The impact of physical therapy on improving the health and quality of life of older people in nursing homes - preliminary findings from the ICARE4OLD project

Ilona Barańska (1), Paulina Wiśniewska (1), Louk Smalbil (2), Katarzyna Szczerbińska (1), Adrianna Ziuziakowska (1), Natalia Drapała (1), Agata Stodolska (1), Emiel O. Hoogendijk (3,4,5), Karlijn J. Joling (6), Hein P. J. van Hout (3), Jitka Pokladníková (7), Jindra Reissigová (7,8), Daniela Fialová (7,9), on behalf of ICARE4OLD (10)

(1) Laboratory for Research on Aging Society, Department of Medical Sociology, The Chair of Epidemiology and Preventive Medicine, Medical Faculty, Jagiellonian University Medical College, Kraków, Poland; (2) Vrije Universiteit Amsterdam, Department of Computer Science, Amsterdam, the Netherlands; (3) Amsterdam UMC, location Vrije Universiteit Amsterdam, Department of General Practice, Amsterdam, the Netherlands; (4) Amsterdam UMC, location Vrije Universiteit Amsterdam, Department of Epidemiology and Data Science, Amsterdam, the Netherlands; (5) Amsterdam Public Health, Aging & Later Life, Amsterdam, the Netherlands; (6) Department of Medicine for Older People, Location Vrije Universiteit Amsterdam, Amsterdam UMC, Amsterdam, Netherlands; (7) Department of Social and Clinical Pharmacy, Faculty of Pharmacy in Hradec Králové, Charles University, Czech Republic; (8) Department of Statistical Modelling, Institute of Computer Science of the Czech Academy of Sciences, Prague, Czech Republic; (9) Department of Geriatrics and Gerontology, 1st Faculty of Medicine in Prague, Charles University, Czech Republic; (10) Individualized CARE for Older Persons with Complex Chronic Conditions in home care and nursing homes (ICARE4OLD)

Introduction and Aim

Physical therapy (PT) plays a crucial role in improving the general well-being of older adults residing in nursing homes (NHs) by enhancing their functional abilities and overall quality of life. Through targeted exercises and therapeutic interventions, PT helps residents maintain and improve their strength, balance, and mobility, which are essential for performing daily activities independently. By addressing physical limitations, PT not only reduces the risk of falls but also helps to control symptoms of some chronic conditions.

The aim of this work is to assess the impact of PT on: functional status, cognitive status and health-related quality of life of older NH residents.

Methods

Data were collected using interRAI tools version 9.0 and the Minimum Data Set 2.0 for routine assessments in NHs. These tools include 200-400 standardized variables across clinical, functional, medical, and psychosocial domains. Functional status, cognitive function, and quality of life were assessed using: the Activity of Daily Living Short Form (ADLSF, range: 0-16), the Cognitive Performance Scale (CPS, range: 0-6), and Health Utilities Index Mark 3 (HUI3, range: 0-1), respectively.

Models were developed using data from the Netherlands (n=41,610) and Belgium (n=34,832) collected between 2005 and 2023, and validated with Canadian data collected from 2014 to 2018 (n=5,489,613). Various machine learning models, such as random forest, decision tree, and linear regression, were tested to evaluate the effect of PT, with the best model selected based on goodness of fit (e.g., R-squared). Propensity score matching was used to pair each patient in the treatment group with a control group counterpart. The analysis included data from patients who met clinician-defined inclusion and exclusion criteria for PT.

Results

The basic characteristics of the residents are shown in Table 1. The results of the analyses on the effect of PT on ADLSF, CPS, and HUI3 are presented in Table 2.

We assessed the impact of PT using the Average Treatment Effect (ATE), which measures the difference in outcome changes between the treatment and control groups from baseline to follow-up. For ADLSF and CPS (where higher scores indicate worse conditions), an ATE below 0 indicates less decline or greater improvement with treatment. For HUI3 (where higher scores indicate better quality of life), an ATE above 0 suggests a positive effect of PT.

The results showed a positive effect of PT on ADLSF, CPS and HUI3, and the goodness of fit of the models was very high (Table 2 and Figure 1). For ADLSF and CPS, we confirmed these results on Canadian data, although the goodness of fit of the models was lower (Figure 2).

Table 1. Basic characteristics of the sample

Characteristic	Treatment group (n=513)	Control group (n=4703)
Age (mean, SD)	82 (8.0)	84 (7.5)
Gender, female (n, %)	151 (29%)	1217 (26%)
ADLSF (mean, SD)	7.6 (3.7)	4.5 (4.2)
CPS (mean, SD)	2.4 (1.7)	2.2 (1.6)
Alzheimer's disease, N (%)	116 (23%)	1455 (31%)
Other dementia, N (%)	148 (29%)	1148 (24%)
Unsteady gait, N (%)	377 (73%)	3187 (68%)
Falls lat 90 days, N (%)	195 (38%)	1429 (30%)

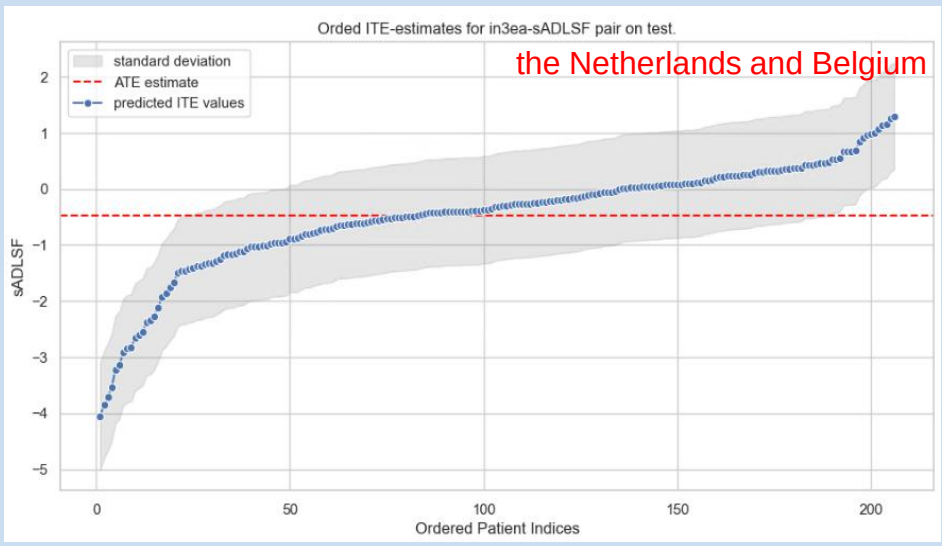

Figure 1. Impact of Physical Therapy on Functional Status Over a 6-Month Period (n=1026)

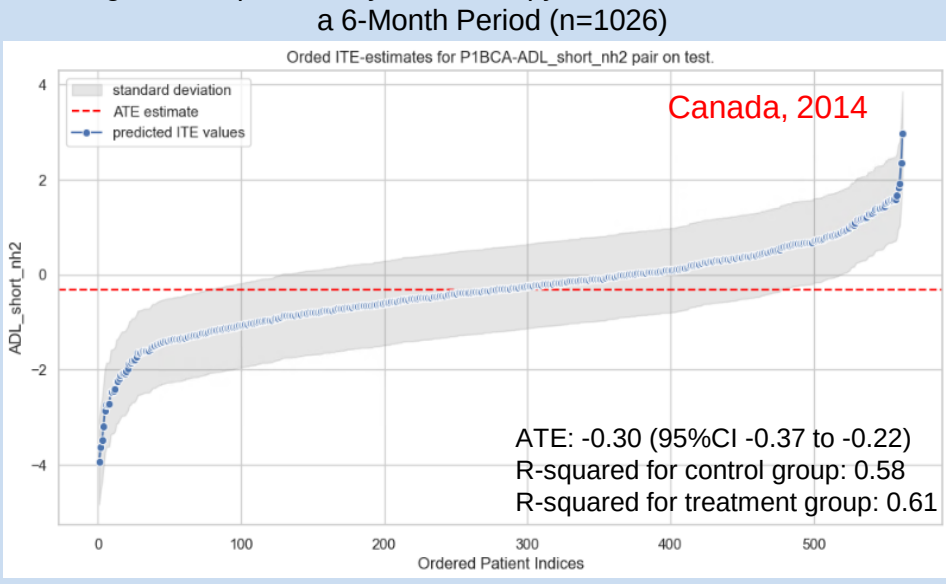

Figure 2. Impact of Physical Therapy on Functional Status Over a 6-Month Period (n=2802)

Conclusions

Preliminary results suggest that physical therapy may positively impact functional and cognitive status and quality of life of older adults in NHs. However, further geographic and historical validation using additional databases is needed to confirm these findings and ensure they are consistent across different populations and settings

Table 2. Effect of physical therapy on functional status (ADLSF), cognitive status (CPS) and quality of life (HUI3)

Outcome	Time of observation (a) and intensity (b)	Best model	n	ATE (95%CI)	Mean Squared Error	R-squared/ Accuracy
ADLSF*	(a) 20-190 days (b) 4 days or more (≥15minutes)	Ridge	1026	-0.47 [-0.61 to -0.34]	Control: 2.44 Treatment: 1.81	Control: 0.82 Treatment: 0.87
CPS*	(a) 20-190 days (b) 5 days or more (≥15minutes)	GradientBoosting Regressor	850	-0.30 [-0.40 to -0.19]	Control: 0.43 Treatment: 0.14	Control: 0.81 Treatment: 0.94
HUI3†	(a) 20-190 days (b) 4 days or more (≥15minutes)	Ridge	836	0.01 [0.01 to 0.02]	Control: 0.02 Treatment: 0.01	Control: 0.78 Treatment: 0.81

**Higher score indicates worse functional status/cognitive function; †Higher score means higher quality of life*

The I-CARE4OLD project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 965341. Additional funding to support the Canadian participation in the work was provided by Canada's New Frontiers Research Fund - Global Fund (grant agreement No. NFRFG-2020- 00500) and the Canadian Institutes of Health Research (grant agreement No. 177780). The work of DF was supported by the institutional program Cooperation of the Faculty of Pharmacy, Charles University, Prague.

Ilona Barańska MSc, MPH, PhD,
ilona.baranska@uj.edu.pl

20th EuGMS VALENCIA, SEPT 18-20, 2024