Awareness of Beers criteria and potentially inappropriate medications among physicians and pharmacists in Palestine

Abdallah Damin Abukhalil, Rph, BCMTMS, PhD, Abdelrazzaq Yahia Shaloudi, PharmD, Niveen Mohammad Shamasneh, PharmD, Asil Maher Aljamal, PharmD
Department of Pharmacy, Nursing and Health Professions, Birzeit University, Birzeit, Palestine

Abstract

Background: The American Geriatric Society Beers criteria comprise a screening tool to identify potentially inappropriate medications (PIMs) and guide healthcare providers (HCPs) in prescribing, dispensing, and recommending appropriate medications. The extent of awareness about PIMs and geriatric medicine among HCPs needs to be assessed. Therefore, this study aimed to examine the level of awareness regarding PIMs and Beers criteria among HCPs in Palestine.

Method: This was a cross-sectional study conducted using a self-administered 20-item questionnaire involving physicians and pharmacists in Palestine. Ten clinical vignettes presenting different medical statuses in the elderly necessitating appropriate prescription advice were used to assess awareness on geriatric medication.

Results: A total of 306 participants, including 116 physicians and 190 pharmacists, participated in the study. 34.0% of the participants had poor awareness, 30.1% had average and 23.2% participants had good awareness about PIMs in the elderly. Only a small percentage of participants had very poor or very good awareness (6.9% vs. 5.9%, respectively) with no difference in the results in terms of profession. There was a significant relationship between the familiarity with Beers criteria and the level of awareness. Finally, participants perceived drug–drug interactions as a major barrier to appropriate prescribing.

Conclusion: The majority of participating HCPs had a low level of awareness, and a close proportion had moderate awareness on PIMs and Beers criteria. Consequently, there is a need to increase HCP’s awareness of medication use in the elderly. Continued education and training in geriatric pharmacotherapy may be valuable.

Keywords: healthcare providers, American Geriatric Society, pharmacotherapy, medication.

INTRODUCTION

In 2019, one in 11 people worldwide were over the age of 65 years; this is predicted to accelerate to one in 6 by 2050 according to the UN World Population Prospects. Developing countries have the vast majority of older people, as well as a rapidly aging population. Age-related disorders account for 51.3% of the global disease burden among adults: cardiovascular disorders, neoplasms, chronic respiratory diseases and sense organ malfunctions positively correlate with advanced age. Due to the prevalence of multi-morbidity, 35% of older adults are known to use an average of five prescription medications. Apart from the pharmacokinetic and pharmacodynamic changes, inter-individual variability in physiological response significantly increases with aging. Drug–drug and drug–disease interactions associated with polypharmacy is noted as a leading cause in adverse drug events (ADEs) and prescription cascades in the elderly. The risk of intolerance and toxicity with many drugs, therefore, outweighs their therapeutic potential rendering them as potentially inappropriate medications (PIMs) in geriatric patients. However, optimisation of pharmacotherapy is mostly based on data from randomised controlled trials involving younger populations or healthy older adults. In comparison to the real-life users of specific medications, the mean age of clinical trial participants was much lower according to a survey by the European project Increasing PaRticipation of the ELDerly In Clinical Trials (PREDICT). This lacunae in evidence based information in geriatric pharmacotherapy leads to inappropriate medication use in the elderly, along with other major risk factors such as...
psycho-social background, lack of geriatric awareness or training among prescribers and polypharmacy. The probability of medical errors caused by health care professionals and patients increase with polypharmacy.9,10 Prescription and monitoring errors were most common and reported in a range of 28-42% among polymedicated and aged patients in different health care settings.11 The epidemiology of medication errors and related adverse events (AEs) was investigated by a systematic review of six international databases by Assiri et al. (2018).12 Out of the 60 studies that met the inclusion criteria, 67% involved patients who were 65 years or older, and various point prevalence of prescribing error was reported in 46 studies. The prevalence of PIMs was reported in 37 cases, however a wide distribution in the range of prevalence (5–95%) was reported, reflecting the difference in detection tools used. PIMs in elderly patients are correlated with several adverse outcomes. It is an independent risk factor for hospitalisation13 and, in comparison to no PIM usage, accounted for 44% increase in mortality in a study by Vatcharavongvan and Puttawanchai.5

Evaluation of PIMs is critical to avoid therapeutic failure, improve the quality of life, and avoid unwarranted investment of time and money towards healthcare. Many assessment tools based on the implicit or explicit criteria are developed to evaluate the appropriateness of specific medication regimens and improve drug selection for older people. The explicit PIM criteria are based on trial evidence, expert opinions, and consensus techniques. The two most widely used evaluation tools based on these criteria are the Beers criteria and the Screening Tool of Older People’s Prescriptions (STOPP).14 Designed and published for the first time by Mark Beers and colleagues in 1991, the Beers criteria for PIMs is reviewed and updated every 3 years by an expert interdisciplinary panel of the American Geriatric Society; the most recent update was made in 2019.15 Beers criteria provide evidence-based recommendations on medications that health care providers (HCPs) should pay attention to, as these medications are probably not the most appropriate, safest or the best choice for older adults of 65 years and above.9 The criteria identify five categories of PIMs: (1) independent of diagnosis or condition, (2) considering drug-disease/syndrome interaction, (3) lack of evidence on benefit vs. risk, i.e., drugs to be used with caution, (4) clinically significant drug-drug interaction, and (5) require renal dose adjustment in case of impaired renal function; creatinine clearance (CrCl) category 9. The 2019 version has made some significant changes, additions and removals from the basic categories, making it more suitable for older patients.16 The tool is applicable in all outpatients, acute and institutionalised settings of care, except for hospice and palliative care scenarios. It is widely used by the medical industry and researchers. Inadequate use of Beers criteria and lack of geriatric awareness among clinicians being a major setback, skill training and educational interventions was shown to decrease prescription of PIMs by 36% post intervention through improved identification of PIMs and BC application.6,17

According to a 2017 report of the Palestinian Central Bureau of Statistics, 3.2% of the Palestinian community are elderly, i.e., 151,413 people are aged 65 and above years. The increased risk of IP positively correlated with age, polypharmacy, degree of morbidity and departments in a cross sectional study involving hospitalised elderly persons in Gaza. The prevalence of IP in 44.2% of the patients was attributed to variations in training, experience and awareness among health care providers and as well as the lack of pharmacist involvement in patient care.18 GPs that received pharmacist support along with a computerised feedback were reported to make fewer prescribing errors, emphasising the need for a multidisciplinary collaborative care approach and provision for clinical medication reviews in preventing IPs.8,19 Awareness evaluations of Palestinian pharmacists on complications associated with psychotropic medications in older patients indicated lack of awareness in geriatric pharmacotherapy.20 Though not restricted to elderly population, prescribing errors were most common among medical errors in hospitals of the Middle East. Error-provoking conditions, such as lack of awareness, was a major contributing factor among others.21 Awareness of PIMs and Beers criteria influence the quality of medical care to the elderly. However, a systematic assessment of this awareness among HCPs in Palestine is lacking. The study is therefore aimed at evaluating the awareness on PIM and Beers criteria among physicians and pharmacists working in hospitals and community pharmacies in Palestine.

METHODOLOGY

In this cross-sectional questionnaire-based study, each participating HCP received a brochure containing the definitions of PIMs and Beers criteria to increase their familiarity and awareness regarding the same.

Ethics Statement

After undergoing revision, this study received ethical approval from the Research Ethics Committee in Birzeit.
University. The questionnaire included informed consent and provided sufficient information and assurances to the respondents to help them decide whether to participate or not. Participation was random, voluntary, and private. The questionnaire did not ask about any personal information. Data collected was stored in password-protected SPSS file, analysed, and discussed with a high level of objectivity, and without bias.

Survey Questionnaire

Due to the absence of a validated tool to measure physicians’ awareness about PIM, a questionnaire was developed for use in this study after a review of similar studies.22,23 The self-administered survey questionnaire developed in English consisted of three sections: section (A) consisted of bio-demographic details including sex, profession, and number of years in practice, the estimated percentage of patients above 65 years old, and the sources used for drug and information on any geriatric training received. Participants were also asked to assess their confidence in recommending medications for elderly patients by rating their agreement or disagreement with the following statement: ‘I have confidence in my ability to recommend appropriate medications for the elderly.’ Using a five-point Likert scale, where ‘1’ indicated strongly agree and ‘5’ strongly disagree, participants were asked to self-rate their familiarity with Beers criteria. Section (B) consisted of ten clinical vignettes meant to determine the awareness about PIMs while prescribing or dispensing medications to older adults. It was designed using the latest updated version of Beers criteria (2019). The vignettes were concerned with therapeutic approaches for diseases frequently observed in older adults. Five cases focused on therapeutic issues in patients with diabetes mellitus, hypertension, and heart failure (No. 1, 2, 6, 7, and 9). Two cases focused on therapeutic issues in patients with depression and sleep disturbances (No. 3, and 4). Case No. 5 addressed the therapeutic choices for pain management in elderly patients with arthritis. Cases 8 and 10 addressed the therapeutic choices for management of allergy and prevention of osteoporosis in elderly women, respectively. In Section C, participants were asked to choose between 12 suspected barriers to appropriate prescribing for the elderly; they were also given the option to add any other factor(s) that posed as a barrier but was not mentioned in the list.

At the start of the study, the questionnaires were distributed by hand, but with the outbreak of COVID-19 and associated quarantines, an online questionnaire was used to complete the study.

Participants

The study population included all physicians and pharmacists who provide healthcare services in health institutions – including hospitals, outpatient health facilities and community pharmacies – in several Palestinian cities including Jerusalem, Ramallah, Al-Bireh, Nablus, Hebron, Jenin, Bethlehem, and Jericho.

Sample Size

Paper surveys were distributed to physicians and pharmacists (n = 184) working in health facilities in Jerusalem, Ramallah, Al-Bireh, Hebron, Nablus, Jenin, and Jericho. Online surveys were distributed to physicians and pharmacists (n = 122) working in health facilities in other Palestinian cities. The total size of the collected sample was 306.

Data Collection and Analysis

After explaining the study objectives and obtaining consent, the randomly selected participants were provided with a copy of the questionnaire and requested to complete the questionnaire in one sitting (no time restriction). They were not allowed to consult their group members for opinions on any question and were asked to complete the questionnaire anonymously. A total of 94 participants who did not return or submitted an incomplete questionnaire were excluded from the study. The HCPs were approached for participation in the study during their leisure times, and it took about 15 min to complete the questionnaire. The level of awareness was determined depending on the participant’s response to ten clinical vignettes. A correct response for each of the cases was awarded 1 point, and incorrect response was awarded 0 point; the highest possible total score was 10. The participant’s awareness was classified based on the total score into six classes: no awareness (score: 0), very poor (score: 1-2), poor (score: 3-4), average (score: 5-6), good (score: 7-8), and very good (score: 9-10). The collected data were subjected to statistical analysis using Statistical Package for Social Sciences, version 21.0 (IBM SPSS Statistics 21). Analysis was done using descriptive statistics, which was used to get the general characteristics of the study participants. Quantitative data (duration of practice) were analysed as mean ± standard deviation. Categorised data (all other questions in the survey) were analysed as frequencies and percentage. To recognise whether a relationship exists between the categorical data (general characteristics and the level of awareness), two-sided Chi-square test was used. One-way ANOVA
and t-test were used to determine the relationship between duration of practice (quantitative data) and the level of awareness.

RESULTS

Table 1 shows the demographic features of 306 participants in this study. Of them, 145 (47.4%) participants were male and 161 (52.6%) were female. There were 116 (37.9%; male: 62.1% and females: 37.9%) physicians, and 190 (62.1%; males: 38.46% and females: 61.6%) pharmacists. The mean duration of practice was 8.0 ± 6.7 years; 35.9% participants practiced for <5 years, 32.2% practiced for 5–10 years, and 23.2% practiced for more than 10 years.

Table S1 shows the exposure of HCPs to elderly patients. Thirty-three (10.8%) participants, which included 14 physicians and 19 pharmacists, saw <5 elderly patients weekly. Seventy-eight (25.5%) participants observed 10–20 patients weekly. Eighty-seven (28.4%) participants, including 40 physicians and 47 pharmacists, attended to more than 20 patients weekly. Thirty-three (10.8%) participants, including 23 physicians and 56 pharmacists, observed 10 elderly patients weekly. Eighty-seven (28.4%) participants were familiar with Beers criteria. Among them, 62 pharmacists were not familiar, and 34% (42 physicians and 62 pharmacists) of participants were unsure about their familiarity with Beers criteria.

The most frequently used drug information source by respondents, of which the majority were pharmacists (68.8%), was the search engine Google. It was found to be the main resource for 56.8% of the pharmacists. Among physicians, 56.9% used medical journals, and 56.0% relied on physician colleagues. The order of drug information sources used by the respondents from the most used to the least was Google, medical journals, pharmacists, physician colleague, and pharmaceutical representatives. Other resources mentioned by the participants were Medscape (19), Micromedex (4), Uptodate (4), Lexicomp (2), Drug.com, Drug leaflets, PubMed, drug information handbook, pharmacotherapy book, and other books (Figure 1).

Table S2 presents the answers of participants to the ten clinical vignettes regarding drug use in the elderly. About 26.8% participants (32 physicians and 50 pharmacists) correctly answered case no. 1, while the remaining 73.2% gave incorrect answers. Case no. 2 were correctly answered by 209 (68.3%) respondents, including 78 physicians and 131 pharmacists. Most participants (71.6%) incorrectly answered case no. 3. Among the 87 (28.4%) who chose the right answer, 36 were physicians and 51 were pharmacists. In case no. 4, 123 (40.2%) participants, including 35 physicians and 88 pharmacists, chose the most appropriate option. The rest of participants (59.8%) chose inappropriate medications. About 51.3%, including 63 physicians and 94 pharmacists, gave the right answer for case no. 5. About 68.6% participants (94 physicians and 116 pharmacists) correctly answered case no. 6. About 69.6% participants, including 86 physicians and 127 pharmacists, correctly answered case no. 7. Majority (71.9%) of the participants, including 74 physicians and 146 pharmacists, answered case no. 8 correctly. In case NO. 9, 51.6% participants, including 60 physicians and 98 pharmacists, administered the appropriate medication. Almost half of the respondents

| Table 1 Demographic characteristics |
|------------------------------------|
| Total subjects                     | 306 |
| Gender                             |     |
| Male                               | (145) 47.4% |
| Female                             | (161) 52.6% |
| Physician                          |     |
| Male                               | (72) 62.1% |
| Female                             | (44) 37.9% |
| Total                              | (116) 100% |
| Pharmacist                         |     |
| Male                               | (73) 38.4% |
| Female                             | (117) 61.6% |
| Total                              | (190) 100% |
| Duration of Practice (Years since basic MB, BS/MD) |     |
| Mean                               | 8.0 ± 6.7 years |
| less than 5 years                  | (110) 35.9% |
| 5 years                            |     |
| 5–10 years                         | (100) 32.2% |
| More than 10 years                 | (94) 31.9% |
(50.3%), including 40 physicians and 114 pharmacists, selected the right medication in case no. 10.

Figure 2 shows evaluation of the awareness about potentially inappropriate medications and Beers criteria among physicians and pharmacists involved in this study. As depicted in Table S3, 6.9%, 34.0%, 30.1%, 23.2%, and 5.9% of the participants had very poor, poor, average, good, and very good awareness, respectively. Poor awareness about PIMs was reflected in the majority of HCPs. Almost equal proportions of physicians and pharmacists showed very poor level of awareness (6.9%, 6.8%, respectively). Regarding awareness of physicians and pharmacists, 35.3% and 33.2% had poor, 31.9% and 28.9% had average, 19.0% and 25.8% had good, and 6.9% and 5.3% had very good awareness, respectively.

Figure 1 Drug information sources used when providing healthcare to the elderly by participants

Figure 2 Level of awareness of potentially inappropriate medications and Beers criteria
There was no significant relationship between the level of awareness on PIMs and (A) gender $[\chi^2 (4, N = 306) = 3.89, p = 0.421]$, (B) profession $[\chi^2 (4, N = 306) = 2.08, p = 0.721]$, (C) elderly patients seen weekly $[\chi^2 (12, N = 306) = 19.66, p = 0.074]$, (D) elderly patients seen routinely $[\chi^2 (12, N = 306) = 7.71, p = 0.807]$, (E) training in geriatric medicine $[\chi^2 (4, N = 306) = 1.34, p = 0.854]$, (F) confidence in recommending appropriate medications for the elderly $[\chi^2 (12, N = 306) = 19.63, p = 0.074]$, and (G) duration of practice $[F (4, 276) = 1.34, p = 0.256]$ (Table S4).

The study has also made an inquiry into the potential barriers for appropriate prescribing to the older adults from the point of view of the participants (Figure 3). While potential drug–drug interaction was suggested as the major barrier by 60.8% of the participants, 1.6% indicated towards other barriers like community pharmacist not being up to date, lack of geriatricians, lack of information about geriatrics, and patient medical status (comorbidities). Some of the other barriers cited were, polypharmacy (50.7%), lack of education on appropriate prescribing in the elderly (48.0%), medication cost (44.1%), lack of documentation of patient’s current medications (39.5%), difficulty in communicating with other health care providers involved in a patient care (34.3%), patient unwilling to discontinue a medication prescribed.

![Figure 3](image_url)

**Figure 3** Barriers to appropriate prescription to older adults with the number and percentage of participants who cited the barrier
by another physician (33.7%), lack of time (29.4%), demand for a specific medication by the patient (28.1%), lack of acceptable therapeutic alternatives (27.5%), limited options in medication formulary (26.5%) and lack of resource and medication references (24.2%).

DISCUSSION

This study examined the level of awareness about PIMs listed on Beers criteria among physicians and pharmacists in Palestine. According to the vignettes scores, most participants have poor, average, or good level of awareness. However, the majority of healthcare professionals had poor awareness about PIMs, with only 5.9% achieving a very high score and 6.9% scored very low. Study findings indicate no difference between physicians and pharmacists in terms of awareness on appropriate medications for the elderly. Moreover, no significant difference in awareness scores between the subgroups, except for the familiarity with Beers criteria, was observed. Healthcare practitioners who were familiar with this tool or had prior awareness about it achieved higher scores and were more cautious while prescribing or dispensing medications to the elderly than others. Surprisingly, only 25.8% of the respondents were familiar with it. HCPs who were trained in geriatric medicine and those who ‘strongly agreed’ or ‘agreed’ with regard to their confidence in appropriately recommending medications had a low level of awareness. About 64.4% of participants were confident despite their low scores. In addition, participants who were more familiar with geriatric patient consultations did not score higher than others. However, it is necessary to note that being a self-reported evaluation, it is vulnerable to recall bias, and therefore may not exactly reflect reality.

Our results are similar to a Malaysian study where six clinical vignettes were used to assess the awareness of physicians and pharmacists on PIMs in geriatric care. Sixty-seven point one per cent of the respondents scored four points or lower and the responses to the clinical scenario presented varied between the participants.22 Similar to our findings, the awareness score was not significantly different between physicians and pharmacists.

Of the ten clinical scenarios concerned with the most common medical conditions in the elderly, more than 50% of the participants had good awareness in alpha-blockers, alpha-agonists, non-steroidal anti-inflammatory drugs, and antihistamines. Participants had moderate awareness of narcotic analgesics, beta-blockers, and selective estrogen modulators. Unfortunately, participants’ awareness regarding sulfonylureas, anti-depressants, and hypnotics was poor. Poor awareness on antidiabetic drugs (Case no. 1) was alarming. Since diabetes is a common chronic disease, this poor awareness indicated the possibility for complications.24 Similarly, depression and insomnia are common abnormal conditions in the elderly and must be addressed with appropriate age-inclusive pharmacotherapy.25,26

Participants rely on a wide range of sources to access drug information while recommending medication to elderly in their daily practice. The use of potentially inappropriate information sources is considered one of the challenges faced by HCPs.27 The most common drug information sources were online search engines, like Google, medical journals, pharmacists, physician colleagues, and pharmaceutical representatives. Physicians preferred medical journals as drug information sources, whereas pharmacists had a preference for internet resources (Google). Other sources, like books, medical websites, and applications were used by 11% of the participants. As there is an increase in dependence on medical applications to obtain drug information, the development of applications for appropriate medication for elderly patients may have had a positive impact on improving the awareness of HCPs. Awareness and use of authorised and tailored medical tools such as the Beers criteria can minimise discrepancies and errors in treatment strategies.

This study also examined perceptions about barriers to appropriate prescribing to elderly. Potential drug–drug interactions were stated as the primary barrier; medication was often avoided to protect the patient from the risk of drug–drug interactions. Half of the participants perceived that the patient could be taking many medications (polypharmacy) and, hence, refrained from prescribing. Therefore, adequate awareness about alternatives when drug-related interactions are suspected is critical to provide quality health care.

Inadequate awareness of HCPs on geriatric medicine often results in negative outcomes. This risk can be reduced by reaffirming the role of hospital-based clinical pharmacists in identifying errors, educating HCPs, and carrying out undergraduate and postgraduate training in geriatric medicine and pharmacotherapy. Implementation of prescribing assessment tools such as the Beers criteria results in improved outcome and reduced cost.28

This study is not free from limitations. As the sample size is relatively small (n = 306), it is not possible to generalise the results to all physicians and pharmacists in Palestine. The information obtained by the survey is self-reported, so it is subject to recall bias. In addition, being a cross-sectional survey, it cannot be used to determine the cause and effect relationship between variables.29
CONCLUSION

The study demonstrates the relatively low awareness about appropriate medications for elderly patients among the physicians and pharmacists in Palestine. The majority of participants had poor or average awareness about PIMs and the criteria for evaluating its presence, such as the Beers criteria. Not surprisingly, participants who had a good understanding of Beers criteria had higher awareness and were cautious in prescribing drugs to their older patients. Suspected drug–drug interactions and polypharmacy were the major barriers to appropriate prescribing to elderly. This calls for the importance of effective communication between HCPs and patients and also improved awareness about the inappropriate/appropriate medications for the elderly. Based on our observations, a study on the impact of educational interventions and undergraduate and postgraduate training in geriatric medicine on HCP’s awareness is essential.

Conflicts of interest statement

The authors declare that they have no conflicts of interest.

Supporting information

Additional supporting information may be found in the online version of this article:

Table S1 Attitude and exposure to prescribing/ dispensing to the elderly.
Table S2 Participants’ answers to the clinical vignette related to drug use in the elderly patients.
Table S3 Participant scores based on their answers to the clinical vignettes.
Table S4 Relationship between the level of awareness and participants’ characteristics.

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