JOURNAL OF HEALTH AND SOCIAL SCIENCES

Journal of Health and Social Sciences (JHSS)
The Italian Journal for Interdisciplinary Health and Social Development *EDIZIONI FS Publishers*
Original Article in Community Pharmacy and Neuropsychology

Community pharmacist- and psychologist-led program of neuropsychological screening in the aftermath of the COVID-19 pandemic: A cross-sectional survey

Nicola Luigi BRAGAZZI[1,2,3*≠], Fiorella PALOMBO-FERRETTI[4,5≠], Rocco CARBONE[4], Tania Simona RE[3], "Pharmacists- and Psychologists in community pharmacies-led Psychological Screening for Cognitive issues in the aftermath of the COVID-19 pandemic" (PsyChOVID) WORKING GROUP[6]

Affiliations:
[1] *Department of Mathematics and Statistics, Laboratory for Industrial and Applied Mathematics (LIAM), York University, Toronto, ON M3J 1P3, Canada.* ***ORCID:*** *0000-0001-8409-868X.*
[2] *Human Nutrition Unit (HNU), Department of Food and Drugs, University of Parma, 43125 Parma, Italy.*
[3] *UNESCO Chair "Anthropology of Health. Biosphere and Healing System", University of Genoa, Genoa, Italy. E-mail: tania.re77@gmail.com.* ***ORCID:*** *0000-0001-5532-6110 (T.S.R.)*
[4] *Associazione nazionale psicologi in farmacia" (ANPIF), Borbiago di Mira, Venice, Italy. E-mail: fiorellapalombo@gmail.com.* ***ORCID:*** **** (F.P.-F.). E-mail: farmarocco@tiscali.it.* ***ORCID:*** *0009-0005-1435-2861 (R.C.).*
[5] *Department of Psychology, University of Padua, Padua, Italy.*
[6] *Valeria Ricci, Giulia Peroni, Marcella Utro, Rosanna Canero Medici, Giulio Maggia, Ilaria Catapano, Sandra Scibelli, Giulia Capuani, Giulia Ghiotto.*
≠ ***First co-authorship***

****Corresponding Author:***
Nicola Luigi Bragazzi, M.D., Ph.D., Human Nutrition Unit Department of Food and Drugs, University of Parma, Medical School, Building C, Via Volturno, 39, 43125 Parma, Italy. E-mail: nicolaluigi.bragazzi@unipr.it.

Abstract

Background: Early detection and diagnosis of cognitive impairment are paramount to improving the clinical outcomes and care of patients. Whilst primary care professionals play a key role in the healthcare management and treatment of their patients, community pharmacists and other allied health professionals working in community pharmacies are more accessible and trusted. As such, they are in an ideal position to identify and assist in the management of individuals with cognitive memory disorders.
Aim: To assess the impact of a pharmacist-based cognitive memory screening service delivered in community pharmacy practice in Italy in the aftermath of the COVID-19 pandemic.
Design: Cross-sectional questionnaire-based survey.
Setting: Community pharmacies.
Population: Patients accessing community pharmacies.
Methods: Participants underwent a comprehensive neuropsychological screening program (the "Montreal Cognitive Assessment" (MoCA) test, the "Babcock Story Recall Test", and the "Rey–Osterrieth complex figure" (ROCF) test). The accuracy, sensitivity, and specificity of the classical medical/psychological referral for cognitive impairment were computed.
Results: A sample of 185 subjects (aged 61.24±15.06 years, 78.9% females) was recruited. The classical medical/psychological referral yielded an accuracy ranging from 58.4% to 63.2%, a sensitivity of 56.3-66.7%, and a specificity of 57.9-74.0% in terms of detection of individuals with cognitive impairment. The neuropsychological screening enabled the identification of a further 33.3-43.8% of subjects that would have been missed otherwise.

Conclusions: Neuropsychological screening programs in the setting of community pharmacies are highly valuable and effective.
Take-home message: Little is known about the feasibility and effectiveness of pharmacist-led cognitive memory screening and referral programs. The present study assessed the impact of a pharmacist-based cognitive memory screening service delivered in community pharmacy practice in Italy in the aftermath of the COVID-19 pandemic.
Keywords: Cognitive impairment; community pharmacy; COVID-19; neuropsychological screening.

Cite this paper as: Bragazzi NL, Palombo-Ferretti F, Carbone R, Re TS, "Pharmacists- and Psychologists in community pharmacies-led Psychological Screening for Cognitive issues in the aftermath of the COVID-19 pandemic" (PsyChOVID) WORKING GROUP. Community pharmacist- and psychologist-led program of neuropsychological screening in the aftermath of the COVID-19 pandemic: A cross-sectional survey. J Health Soc Sci. 2023;8(2):142-150. Doi: 10.19204/2023/CMMN6.

Received: 10 January 2023; Accepted: 10 May 2023; Published: 15 June 2023

INTRODUCTION

Cognitive impairment is a cluster of neuropsychological deficits, namely, loss of memory, learning, thinking, and behavioral difficulties, and a decreased ability to concentrate on a task [1]. It usually affects the elderly and can range from a mild form, sub-clinical or not clinically detectable, to full-blown dementia [2,3]. Such clinical heterogeneity reflects the many different etiologies underlying cognitive impairment [4], from neurodegenerative diseases to stroke and cerebrovascular disorders [5]. Early detection and diagnosis of cognitive impairment are of paramount importance to improve the clinical outcomes and care of patients, in that cognitive impairment has a dramatically high burden in terms of quality of life, social functioning (until a complete loss of autonomy and independence, with a subsequent need for permanent caregivers and assistance by healthcare services), and mortality [6,7].

In the USA, the number of people aged 65 years or older with full-blown dementia is anticipated to increase by 50% by 2050, with a staggering economic and social impact [7]. According to the World Health Organization (WHO), more than 55 million people globally suffer from dementia, with over 60% of them living in low-and middle-income countries (LMICs). This figure is projected to increase up to three times, based on the estimations of the "Global Burden of Disease" (GBD) 2019 Dementia Forecasting group [8]. As such, the burden generated by dementia is dramatically high, in epidemiological, clinical, and societal terms, with nearly 10 million new yearly cases worldwide.

Even though, as of today, there exist no effective drug treatment options that can revert or, at least, stop the cellular processes of neuro-deterioration in subjects with dementia, early detection can be beneficial in that it can enable early initiation of pharmacological treatment to treat and delay the worsening of neuropsychological symptoms. Moreover, at the initial stages, patients can be engaged in support groups, involved in planning for future healthcare and economic-financial needs, and can adopt lifestyle changes before the disease progresses further [7-9].

Whilst primary care professionals play a key role in the healthcare management and treatment of their patients, however, early detection and diagnosis of mild cognitive impairment or full-blown dementia are often disclosed in an untimely fashion or even missed or delayed in clinical settings [9]. In the last decades, cognitive impairments have gone under-detected, underdiagnosed, and, as such, undertreated, generating relevant costs for society [9].

Among healthcare providers, community pharmacists and other allied health professionals working in community pharmacies are highly accessible and trusted [10], and can be approached and consulted without appointments or referrals [11]. Therefore, they are in an ideal position to identify and assist in the management of individuals with cognitive memory disorders [10,11].

In the last decades, and especially during the "Coronavirus Disease 2019" (COVID-19) pandemic, there has been an expansion of the role of community pharmacists, both in terms of duties and skills, with the pharmacist not only dispensing a prescribed drug, but also optimizing pharmacotherapy,

administering therapeutics, and supporting patient's mental health and well-being [12]. Therefore, community pharmacists can play "integral, yet diverse, roles in caring for people living with mental illness" and psychological issues, including cognitive impairment [12].

However, little is known about the feasibility and effectiveness of pharmacist-led cognitive memory screening and referral programs. Even though community pharmacists are in an ideal position to empower patients and contribute to their mental health and psychological well-being, by educating them and reviewing their medicines, their contribution to mental healthcare remains to be quantified in terms of the diverse services and interventions provided, and formally assessed and measured. Indeed, the impact of community pharmacists on mental health has been overlooked and understudied. The currently available body of scholarly evidence is scarce and anecdotal [12].

Therefore, the present study was undertaken to assess the impact of a pharmacist-based cognitive memory screening service delivered in community pharmacy practice in Italy in the aftermath of the COVID-19 pandemic.

METHODS

Study protocol and ethical clearance

The present study protocol was developed involving the network of the Italian "Associazione nazionale psicologi in farmacia" (ANPIF, National Association of Psychologists working in Community Pharmacies), and, after in-depth review, received full ethical approval by its ethical committee (approval date June 10, 2022).

Study design and sample recruitment

The present study was devised as an observational, cross-sectional, multicenter study. The survey data were collected retrospectively.

Procedures

Participants were clients attending a network of community pharmacies that had agreed to offer neuropsychological screening. Each participant underwent a comprehensive neuropsychological evaluation. The "Montreal Cognitive Assessment" (MoCA) test [13], which is a popular and simple-to-administer cognitive test, was administered to screen for mild cognitive impairment (MCI) and Alzheimer's disease. All index scores were calculated based on the validated methods reported in the NACC UDS-3 scoring criteria. Furthermore, the "Babcock Story Recall Test" (BSRT) [14], developed by Babcock and Levy in 1940, was administered: the BSRT is a verbal memory measure in which examinees were read a brief story and asked to provide immediate recall; the story was, then, repeated, and after 20 minutes delayed recall was obtained. The "Rey–Osterrieth complex figure" (ROCF) [15,16] is a neuropsychological test formulated by the Swiss psychologist André Rey in 1941 and further revised and standardized by Paul-Alexandre Osterrieth in 1944. This test involved different cognitive abilities and functions, including visuospatial ones, memory, attention, planning, and working memory, as well as executive functions, in which each participant was asked to reproduce a complicated line drawing. First, the examinee had to copy it freehand (recognition) and draw it from memory (recall).

In terms of reliability and validity, the psychometric properties of the tests utilized were comparable to those reported in the literature by other studies, including the initial investigations that developed and tested the original instruments.

Statistical analysis

Before proceeding with statistical analysis, data were visually inspected to capture potential outliers. Where appropriate, data were presented as means and standard deviations (continuous variables) or as percentages (categorical variables). Differences in the frequencies of categorical variables were assessed by using the chi-squared test.

The effectiveness of the classical medical/psychological referral for cognitive impairment was assessed by computing the number of true positive cases (TP), that is to say, the number of cases correctly identified as such (patients with cognitive impairment), false positive cases (FP), the number of cases wrongly identified as patients, the true negative cases (TN), the number of cases correctly identified as healthy subjects, and, finally, the false negative cases (FN), that is to say, the number of

cases incorrectly identified as healthy subjects (the cases "missed" by the referral method). Accuracy, or the classical medical/psychological method's ability to correctly differentiate between the patients and the healthy cases, was calculated as the proportion of TP and TN in all evaluated cases. Sensitivity, the ability of the specialist referral method to properly identify the patient cases, was estimated as the proportion of TP in all patient cases, while specificity, or the ability of the classical medical/psychological method to determine the healthy cases as such correctly, was computed as the proportion of TN in healthy cases [17].

All statistical analyses were carried out using "Statistical Package for Social Sciences" (SPSS v28 for Windows, IBM, NY, USA).

Data availability

The data associated with the paper are not publicly available but are available from the corresponding author on reasonable request.

RESULTS

Characteristics of the sample

A sample of 185 subjects (out of an initial list of 235 eligible individuals, 78.7% participation rate) consented to participate in this study and were recruited: their mean age was 61.24±15.06 years (range 19-90 years, median 63 years), 78.9% were females (n=146), and 21.1% were males (n=39). In terms of geographic distribution, 58.4% (n=108), 19.5% (n=36), and 18.4% (n=34) were from North, Central, and South Italy, respectively, while 3.8% (n=7) lived on islands. In terms of marital status, 44.9.% (n=83) were married, 14.6% (n=27) widowed, 10.3% (n=19) separed/divorced, and 30.3% (n=56) single; 73.0% (n=135) had children. Slightly less than one quarter (23.8%, n=44) lived alone. Concerning educational attainment, 27.0% (n=50) had higher education (i.e., a degree or a post-degree title), while 6.5% (n=12), 26.5% (n=49), and 40.0% (n=74) had primary and lower and upper secondary education, respectively. Concerning job status, 37.3% (n=69) were working, whereas 15.1% (n=28) and 47.6% (n=88) were unemployed and retired, respectively. Concerning co-morbidities, 64.6% (n=115) were taking drugs, and 55.7% (n=103) had at least a chronic disease: more specifically, 76.0% (n=79) had one co-morbidity, while 16.3% (n=17), 4.8% (n=5), and 2.9% (n=3) had two, three, and four co-morbidities, respectively. The most commonly reported medical issue was hypertension (35.0%, n=36), followed by cardiovascular disease (11.7%, n=12), diabetes (8.7%, n=9), thyroid dysfunction (7.8%, n=8), hypercholesterolemia (6.8%, n=7), and asthma (4.9%, n=5). Regarding SARS-CoV-2 serostatus, 42.7% (n=79) had contracted COVID-19. For these patients, access to the community pharmacy occurred 7 (range 1-34) months after the infection. Finally, most of the subjects recruited (95.1%, n=176) had received immunization against COVID-19. Further details are reported in Table 1.

Table 1. Overview of the major characteristics of the sample recruited.

Parameter	Value
Age	61.24±15.06 years
Sex/gender	78.9% females (n=146)
	21.1% males (n=39)
Geographic distribution	58.4% (n=108) North Italy
	19.5% (n=36) Central Italy
	18.4% (n=34) South Italy
	3.8% (n=7) islands
Marital status	44.9.% (n=83) married
	14.6% (n=27) widowed
	10.3% (n=19) separated/divorced
	30.3% (n=56) single
	73.0% (n=135) with children
	23.8% (n=44) living alone
Educational attainment	27.0% (n=50) higher education

	6.5% (n=12) primary education
	26.5% (n=49) lower secondary education
	40.0% (n=74) upper secondary education
Job-status	37.3% (n=69) working
	15.1% (n=28) unemployed
	47.6% (n=88) retired
Co-morbidities	64.6% (n=115) taking drugs
	55.7% (n=103) at least one chronic disease
SARS-CoV-2 serostatus	42.7% (n=79) contracted COVID-19
Immunization against COVID-19	95.1% (n=176)

Psychological issues

More than one-half of the participants (56.8%, n=105) suffered from psychological impairments: more specifically, anxiety (45.7%, n=48), depressive disorder (34.3%, n=36), both anxiety and depressive disorder (5.7%, n=6), eating disorder (2.9%, n=3), post-traumatic stress disorder (2.9%, n=3), psychotic disorder (1.0%, n=1), and other psychological complaints not otherwise classified (7.6%, n=8); 48.6% (n=51) were on psycho-drugs. More than one-half of the participants (55.2%, n=58) had a positive family history of psychological issues. Finally, 82.9% (n=87) had complained of psychological issues before, while 17.1% (n=18) of the participants complained of a worsened psychological issue during the COVID-19 pandemic. Further details are shown in Table 2.

Table 2. Cognitive complaints and outcomes of the neuropsychological assessment.

Parameter	**Value**
Psychological issues	56.8% (n=105)
On psycho-drugs	48.6% (n=51)
Positive family history of psychological issues	55.2% (n=58)
Timing of the psychological issue	82.9% (n=87) before the COVID-19 pandemic
	17.1% (n=18) during the COVID-19 pandemic
Cognitive complaints	51.9% (n=96)
Duration of cognitive impairment	12 (range 1-120) months on average
MoCA test	39.5% (n=73) normal values
	11.9% (n=22) borderline values
	48.6% (n=90) impaired values
Immediate recall test	85.4% (n=158) normal values
	4.3% (n=8) borderline values
	10.3% (n=19) impaired values
Delayed recall test	85.9% (n=159) normal values
	5.4% (n=10) borderline values
	8.6% (n=16) impaired values
ROCF test	68.1% (n=126) normal values
	10.8% (n=20) borderline values
	21.1% (n=39) impaired values
Previous consultations	27.0% (n=50)
Referrals	34.1% (n=63)

Neuropsychological assessment

Ninety-six (51.9%) accessed community pharmacies due to subjective cognitive complaints: more specifically, memory impairment (68.7%, n=66), concentration impairment (16.7%, n=16), attention impairment (4.2%, n=4), brain fog syndrome (4.2%, n=4), concentration and memory impairment (3.1%, n=3), brain fog syndrome and memory impairment (1.0%, n=1), attention and concentration impairment (1.0%, n=1), and cognitive issue not otherwise classified (1.0%, n=1). Cognitive impairment lasted 12 (range 1-120) months on average. Concerning the MoCA test, 73 (39.5%), 22 (11.9%), and 90 (48.6%) displayed normal, borderline, and impaired values, respectively. Concerning the immediate recall test, 158 (85.4%), 8 (4.3%), and 19 (10.3%) subjects displayed normal,

borderline, and impaired values, respectively. Concerning the delayed recall test, 159 (85.9%), 10 (5.4%), and 16 (8.6%) subjects displayed normal, borderline, and impaired values, respectively. Finally, concerning the ROCF test, 126 (68.1%), 20 (10.8%), and 39 (21.1%) participants displayed normal, borderline, and impaired values, respectively. Further details are reported in Table 2.

Previous consultations and referrals

Eighty-two (44.3%) of the participants had previous consultations (n=50, 27.0%; with a specialist (n=23, 46.0%), a general practitioner (n=18, 36.0%), a psychologist/psychotherapist (n=7, 14.0%), a psychiatrist (n=1, 2.0%), or a pharmacist (n=1, 2.0%)) and referrals (n=63 (34.1%); from a general practitioner (n=26, 41.3%), a psychologist/psychotherapist (n=19, 30.2%), a specialist (n=10, 15.9%), or a pharmacist (n=8, 12.7%)). Further details are reported in Table 2.

Impact of the neuropsychological screening

Concerning the MoCA test scores (including both borderline and impaired values), the medical/psychological referral yielded an accuracy of 63.2%, a sensitivity of 56.3%, and a specificity of 74.0%. The specialist referral method enabled the identification of 63 subjects with abnormal MoCA test values (3 borderline, 60 clinically impaired), whilst the neuropsychological screening identified further 49 subjects (19 borderline, 30 clinically impaired) that would have been otherwise missed (that is to say, 43.8% of the entire population with abnormal MoCA test scores). Regarding the immediate recall test scores (including both borderline and impaired values), the medical/psychological referral yielded an accuracy of 60.5%, a sensitivity of 66.7%, and a specificity of 59.5%. The specialist referral method enabled the identification of 18 subjects with abnormal immediate recall test values (5 borderline, 13 clinically impaired), whereas the neuropsychological assessment identified further 9 subjects (3 borderline, 6 clinically impaired) that would have been otherwise missed (i.e, 33.3% of the entire population with abnormal immediate recall test scores). Concerning the delayed recall test scores (including both borderline and impaired values), the medical/psychological referral yielded an accuracy of 58.4%, a sensitivity of 61.5%, and a specificity of 57.9%. The specialist referral method identified 16 subjects with abnormal delayed recall test (5 borderline, 11 clinically impaired), whilst the neuropsychological screening enabled the identification of further 10 subjects (5 borderline, 5 clinically impaired) that would have been otherwise missed (that is to say, 38.5% of the entire population with abnormal delayed recall test scores). Finally, regarding the ROCF scores (including both borderline and impaired values), the medical/psychological referral yielded an accuracy of 60.0%, a sensitivity of 57.6%, and a specificity of 61.1%. The specialist referral method enabled the identification of 34 subjects with abnormal ROCF test (11 borderline, 23 clinically impaired), whilst the neuropsychological assessment identified further 25 subjects (9 borderline, 16 clinically impaired) that would have been otherwise missed (that is to say, 42.4% of the entire population with abnormal ROCF scores). Further details are reported in Table 3.

Table 3. The impact of the neuropsychological screening (compared against the classical medical/psychological referral method) on the identification of subjects with cognitive impairment.

Neuropsychological test	Normal values	Borderline values	Deficit values	Statistical significance
MoCA test				p<0.0001
Without previous consultations/referrals	54 (74.0%)	19 (86.4%)	30 (33.3%)	
With previous consultations/referrals	19 (26.0%)	3 (13.6%)	60 (66.7%)	
Immediate recall test				p=0.0393
Without previous consultations/referrals	94 (65.0%)	3 (37.5%)	6 (31.6%)	
With previous consultations/referrals	64 (35.0%)	5 (62.5%)	13 (68.4%)	

Delayed recall test				p=0.1180
Without previous consultations/referrals	92 (57.9%)	5 (50.0%)	5 (31.3%)	
With previous consultations/referrals	67 (42.1%)	5 (50.0%)	11 (68.7%)	
ROCF				p=0.0553
Without previous consultations/referrals	77 (61.1%)	9 (45.0%)	16 (41.0%)	
With previous consultations/referrals	49 (38.9%)	11 (55.0%)	23 (59.0%)	

DISCUSSION

The present survey demonstrated the feasibility and effectiveness of conducting a neuropsychological screening in non-clinical settings (community pharmacies). This well reflects that, in the last years, the pharmacy profession has continued to broaden and diversify the healthcare services and provisions offered, toward a "patient-centered care practice" [18,19].

The engagement of community pharmacists and other allied health professionals working in community pharmacies, including psychologists, in screening cognitive impairment is novel in Italy and worldwide. On the other hand, an increasing, accumulating body of scholarly research has shown the beneficial effects of community pharmacist-led screening of chronic diseases, spanning from diabetes and dysmetabolic disorders to cardiovascular diseases [20,21], supporting their "expanded" role of "enhanced care". Screenings conducted in community pharmacies have successfully identified subjects at risk for chronic diseases, including neuropsychiatric ones [22], whose diagnosis would have been missed in clinical settings. Besides providing disease state, the community pharmacist can deliver medical education, enhancing patients' health literacy and significantly improving the health-related perceived quality of life and clinical outcomes by promoting and encouraging behavioral changes. Indirectly, community pharmacists can prevent neurodegenerative diseases in that brain health is profoundly interconnected with overall health, heart, and blood vessels. Indeed, approximately 65% and 56% of our sample were taking drugs and had at least one chronic disease. Hypertension, CVD, and diabetes/dysmetabolic syndrome were the three leading co-morbidities. All of these medical conditions have been shown to be linked with cognitive impairment. As such, controlling for these factors can help counteract or delay the insurgence of cognitive decline and full-blown dementia. In the present survey, community pharmacists and other allied health professionals expanded their clinical services to conduct neuropsychological screening programs.

This emphasized the unique opportunity pharmacists and healthcare professionals working in a community pharmacy setting have to identify people at risk for dementia [22-24]. This well reflects community pharmacists' "expanded role" in the last years, especially during the COVID-19 pandemic and the evolution of patient-pharmacist encounters. While pharmacists have been traditionally seen as mere dispensers of medications and pharmacies have been conceived as "compounding centers devoted to the manipulation of materia medica" [25], they are currently conceived as providers of patient-centered healthcare services, along with primary care providers, spanning from counseling to medication management services, including immunization, point-of-care testing, and chronic disease state management. Pharmacies have become "medical-pharmaceutical networks" [25].

Community pharmacists have played a key role during the COVID-19 outbreak, especially in reaching underserved and socially vulnerable communities that other healthcare providers would not have reached [25]. They have acquired new skills and roles, as well as duties and responsibilities, to meet the demands and challenges of our contemporary society [25].

This study has several limitations, which should be properly acknowledged: i) the limited sample size, and ii) the cross-sectional study design. Moreover, with the exception of the neuropsychological assessment, which expert, qualified neuropsychologists conducted, we relied on self-report measures. Further high-quality, prospective studies with larger sample sizes should be

carried out using a longitudinal design. On the other hand, our study presents several novel aspects: the neuropsychological assessment was conducted on a sample of people accessing community pharmacies within pharmacists and psychologists-led cognitive memory screening and referral programs during the COVID-19 pandemic.

CONCLUSION

The present study showed that the classical medical/psychological referral yielded an accuracy ranging from 58.4% to 63.2%, a sensitivity of 56.3-66.7%, and a specificity of 57.9-74.0% in terms of detection of cognitive impairment. The neuropsychological screening enabled the identification of a further 33.3-43.8% of subjects that would have been missed by the specialist referral method. In conclusion, a neuropsychological screening in the setting of community pharmacies is highly valuable and effective. However, further research in the field is urgently warranted due to the above-mentioned shortcomings.

Funding: None.

Acknowledgments: We thank Federfarma Italy, Assofarm, Fofi, Fenagifar, Aisfa, Cnop, and AFD ("Associazione Farmacisti Divulgatori"), for their support.

Conflicts of Interest: None.

Data Availability Statement: All data that support the findings of this study is presented in Tables 1-3.

Publisher's Note: Edizioni FS stays neutral with regard to jurisdictional claims in published maps and institutional affiliation.

References

1. Petersen RC, Smith GE, Waring SC, Ivnik RJ, Tangalos EG, Kokmen E. Mild cognitive impairment: clinical characterization and outcome. Arch Neurol. 1999 Mar;56(3):303-8. doi: 10.1001/archneur.56.3.303. Erratum in: Arch Neurol 1999 Jun;56(6):760.
2. Eshkoor SA, Hamid TA, Mun CY, Ng CK. Mild cognitive impairment and its management in older people. Clin Interv Aging. 2015 Apr 10;10:687-693. doi: 10.2147/CIA.S73922.
3. Pais R, Ruano L, P Carvalho O, Barros H. Global Cognitive Impairment Prevalence and Incidence in Community Dwelling Older Adults-A Systematic Review. Geriatrics (Basel). 2020 Oct 27;5(4):84. doi: 10.3390/geriatrics5040084.
4. Islam N, Hashem R, Gad M, Brown A, Levis B, Renoux C, et al. Accuracy of the Montreal Cognitive Assessment tool for detecting mild cognitive impairment: A systematic review and meta-analysis. Alzheimers Dement. 2023 Mar 19. doi: 10.1002/alz.13040. Epub ahead of print.
5. Dhakal A, Bobrin BD. Cognitive Deficits. [Updated 2023 Feb 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559052/.
6. Lin JS, O'Connor E, Rossom RC, Perdue LA, Burda BU, Thompson M, et al. Screening for Cognitive Impairment in Older Adults: An Evidence Update for the U.S. Preventive Services Task Force [Internet]. Rockville (MD): Agency for Healthcare Research and Quality (US); 2013 Nov. Report No.: 14-05198-EF-1.
7. Rickles NM, Skelton JB, Davis J, Hopson J. Cognitive memory screening and referral program in community pharmacies in the United States. Int J Clin Pharm. 2014 Apr;36(2):360-367. doi: 10.1007/s11096-013-9904-7. Epub 2013 Dec 20.
8. GBD 2019 Dementia Forecasting Collaborators. Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: an analysis for the Global Burden of Disease Study 2019. Lancet Public Health. 2022 Feb;7(2):e105-e125. doi: 10.1016/S2468-2667(21)00249-8. Epub 2022 Jan 6.
9. Reiss AB, de Levante Raphael D, Chin NA, Sinha V. The physician's Alzheimer's disease management guide: Early detection and diagnosis of cognitive impairment, Alzheimer's disease and related dementia. AIMS Public Health. 2022 Sep 27;9(4):661-689. doi: 10.3934/publichealth.2022047.
10. Berenbrok LA, Tang S, Gabriel N, Guo J, Sharareh N, Patel N, et al. Access to community pharmacies: A nationwide geographic information systems cross-sectional analysis. J Am Pharm Assoc (2003). 2022 Nov-Dec;62(6):1816-1822.e2. doi: 10.1016/j.japh.2022.07.003. Epub 2022 Jul 15.
11. Melton BL, Lai Z. Review of community pharmacy services: what is being performed, and where are the opportunities for improvement? Integr Pharm Res Pract. 2017 Mar 6;6:79-89. doi:

10.2147/IPRP.S107612.
12. El-Den S, Collins JC, Chen TF, O'reilly CL. Pharmacists' roles in mental healthcare: Past, present and future. Pharm Pract (Granada). 2021 Jul-Sep;19(3):2545. doi: 10.18549/PharmPract.2021.3.2545. Epub 2021 Sep 11.
13. Nasreddine ZS, Phillips NA, Bédirian V, Charbonneau S, Whitehead V, Collin I, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc. 2005 Apr;53(4):695-9. doi: 10.1111/j.1532-5415.2005.53221.x. Erratum in: J Am Geriatr Soc. 2019 Sep;67(9):1991.
14. Horner MD, Teichner G, Kortte KB, Harvey RT. Construct validity of the Babcock Story Recall Test. Appl Neuropsychol. 2002;9(2):114-116. doi: 10.1207/S15324826AN0902_7.
15. Meyers J, Meyers K. Rey complex figure test under four different administration procedure. Clin Neuropsychol. 1995;9:63–67.
16. Shin MS, Park SY, Park SR, Seol SH, Kwon JS. Clinical and empirical applications of the Rey-Osterrieth complex figure test. Nat Protoc. 2006;1:892–899.
17. Baratloo A, Hosseini M, Negida A, El Ashal G. Part 1: Simple Definition and Calculation of Accuracy, Sensitivity and Specificity. Emerg (Tehran). 2015 Spring;3(2):48-49.
18. Davis K, Schoenbaum SC, Audet AM. A 2020 vision of patient-centered primary care. J Gen Intern Med. 2005 Oct;20(10):953-957. doi: 10.1111/j.1525-1497.2005.0178.x.
19. Turner K, Weinberger M, Renfro C, Ferreri S, Trygstad T, Trogdon J, et al. The role of network ties to support implementation of a community pharmacy enhanced services network. Res Social Adm Pharm. 2019 Sep;15(9):1118-1125. doi: 10.1016/j.sapharm.2018.09.015. Epub 2018 Sep 27.
20. George PP, Molina JA, Cheah J, Chan SC, Lim BP. The evolving role of the community pharmacist in chronic disease management - a literature review. Ann Acad Med Singap. 2010 Nov;39(11):861-867.
21. Rondeaux S, Braeckman T, Beckwé M, El Oueriaghli El Ghammaz D, Devroey D, et al. Design and Development of Tools for Risk Evaluation of Diabetes and Cardiovascular Disease in Community Pharmacy. Int J Environ Res Public Health. 2023 Feb 5;20(4):2819. doi: 10.3390/ijerph20042819.
22. Breslow RM. Patient attitudes regarding pharmacist-administered memory screening in community pharmacies. J Am Pharm Assoc (2003). 2013 Nov-Dec;53(6):648-51. doi: 10.1331/JAPhA.2013.12227.
23. Maidment ID, Damery S, Campbell N, Seare N, Fox C, Iliffe S, et al. Medication review plus person-centred care: a feasibility study of a pharmacy-health psychology dual intervention to improve care for people living with dementia. BMC Psychiatry. 2018 Oct 19;18(1):340. doi: 10.1186/s12888-018-1907-4.
24. Littlewood E, Chew-Graham CA, Coleman E, Gascoyne S, Sloan C, Ali S, et al. A psychological intervention by community pharmacies to prevent depression in adults with subthreshold depression and long-term conditions: the CHEMIST pilot RCT. Southampton (UK): NIHR Journals Library; 2022 Mar.
25. Bragazzi NL, Mansour M, Bonsignore A, Ciliberti R. The Role of Hospital and Community Pharmacists in the Management of COVID-19: Towards an Expanded Definition of the Roles, Responsibilities, and Duties of the Pharmacist. Pharmacy (Basel). 2020 Aug 7;8(3):140. doi: 10.3390/pharmacy8030140.