergency mental health resources, where you can obtain further information and help with social isolation and loneliness prevention. In addition, the printed handout “Understanding Loneliness and Social Isolation: How to Stay Connected,” published by

the National Institute on Aging (2020), will be provided to you. This handout contains detailed information on social isolation and loneliness prevention and additional external resources to obtain additional help.

Furthermore, the potential risk of COVID infection exists during the current pandemic, especially from the repeated interactive in-person session or from sharing the PARO robot between the participants. To ensure infection precautions, disposable masks will be provided to you and will be worn by all individuals during interactive sessions. Hand hygiene with an alcohol-based hand sanitizer or soap and water will be performed at the begging and the end of visits, and the PARO device will be disinfected with PDI Super Sani-Cloth Germicidal Disposable Wipe. In addition, this student is up to date with the recommended COVID vaccinations to minimize the transmission of infection. In addition, if you or this student develops any signs and symptoms of COVID infection, has been recently exposed to a COVID-positive individual, or received a positive COVID test, then the PARO sessions will be postponed per the current CDC regulations until you, or the student is free of symptoms for at least 24 hours and receives a negative COVID test. This project manager will also assist you with arranging COVID testing if requested. You will not be responsible for costs associated with COVID testing. Moreover, this DNP student remains up to date with the recommended COVID vaccinations to minimize the transmission of infection.

Furthermore, the breach of confidentiality may pose a potential risk. However, this will be minimized by using encrypted data. We will not release any names of subjects to maintain anonymity.

There are no direct benefits to your participation in the project. However, many studies showed that people who interacted with the PARO robot improved their emotional and social well-being.

Taking part in this project is voluntary. You do not have to participate, and you can stop at any time. Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

2. PURPOSE OF THIS PROJECT

The purpose of this project is to develop an evidence-based intervention for reducing social isolation and loneliness in the homebound geriatric population that can be easily implanted in the community or home setting. By promoting interaction with the PARO therapeutic device, patients will receive positive emotions and feelings of social connectedness, improving their overall well-being and quality of life. This project will also offer clinicians an evidence-based approach to social isolation management in other vulnerable groups, supporting the recommendation of policy changes in different healthcare settings.

3. WHO CAN PARTICIPATE IN THIS PROJECT

3.1 Who can take part in this project?

The participants will be recruited from the population of patients receiving care from the providers of Zinger Medical Offices. This student will use inclusion and exclusion criteria to select subjects. In particular, the inclusion criteria involve: being 65 years and older; of any gender; having a homebound status as documented in the medical record; living in a community alone, with their families, or with caregivers; living in Chicago or the Northwest Suburbs of Chicago since the majority of the patients of Zinger Medical Office reside in this areas; speaking English, Ukrainian, Polish, or Russian languages as this DNP student is fluent in these languages; having chronic diseases well controlled with lifestyles or medications; being cognitively intact; having stable mental and emotional status free from anxiety, depression, or psychosis; being willing to participate in the PARO sessions and sign informed consent, and meeting the criteria of loneliness and social isolation as measured by self-report and the UCLA Loneliness scale.

Being cognitively intact, known as cognitively healthy, implies the capacity of an individual to think, remember, and understand (CDC, 2019). "Cognition is a combination of processes in the brain that includes the ability to learn, remember, and make judgments" (CDC, 2019, n.p.). This DNP project will include participants who are cogitatively healthy and are free from the diagnosis of dementia or cognitive impairment as documented in the medical record.

Furthermore, the exclusion criteria include: being younger than 65 years of age; being non-homebound or missing the documentation of the homebound status in the medical record; residing in assistive living or rehabilitation facilities; being in a hospital; living outside of Chicago or the Northwest Suburbs of Chicago; not being fluent in English, Ukrainian, Polish, or Russian; having poorly controlled chronic diseases; having documented any form of dementia or cognitive deficit; having unstable emotional and mental status, including depression, anxiety, and psychosis; having a terminal diagnosis due to the vulnerability of the condition; having a pacemaker or a defibrillator since PARO may interfere with the electrical current of these devices; having severe pain poorly-controlled by pharmacological and nonpharmacological treatments due to the difficulty participating the PARO sessions; being discharged from the hospital within the last two weeks since the time is needed for providers to medically stabilize patients; being a new patient to Zinger Medical Offices because the extra time is required for initial treatments and the establishment of patient-provider relationships; being unwilling to participate in the PARO sessions or to sign informed consent; and not meeting the criteria of loneliness and social isolation as measured by self-report and the UCLA Loneliness scale.

3.2 How many people are expected to take part in this project?

This project estimates to have between 20 to 30 participants.

4. INFORMATION ABOUT PROJECT PARTICIPATION

4.1 What will happen to me in this project?

Before the project implementation, you will be contacted over the phone to schedule a pre-intervention visit. This visit will include providing you with full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. You are required to sign an informed consent to participate in the project. In addition, you will receive instructions about the PARO device and will watch a brief video about the robot. After that, the printed UCLA Loneliness questionnaire will be administered to you in paper and pen format. Some of the UCLA Loneliness questions may contain sensitive information, such as your perceived feelings of loneliness, difficulty making friends, or lacking companionship. You may skip questions that make you uncomfortable and discontinue the questionnaire at any time. Next, you will be given a printed calendar to list the dates and times of the subsequent meetings. You will be asked to place the calendar in a visible area, such as hanging it on the wall or refrigerator, to keep visual reminders of upcoming visits. The phone number of this project manager will be provided to you if the PARO session should be rearranged or canceled.

During the implementation of the project, this student will call you a day before the visit to provide a reminder. You will be given a two-hour window for the visit to cover the time needed for the student to travel to your home. After entering your home, you and this student will wash your hands with an alcohol-based hand sanitizer or soap and water. A disposable facemask will be provided to you and if needed to your caregivers at the begging of each visit to ensure infection control. Then, this student will reinforce information about the PARO device presented during the pre-intervention visit and will introduce PARO. The robot will be placed on a hard surface, such as a table or a chair, in front of you. The device will be turned on by this student. You will be advised to have unstructured interactions with the PARO robot, such as grooming, petting, hugging, greeting, and talking. This project manager will encourage this human-robot contact and will answer any pertinent questions that you may have. Each interactive PARO session will last 15 minutes. At the end of the visit, PARO will be turned off by this student and will be disinfected with PDI Super Sani-Cloth Germicidal Disposable Wipe. The device will be placed in a carrier to be taken out of your home. After the interaction, you and this student will wash your hands with an alcohol-based hand sanitizer or soap and water. Then, this student will review with you the upcoming visit and will adjust the schedule if needed. This student will reschedule the meeting for another day or time within the same week if you make a request.

These PARO interactive sessions will be conducted twice a week and last eight weeks. A week before the last visit, you will be notified that the PARO interactive sessions will be ended next week. You will be provided with a list of community resources and the handout, “Understanding Loneliness and Social Isolation: How to Stay Connected,” published by the National Institute on Aging (2020), to assist you with additional information and external resources for social isolation and loneliness prevention. During the final visit, you will interact with the PARO and complete the UCLA Loneliness questionnaire in paper and pen format. This visit will last 30 minutes to accommodate the interactive PARO session and the completion of the survey.

The only time when medical records are reviewed is when this student performs the selection of the potential participants based on the inclusion and exclusion criteria. Otherwise, medical records will not be used for any other purposes.

4.2 How much of my time will be needed to take part in this project?

The initial pre-intervention visit will last approximately 30 minutes. It will include receiving information about the project and the function of the PARO robot, watching a brief video presentation about the PARO device, signing informed consent, and completing the UCLA Loneliness questionnaire. The questionnaire is expected to take about 10 minutes. The PARO interactive sessions will be conducted at your home twice a week for eight weeks, comprising 16 sessions. Each session will last 15 minutes. The last visit will be 30 minutes and include the PARO interactive session and the completion of the UCLA Loneliness questionnaire.

4.3 If I decide not to take part in this project, what other options do I have?

Your participation in this project is voluntary. You may choose not to participate. If you decide not to participate in this project, many options are available to address loneliness and social isolation. You can increase your social connections with others, such as family or friends, by using phone, video, email, letter, text, or social media. You can learn about community resources and local services. You can attend support groups or recreational activities. You can volunteer to help others or find a hobby to enjoy. You can also check with your healthcare provider to discuss other options.

5. INFORMATION ABOUT PROJECT RISKS AND BENEFITS

5.1.1 What happens if I get hurt, become sick, or have other problems because of this project?

The project manager has taken steps to minimize the risks of this study. Please tell the student if you have any injuries or problems related to your participation in the project. The project manager will be able to assist you with obtaining emergency treatment, if appropriate, but you or your insurance company will be responsible for the cost. Participants will not be responsible for costs associated with COVID testing. By signing this form, you do not give up your right to seek payment if you are harmed because of being in this project.

To ensure infection prevention during the COVID-19 pandemic, we ask you to notify us as soon as possible if you develop any of the following:

1) a positive viral test for COVID

2) symptoms of COVID infection

- · Fever or chills
- · Cough
- · Shortness of breath or difficulty breathing
- · Fatigue
- · Muscle or body aches
- · Headache
- · New loss of taste or smell
- · Sore throat
- · Congestion or runny nose
- · Nausea or vomiting
- · Diarrhea

3) close contact with someone with COVID infection

If any of the above criteria are met, we will need to postpone the visit per the current CDC regulations until you have a negative COVID test.

If you or this student develops any of the listed above symptoms, a negative COVID test is required before the continuation of PARO sessions, and both you and this student must be free of symptoms for at least 24 hours. In addition, we will notify you if this student was exposed to a COVID-positive individual or if this student develops a COVID-19 infection. This student will require to quarantine per CDC guidelines and to have a negative COVID test before visiting you.

We respect your decision to cancel any visits related to COVID transmission regardless of the negative COVID test provided by the student.

5.2 How could I benefit if I took part in this project? How could others benefit?

You can participate in this project and have positive inactions with the PARO robot. Other people will also benefit since your contribution to this project will generate evidence-based information to address policy changes for social isolation and loneliness management in homebound older adults and other populations.

6. ENDING THE PROJECT

6.1 If I want to stop participating in the project, what should I do?

You are free to leave the project at any time. If you leave the project before it is finished, there will be no penalty for you. If you decide to leave the project before it is completed, please tell one of the persons listed in Section 9. "Contact Information". If you choose to tell this project manager why you are leaving the study, your reasons may be kept as part of the study record. This student will keep the information collected about you for the research unless you ask us to delete it from our records. If this student has already used your information in the project analysis, removing your data will not be possible.

7. FINANCIAL INFORMATION

7.1 Will I be paid or given anything for taking part in this project?

You will not receive financial compensation for your participation in the project. There is no cost to you for using the PARO device during the project. In addition, you will not be billed for receiving the PARO interactive sessions during the study.

8. PROTECTING AND SHARING RESEARCH INFORMATION

8.1 How will the researchers protect my information?

The review of medical records to identify potential subjects, calling patients to schedule the initial pre-intervention visits, and scheduling PARO interactive sessions will be performed by this DNP student in the restricted area of Zinger Medical Offices, away from other employees, patients, and visitors. This scholar will review the medical records only to identify the potential subjects. Each participant will be assigned a coding number. The demographic data will be collected during the recruitment of participants and include the subjects' age, gender, race, ethnicity, and language. This information will be used to describe the characteristics of a sample. The pre-intervention visits and PARO interactive sessions will be conducted with each participant individually at his or her place of residence to maintain confidentiality. The UCLA Loneliness Scale Version 3 will be utilized to collect pre- and post-intervention data. This questionnaire will be administered in paper and pen format to each patient during the pre-intervention and at the last PARO visit. The UCLA Loneliness Scale will not contain any Protected Health Information (PHI) of the subjects. The pre and post-intervention questionnaires will have a listed number matching the coding number assigned to each patient. This will allow the detection of changes in loneliness and social isolation scores related to the provided intervention. The completed UCLA Loneliness surveys and demographic information will be kept in the locked cabinet in the medical office. Upon the completion of the project, data will be entered into the SPSS software for analysis.

The breach of confidentiality may pose a potential risk. However, this will be reduced by using encrypted data. This DNP student will not release any names of subjects to maintain anonymity. This project manager will maintain data security and protection. The participants will

be informed that their involvement in the project is anonymous. This DNP student will assess medical records in the restricted office area and away from coworkers and patients. This scholar will conduct phone calls to recruit participants in the private room of the office and behind a locked door. Importantly, patient-specific information will be de-identified. This project manager will create a list with the coding numbers. This list will be stored in a secure file in the locked cabinet in the medical office. During the traveling between patients, the list will be kept with this DNP student at all times in a separate and locked section of the medical bag. In addition, the coding numbers will be listed on the UCLA Loneliness questionnaires to conduct pre and post-intervention testing and to ensure a proper follow-up of the subjects. The completed UCLA Loneliness surveys will be kept in the locked cabinet in the medical office. This student will enter the data from the surveys into the SPSS software to conduct statistical analysis. The SPSS file and the computer are password protected and restricted to everyone except this project manager. The printed reports will be stored in a locked area in the medical office, and the electronic data will be saved in the secure file of a password-protected computer. Furthermore, the demographic information of participants will be utilized only to describe the sample of the patient population. It will allow the generalizability of the results obtained from this project to other populations and practice areas. After five years, all data will be destroyed by shredding the written records and permanently deleting the electronic files.

8.2 Who will have access to my research records?

There are reasons why information about you may be used or seen by the researchers or others during or after this project. Examples include:

- This DNP student, who is responsible for conducting the project, the director of Zinger Medical Offices Dr. Eduard Zinger, the DNP faculty of Oak Point University, a statistician, and the Institutional Review Board (IRB) to make sure that the study is done in a safe and proper manner.
- Federal or State law may require the study team to give information to government agencies. For example, to prevent harm to you or others or for public health reasons.

8.3 What will happen to the information collected in this project?

We will not keep your name or other information that can identify you directly. The results of this project could be published in an article or presentation but will not include any information that would let others know who you are.

8.4 Will my information be used for future research or shared with others?

We may use or share your research information for future research studies. If we share your information with other researchers, it will be de-identified, which means that it will not contain

your name or other information that can directly identify you. This research may be similar to this project or completely different. We will not ask for your additional informed consent for these studies.

9. CONTACT INFORMATION

Whom can I contact about this project?

Please contact the researchers listed below:

- Obtain more information about the project
- Ask a question about the project procedures
- Report an illness, injury, or other problem (you may also need to tell your regular doctors)
- Leave the project before it is finished
- Express concern about the project

Principal Investigator: Iryna Lyuta, MSN, FNP-BC
Phone: 312-479-3477
Email: Iryna.lyuta@oakpoint.edu

Faculty Advisor: Lisa Biancalana-Marsh, DNP, APRN-FPA, FNP-BC, TNS
Phone: 630-537-9795
Email: lisa.biancalana-marsh@oakpoint.edu

Agency Director: Eduard Zinger, MD
Email: edzinger@hotmail.com
Phone: 773-412-6123

If you have questions about your rights as a research participant or wish to obtain information, ask questions or discuss any concerns about this project with someone other than the researcher(s), please contact the following:

Institution: Oak Point University

- Institutional Review Board Chair: Carlissa Jackson, Ed.D, M.A., P.A.
- Title: Director of Institutional Research
- Institution: Oak Point University
- Address: 1431 N. Claremont Ave, Chicago, IL 60622
- Phone: (773) 252-5150

10. YOUR CONSENT

Consent/Assent to Participate in the Project

By signing this document, you are agreeing to be in this project. Make sure you understand what the project is about before you sign. I/We will give you a copy of this document for your records and I/we will keep a copy with the project records. If you have any questions about the project after you sign this document, you can contact the project team using the information in Section 9 provided above.

I understand what the project is about and my questions so far have been answered. I agree to take part in this project.

Print Legal Name: _____

Signature: _____

Date of Signature (mm/dd/yy): _____

Legally Authorized Representative Permission

By signing this document, you are agreeing to the person named below to participate in this project. Make sure you understand what the project is about before you sign. I/We will give you a copy of this document for your records. I/We will keep a copy of the project records. If you have any questions about the project after you sign this document, you can contact the project team using the information provided above.

I understand what the project is about, and my questions so far have been answered. I agree for the person named below to take part in this project.

_____

Print Participant Name

_____

Print Legally Authorized Representative Name

Relationship to participant: □ Parent □ Spouse □ Child □ Sibling □ Legal guardian □ Other

_____

Signature Date

_____

Printed Legally Authorized Representative Name

Relationship to participant: □ Parent □ Sibling □ Legal guardian □ Other

_____

Signature Date

Reason second parent permission was not collected:

□ Parent is unknown

□ Parent is deceased

□ Parent is incompetent

□ Only one parent has legal responsibility for care and custody

□ Parent is not reasonably available*; explain:

** Note: "Not reasonably available" means the other parent cannot to be contacted by phone, mail, email, or fax, or his or her whereabouts are unknown. It does not mean that the other parent is at work or home, or that he or she lives in another city, state, or country.*

Appendix M

OAK POINT UNIVERITY
CONSENT FOR PHOTOGRAPHS AND VIDEO

Project title: Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults

Principal Investigator: Iryna Lyuta, MSN, FNP-BC, and the current Doctor of Nursing Practice (DNP) student at Oak Point University

I consent for photographs and videos to be made of me and taken during my participation in this DNP Project. I understand that this information may be publicly shared for the purposes of disseminating the obtained knowledge, teaching purposes, and publications in journals, textbooks, and electronic publications. By consenting to photographs and videos, I understand that I will not receive payment from any party. Refusal to consent will not affect the medical care I receive and there are no penalties for refusal. I understand that the confidentiality of my name will be preserved and my name will not be shared with the public. If I have any questions in the future, I may contact

> **Principal Investigator:** Iryna Lyuta, MSN, FNP-BC
> **Phone:** 312-479-3477
> **Email**: Iryna.lyuta@oakpoint.edu

I consent for photographs and videos to be used in medical publications, including journals, textbooks, and electronic publications. I understand that the images and videos may be seen by members of the general public, in addition to healthcare providers, scientists, and medical researchers that regularly use these publications in their professional education. Although these photographs and videos will be used without identifying information such as my name, I understand that it is possible that someone will recognize me. I also agree that my photographs and videos be shown for teaching purposes and dissemination of information to healthcare professionals.

Consent/Assent to Participate in the Project

By signing this form below, I confirm that this consent has been explained to me in terms that I understand

Print Legal Name: _____

Signature: _____

Date of Signature (mm/dd/yy): _____

Appendix N

IRB Study Closure Report

Oak Point University IRB Form

STUDY CLOSURE REPORT

Please fill in all spaces, otherwise this form will be returned.

PROJECT NUMBER: 20221211.01

PROJECT TITLE: Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults

ORIGINAL DATE OF APPROVAL: 01/11/2023

PRINCIPAL INVESTIGATOR(S): Iryna Lyuta, MSN, FNP-BC

STUDY CLOSURE DATE: 08/15/2023

1. Reason for closure

Completion of the DNP Project

2. Please attach manuscript (abstract/study findings/summary report). The completed manuscript is provided.
3. Number of subjects since study initiation: 20
4. Number of subjects since last report: 20
5. Number of subjects completing study: 19
6. If there were no subject enrollments since last approval, please explain why:

N/A

7. Number of withdrawals and reasons for each withdrawal:

One subject unexpectedly passed away during the third week of the project implementation.This event was unrelated to the DNP project. The patient developed chest pain and weakness over the weekend and refused to go to the hospital. Her daughter was aware. Patient passed way at home on 02/06/2023.

8. Number of Serious Adverse Event(s) with brief description:

0

9. Benefits (briefly describe):

This DNP project increases public awareness regarding social isolation and loneliness and their effect on human health and well-being, it offers evidence-based approach for clinical care, it addresses gaps in access to care services, it targets vulnerable populations, and it supports using technology for improving patient outcomes and quality of healthcare.

10. Other comments:

None

Principal Investigator: _____ 08/15/2023

Signature Date

Printed Principal Investigator's Name: Iryna Lyuta, MSN, FNP-BC

**Study Summary Attached

Appendix O

Calendar for Scheduling PARO Visits

Appendix P

List of Community Resources

SOCIAL ISOLATION AND LONELINESS

Outreach Community Resources

Table of Contents

ADULT DAYCARE CENTERS

Forever Young ADS

This company serves Russian and Polish communities. It provides social activities, musical entertainment, and exercise programs for seniors who strive to remain active and socially engaged. Participants are also offered on-site meals and nursing care. Transportation is provided to and from the center.

Chicagoland area:

6700 North Lincoln Ave.
Lincolnwood, IL 60712
Tel: (847) 673-6633

Suburbs:

818 Chaddick Dr.
Wheeling, IL 60090
Tel: (847) 229-0001

Web: https://www.foreveryoungads.com

Hours: Monday–
Friday 8 AM - 3
PM

FITNESS CENTERS

YMCA

-health and wellness programs for older adults, including balance training, exercises for arthritis, and muscle training, are available in multiple locations.

Tel: (800) 872-9622
Email: fulfillment@ymca.net
Web: www.ymca.net

Silver Sneakers

-live and online fitness classes, on-demand videos, and access to thousands of gyms across the country for adults 65 and older.

Tel: (866) 584-7389
Email: support@silversneakers.com
Web: www.silversneakers.com

Chicago Park District Fitness Centers

-high-quality fitness centers alternative to private gyms. These centers feature treadmills, cross trainers, bikes, free weights and benches, and core-focused weight equipment. Many parks also offer fitness classes.

Tel: (312) 742 -7529; TTY Tel: (312) 747-2001
Email: play@chicagoparkdistrict.com
https://www.chicagoparkdistrict.com/parks-facilities/fitness-center

HOLOCAUST COMMUNITY SERVICES

Council For Jewish Elderly (SJE) Senior Life

This association provides financial support, care coordination, and socialization training for Jewish seniors in the Chicagoland area.

3003 West Touhy Ave.
Chicago, IL 60645
Tel: (773) 508-1004, (773) 508-1000
Fax: (773) 508-1028
Email: hcs@cje.net
Web: http://www.cje.net

CATHOLIC CHARITIES USA

Catholic Charities of the Archdiocese of Chicago

This organization offers supportive services, adult protection services, and care coordination, including employment assistance, counseling, food and nutrition services, emergency rental, and shelter assistance.

721 North La Salle St.
Chicago, IL 60654
Tel: (312) 655-7700
Email: info@catholiccharities.net
Web: https://www.catholiccharities.net/senior-care/

TRANSPORTATION SERVICES

Star Medical Transportation

This company provides non-emergency transportation to people with special needs and mobility restrictions. Vehicles can accommodate special heights, access, clearance, and seating.

1884 Techny Rd.
Northbrook, IL 60062
Tel: (847) 559-1111

City of Chicago Mobility Direct taxicabs

This company offers a wheelchair-accessible taxi for people living in Chicago. Individuals can call the phone number listed below or use the CURB application to request a taxicab.

Tel: (800) 606-1282
Download the CURB app: Curb - Request & Pay for Taxis
Visit the CURB website: https://www.gocurb.com/chicagowav

FOOD SERVICES

Meals on Wheels

This not-for-profit organization provides in-home delivery food services to homebound adults 60 years and older and younger individuals with disabilities.

Meals on Wheels Chicago
314 West Superior St.
Suite 201
Chicago, IL 60654
Tel: (312) 744-4016
Email: info@mealsonwheelschicago.org

Meals on Wheels Northeastern Illinois
1723 Simpson St.
Evanston, IL 60201
Tel: (847) 332-2678
Email: info@MealsonWheelsNEI.org

Home Delivered Meals (HDM)

This program is supported by the Illinois Department on Aging and focuses on providing meals to adults 60 years and older who are homebound or frail due to illness or disability. Geographic area served: City of Chicago.

Tel: 312-744-4016
Email: HDMreferrals@openkitchens.com

MEDICAL SUPPLY COMPANIES

Supply companies sell assistive devices and medical equipment such as canes, walkers, wheelchairs, hospital beds, bedside commodes, support surfaces and braces, oxygen concentrators, tube feeding supplies, and incontinence products. In-home delivery services are available.

Advanced Medical Supply

3322 North Milwaukee Ave.
Chicago, IL 60641
Tel: (773) 205-6993
Fax: (773) 205-6994
Email:
info@advancedmedicalsupply.net

Lava Supply

7564 Lincoln Ave.
Skokie, IL 60077
Tel: (847) 329-1238
Fax: (847) 329-1255

D&M Medical Supply

738 South Buffalo Grove Rd.
Buffalo Grove, IL 60089
Tel: (847) 520-4901
Fax: (847) 243-2303
(800) 697-4401

WHY Medical Supply

100 Terrace Dr.
Mundelein, IL 60060
Tel: (847) 362-0500
Fax: (847) 327-3158
Email: whymedicalsupply@gmail.com

HOME CARE SERVICES

These agencies provide trained caregivers for seniors who require companionship and assistance with daily tasks, such as housekeeping, cooking, and grocery shopping.

Help at Home

36 South Wabash Ave.
Chicago, IL 60603
Tel: (312) 762-0900
(312) 726-1245

Addus Home Care

1 North LaSalle St.
Suite 4100
Chicago, IL 60602
Tel: (312) 663-4647

European Service At Home

1928 West Fulton St.
Suite 2N
Chicago, IL 60612
Tel: (312) 455-0100

European American Association

2827 West Division St.
Chicago, IL 60622
Tel: (773) 342-5868

HOME HEALTH AGENCIES

These agencies provide nursing care, physical, occupational, and speech therapies, and home health aide assistance for managing acute and chronic illnesses and allowing people to regain their independence.

WellCare Home Health

3340 Dundee Rd., Suite 2C3
Northbrook, IL 60062
Tel: (847) 562-4041

Reliable Home Health Care

3929 West 95th St.
Evergreen Park, IL 60805
Tel: (855) 618-0092

Elite Home Health Care

3100 Dundee Rd., Suite 304
Northbrook, IL 60062
Tel: (847) 400-5410

Advanta Home Health

1500 Skokie Boulevard, Suite 410
Northbrook, IL 60062
Tel: (847) 504-0888

Progressive Home Health

601 Skokie Blvd, Suite 303
Northbrook, IL 60062
Tel: (847) 753-6800

Senior Home Health

1400 Renaissance Drive, Suite 212
Park Ridge, IL 60068
Tel: (847) 376 - 8939

PHARMACIES

These local pharmacies offer in-store medication pick-up and free delivery.

Kedvon Pharmacy - Buffalo Grove

770 South Buffalo Grove Rd.
Buffalo Grove, IL 60069
Tel: (847) 947-2601
Fax: (847) 947-2326
Monday - Friday: 10 AM - 6 PM
Saturday: Closed
Sunday: Closed

Golf Mill Pharmacy

8941 West Golf Rd.
Niles, IL 60714
Tel: (847) 803-3340
Fax: (847) 803-3342
Monday - Friday: 9 AM – 6 PM
Saturday: 10 AM- 1 PM
Sunday: Closed

Health Mart Pharmacy

1260 West Devon Ave.
Chicago, IL 60660
Tel: (872) 210-5522
Fax: (773) 856-0954
Monday - Friday: 10 AM - 6 PM
Saturday: 10 AM - 3 PM
Sunday: Closed

Kedvon Pharmacy - Wheeling

56 South Milwaukee Ave.
Wheeling, IL 60090
Tel: (847) 459-0001
Fax: (847) 947-2972
Monday - Friday: 10 AM - 6 PM
Saturday: 10 AM - 2 PM
Sunday: Closed

Nathan Pharmacy

6420 North California Ave.
Chicago, IL 60645
Tel: (773) 973-6107
Fax: (773) 973-7580
Monday - Friday: 9 AM - 6 PM
Saturday: Closed
Sunday: Closed

North Suburban Pharmacy

4954 Oakton St.
Skokie, IL 60077
Tel: (847) 674-0707
Fax: (847)674-0808
Monday - Friday: 10 AM - 6 PM
Saturday and Sunday: Closed

GOVERNMENTAL AGENCIES

Illinois Department of Human Services (IDHS)

This agency provides Illinois residents with access to social services and programs, including applications for medical benefits, Link Card, Supplemental Nutrition Assistance Program (SNAP), Temporary Assistance for Needy Families (TANF), emergency food and housing assistance, and immigrant services.

Office locator: https://www.dhs.state.il.us/page.aspx?module=12
IDHS Help Line: (800) 843-6154; (866)324-5553 TTY

Chicago Department of Family and Support Services (DSSS) Senior Services

The Illinois Department on Aging designates this agency to provide a wide range of services, including information for seniors 60 years and older, employment programs for people 55 and older, and referrals to case management.

1615 West Chicago Ave.
Chicago, IL 60622
Office Tel: (312) 743-0300
Hours: Monday to Friday
8:30 AM- 4:30 PM

Information Tel:
(312) 744-4016.
(312) 744-6777 TTY
Email: aging@cityofchicago.org
Web: http://www.cityofchicago.org

MENTAL HEALTH SERVICES

In Crisis / Emergency: call 911

Mental Health Emergency: call 988

Mental Health Resources available from the U.S. Department of Health and Human Services (HHS)

MentalHealth.gov- provides access to information on mental health and mental health problems, strategies to promote psychological health, and how to obtain help.

Web: https://www.mentalhealth.gov

Mental Health Resources available from the Illinois Department of Human Services (IDHS)

Office Locator- search for a service provider, such as a mental health specialist, located near you.

Web:
https://www.dhs.state.il.us/page.aspx?module=12&officetype=&county=
Tel: (800) 843-6154

Non-Crisis Mental Health Provider Directory- provides a list of mental health providers in Illinois.

Web: https://www.dhs.state.il.us/page.aspx?item=43695
Tel: (312) 814-5050

List of Mental Health Treatment- offers information on various mental services and treatment programs.

Web: https://www.dhs.state.il.us/page.aspx?item=32490

INTERNET RESOURCES

AARP Foundation Connect 2 Affect- provides information on social isolation, strategies to promote socialization, and the available community resources. Also, people can complete a computerized survey to identify their risks of isolation.

Web: https://connect2affect.org

Centers for Disease Control and Prevention- offers information on loneliness and social isolation, their effect on health and well-being, strategies to overcome them, and links to external resources.

Web: https://www.cdc.gov/aging/publications/features/lonely-older-adults.html

Commit to Connect Activities and Resources- provides a list of resources to reduce social isolation and loneliness as a national effort led by the Administration for Community Living.

Web: https://acl.gov/CommitToConnect/activities

Eldercare Locator- a nationwide program that helps older adults and their caregivers find local services and resources, such as financial support, transportation, and caregiving.

Web: https://eldercare.acl.gov/Public/Resources/LearnMoreAbout/Support_Services.aspx

engAGED- a national resource center for older adults that provides publications, materials, blogs, videos, and toolkits on how to stay engaged.

Web: https://www.engagingolderadults.org

National Institute on Aging- provides social isolation and loneliness outreach toolkit, including videos, print publications, flyers, posts, and infographics.

Web: https://www.nia.nih.gov/ctctoolkit

USAging- provides information and recommendations from the Area Agencies on Aging on various programs and services, including counseling, caregiver support, and meal assistance programs.

Web: https://www.usaging.org

HELPLINES

Universal Emergency Number – call 911 to request emergency help

988 Suicide & Crisis Lifeline - provides 24/7 free lifeline confidential support for people in emotional distress and crisis.

Crisis phone line: call or text 988
Web lifeline: https://988lifeline.org

Adult Protective Services Hotline- to report suspected neglect, abuse, or financial exploitation of adults 60 years and older or a person 18-59 years of age with a disability. This hotline is available 24/7.

Call: (866) 800-1409
https://www2.illinois.gov/aging/protectionadvocacy/pages/abuse.aspx

American Foundation for Suicide Prevention- provides counseling, virtual support, and guidance for suicide loss survivors. To schedule a conversation visit:

Web: https://afsp.org/healing-conversations

Alzheimer's Association- provides a 24/7 confidential helpline for information and support for people living with Alzheimer's disease, their families, caregivers, and the public.

Call: (800) 272-3900
Email: info@alz.org
Web: www.alz.org

SAGE National LGBTQ+ Elder Hotline- provides crisis response 24/7 for LGBTQ+ older people and offers counseling, emotional support, and information on community resources, healthcare, legal services, and transportation.

Call: (877) 360-LGBT (5428)
Web: https://www.sageusa.org/your-rights-resources/

Substance Abuse and Mental Health Services Administration (SAMHSA) National Helpline- is a 24/7 confidential helpline for treatment referral and information services for people and their families facing mental and/or substance use disorders.

Call: (800)-662-HELP (4357)
Web: https://www.samhsa.gov/find-help/national-helpline

Veterans Crisis Line- provides 24/7 support from the Department of Veterans Affairs (VA) responders. VA also offers veterans and their families network support and connection with local resources.

Crisis line: 988 and press 1; or text 838255
Call: (800) 273-8255 and press 1
Web: https://www.veteranscrisisline.net/