Outcomes of Pharmacists’ Involvement with Residents of Special Nursing Homes for the Elderly

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The current study aimed to examine the outcomes of pharmacists’ involvement with elderly people in special nursing homes. We analyzed 58 cases involving regular visits by community pharmacists to 41 residents. The residents’ mean age was 87.8 ± 6.9 years, and 68.3% were prescribed 6 or more types of medication. Antipsychotic and insomnia medication was taken by 24.4% and 31.8% of residents, respectively. Pharmaceutical consultation following medication use accounted for 60.3% of pharmacists’ involvement with residents. The outcomes of these consultations included improvements in prescription content; the identification and prevention of adverse drug events; improvement in activities of daily living; and improvement in test results, sleep, and urination/bowel control. The results also suggested that pharmacists’ intervention reduced drug costs. Information that facilitated involvement was most frequently acquired via conversations (67.2%) and conferences (24.1%) in the facilities. The most common information sources were care workers (72.4%), followed by nurses (37.9%), physicians (6.9%), and functional training instructors (6.9%). Information was also acquired from patients (3.4%) and their family members (5.2%). The findings indicated that regular visits by pharmacists to facilities for elderly people and conversations between residents, their family members, and physicians, nurses and various other professionals improved various pharmacotherapy outcomes.

Key words—pharmacist; special nursing home; polypharmacy; elderly; outcome

INTRODUCTION

According to a survey report issued by the Japan Pharmaceutical Association in March 2010,1,2 74.8% of respondents receiving care at special nursing homes for the elderly were prescribed prescription medication. Of these, 80.8% were prescribed drugs provided via outside prescriptions and delivered to the facility by community pharmacists. In addition, although 93.9% of residents who were prescribed drugs required drug management by facility staff or external pharmacists, only 6.2% of special nursing homes had visiting pharmacists who stored and managed drugs.1,3 Facility nurses are primarily involved in drug management on a daily basis, and care workers undertake drug delivery. Supervised administration is a substantial work burden for both nurses and care workers; furthermore, in addition to anxiety about the lack of knowledge about drugs and the risk of drug delivery and medication errors, the use of multiple drugs renders supervised administration complex and maximal-

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hospital referrals and hospitalization cases, and occurrence of delirium/falling/death cases have been suggested as endpoint references in the assessment of outcomes. In addition, a systematic review based on multiple randomized controlled trials showed that collaborative interventions involving various professionals in facilities for the elderly generally produce positive outcomes; in addition, the inclusion of primary care physicians and pharmacists on the team and smooth communication and coordination within the team contributed to intervention success. Moreover, in a Japanese study involving a communal, long-term daily care facility for dementia patients, community pharmacists supported supervised administration by offering single-dose packages and attempted collaboration with facility staff by implementing drug management boxes; this resulted in greater medication regimen compliance relative to that observed with the simple provision of single-dose packages. Furthermore, other studies have reported dose reductions, which resulted from prescription-related advice provided by pharmacists to physicians, in geriatric health service facilities. However, the outcomes of pharmacists’ collaboration with other professionals in interventions for special nursing homes have yet to be verified. The current study aimed to clarify the outcomes of pharmacists’ involvement with residents of special nursing homes for the elderly, based on cases in which community pharmacists visited these special nursing homes regularly to provide medication. Also, in establishing the protocols for intervention study as the continuing research, we will make basic data that will contribute to construct the procedure for pharmacists’ intervention including the timing of the collaboration with other professionals and to decide endpoints to evaluate the outcomes based on this study.

**METHOD**

**Study Design**  
The study was retrospective and observational in design.

**Participants**  
Three special nursing homes operated by a social welfare corporation in Toyonaka, Osaka (one facility in Takarazuka, Hyogo and two in Toyonaka, Osaka) were included in the study. These facilities received regular visits from community pharmacists and consented to participate in the study. Maximum occupancy for each of the special nursing homes was 100, 144, and 45, with care provided for groups of 8–10 residents. Of the 173 residents who received prescription drugs from pharmacies, those for whom community pharmacists had provided some form of pharmaceutical intervention between November 2015 and September 2017 were included in the analysis.

**Procedure**

**Extraction and Classification of Pharmaceutical Intervention Cases**  
During the study period, two community pharmacists who provided pharmaceutical care in the special nursing homes recorded intervention content individually via a format activity log, as shown in Fig. 1 (one log for each case). The data retrospectively collected in this study is the case of all involvement between November 2015 when the pharmacist started visiting the special nursing homes and the most recent September 2017.

We brainstormed activity log development in a meeting involving the two pharmacists who visited the special nursing homes, the manager of the organization to which the pharmacists belonged, academic/operational specialists from the organization, and faculty members from the pharmacy department. We determined items and categories for the logs via the KJ (Kawakita Jiro) method.

The two pharmacists visiting special nursing homes held over 10 years’ experience as community pharmacists each. They visited special nursing homes once per week. On visiting days, they collected information from medical/care professionals, such as nurses and care workers, in the facilities and checked nursing and care records. Thereafter, they confirmed the conditions of residents who had experienced changes in their physical conditions since the last visit and verified prescription changes.

In the activity log, we classified the content of pharmaceutical interventions into three main categories: (1) education and awareness building for nurses and care workers, (2) medication monitoring, and (3) pharmaceutical consultation following medication use. Expected outcomes for each intervention were determined for each category. The classification of cases and selection of outcomes (multiple answers permitted) were left to the discretion of the pharmacists involved. Other log items included prescription content, information acquired by the pharmacists, the pharmacists’ assessments based on acquired information, suggestions made to physicians and the results thereof, forthcoming plans, methods.
of acquisition of information that facilitated pharmacists’ interventions (‘‘information acquisition methods,’’ multiple answers permitted), and the people with whom pharmacists had communicated to obtain information (‘‘information sources,’’ multiple answers permitted). Information acquisition methods were classified into five categories: conversations in the facilities, conferences in the facilities, telephone calls, emails, and records (e.g., examination of records, such as nursing and care records, in the facilities, and other). Information sources were classified into the following categories: physicians, nurses, care workers, functional training instructors, patients, patients’ family members, and other. Completed logs were stored at a data center (the headquarters of the pharmacy group that employed the pharmacists), and simple tabulation was performed after masking personal information and assigning research identification numbers to anonymize the data.

**Calculating Changes in Drug Costs Resulting from Pharmaceutical Interventions** We calculated prescription drug costs, which were modified based on the drug pricing standards of April 2017, for each case. In particular, the monthly differences in drug costs was calculated by multiplying the daily prices of the medication by 30 before and after prescriptions were changed. For drugs taken once per week, this procedure was applied after the overall drug cost was divided by 7 to calculate the daily drug cost.

**Ethical Considerations** The current study complies with ‘‘Ethical Guidelines for Medical and Health Research Involving Human Subjects’’ and was conducted with the approval of the ethics review board at Osaka University of Pharmaceutical Sciences (Approval No. 0039).

**RESULTS**

**Attributes of Residents Receiving Pharmaceutical Interventions** The attributes of residents receiving pharmaceutical interventions are shown in Table 1. From November in 2015 to September in 2017, community pharmacists provided pharmaceutical interventions for 41 residents. The residents’ mean age was 87.8±6.9 years, and 80.5% were women; in addition, 24 (58.5%) had a history of dementia. The number of different types of internal medicine (before the in-
Cases 2 and 3 illustrate improvement in drug adherence, as inappropriate crushing of pills was prevented. Case 1 is an example of appropriate drug administration, as changing dosage forms allowed medication use. Instances of pharmaceutical consultation following medication use included Case 4, in which adverse drug events were resolved by discontinuing antipsychotic medication use, and Case 5, in which sufficient sleep time was achieved by changing the timing of antipsychotic medication administration. Furthermore, adverse drug events, particularly diarrhea, were improved via the reduction of the dosage of the medication involved (Case 6).

Methods of Information Acquisition That Facilitated Pharmacists’ Intervention The information acquisition methods that facilitated pharmaceutical intervention by pharmacists are shown in Table 3. Conversations in the facilities was the most common method (39 cases, 67.2%), followed by conferences in the facilities (14 cases, 24.1%). Information was acquired via records, such as those for nursing/care, held in the facilities in 7 cases (12.1%), and no cases involved information acquisition via email. In addition, the most common sources of information acquired by pharmacists were care workers (42 cases, 72.4%), followed by nurses (22 cases, 37.9%). Moreover, physicians and functional training instructors were each sources of information in 4 cases (6.9%), and patients and their family members were information sources in 2 (3.4%) and 3 (5.2%) cases, respectively.

The acquisition of information from physicians and nurses occurred most frequently during conferences in the facilities. In contrast, the acquisition of information from care workers, functional training instructors, patients, and patients’ family members occurred most frequently during conversations in the facilities.

Changes in Drug Costs Resulting from Pharmaceutical Interventions The number of different types of internal medicine prescribed as a result of pharmaceutical consultation following medication use decreased by 9 in one case; this corresponded to the reduction of 747.75 yen in daily drug costs, or 22,432.5 yen over a 30-day period, respectively. Total drug costs also decreased in cases that did not

### Table 1. The Attributes of Residents Receiving Pharmaceutical Interventions in Special Nursing Homes

| Items                                           | n (%) |
|-------------------------------------------------|-------|
| Number of residents receiving pharmaceutical intervention | 41    |
| Sex                                             |       |
| Male                                            | 8 (19.5) |
| Female                                          | 33 (80.5) |
| Age (years), mean±S.D.                          | 87.8±6.9 |
| Cases                                           | 58    |
| Medical history                                 |       |
| Dementia                                        | 24 (58.5) |
| Hypertension                                    | 21 (51.2) |
| Diabetes mellitus                               | 9 (22.0) |
| Cerebral vascular disease                       | 10 (24.4) |
| Parkinson’s disease                             | 2 (4.9) |
| Heart disease                                   | 12 (29.3) |
| Anemia                                          | 4 (9.8) |
| Osteoporosis                                    | 6 (14.6) |
| Number of different types of internal medicine, mean±S.D. | 7.3±3.6 |
| Number of different types of internal medicine  |       |
| ≤5                                              | 13 (31.7) |
| 6–10                                            | 21 (51.2) |
| 11–15                                           | 6 (14.6) |
| 16–20                                           | 1 (2.4) |
| Antipsychotic medication                        | 10 (24.4) |
| Insomnia medication                             |       |
| Benzodiazepines                                 | 9 (22.0) |
| Non-benzodiazepines                             | 4 (9.8) |

In Breakdown of Cases We analyzed 58 intervention cases involving 41 residents. The most common type of involvement (35 cases, 60.3%) was pharmaceutical consultation following medication use, followed by education and awareness building for nurses and care workers (13 cases, 22.4%) and medication monitoring (10 cases, 17.2%). Improvement in prescription content was the most common outcome (16 cases), followed improvement in drug adherence (9 cases) and drug-related knowledge (8 cases; Fig. 2).

Details of individual cases are shown in Table 2. Case 1 is an example of appropriate drug administration, as inappropriate crushing of pills was prevented. Cases 2 and 3 illustrate improvement in drug adherence, as changing dosage forms allowed medication use. Instances of pharmaceutical consultation following medication use included Case 4, in which adverse drug events were resolved by discontinuing antipsychotic medication use, and Case 5, in which sufficient sleep time was achieved by changing the timing of antipsychotic medication administration. Furthermore, adverse drug events, particularly diarrhea, were improved via the reduction of the dosage of the medication involved (Case 6).
involve a change in the number of internal medicines; in addition, education and awareness building for nurses and care workers, medication monitoring, and pharmaceutical consultation following medication use resulted in reductions of 571.5 yen, 192.0 yen, and 13,272.0 yen over a 30-day period, respectively.

**DISCUSSION**

The results indicated that regular pharmacist involvement with residents of special nursing homes resulted in a wide range of outcomes. One possible reason for this finding is that pharmacists’ visits to the facilities allowed them to provide benefits that they did not provide by simply fulfilling prescriptions in pharmacies. The opportunity to understand residents’ conditions and obtain information from relevant people allowed pharmacists to act quickly and accurately to resolve various pharmacotherapy-related issues. For instance, conversations with care workers in facilities were the most common method of information acquisition that facilitated pharmaceutical intervention (Cases 1, 2, 3, 5, and 7, as shown in Table 2). As care workers assisted residents with eating, sleep problems, excretion, and drug administration in the facilities, they were more likely to notice issues involving supervised administration based on residents’ living conditions. Information obtained from functional training instructors facilitated pharmaceutical intervention in 4 cases, of which one was Case 4 (Table 2). As functional training instructors obtained a thorough understanding of the residents’ activity levels and conditions via rehabilitation, they were more likely to identify side effects such as extrapyramidal symptoms that arose from agents that affected the central nervous system. This finding indicated that information sharing between pharmacists and nurses, who managed all aspects of care for residents, and care workers and functional training instructors resulted in outcomes such as the identification and prevention of mismatches in swallowing ability, medication formulation, and adverse drug events including side effects; improvement in activities of daily living; and identification and prompt treatment of sleep and excretion problems.

There were no significant differences in the proportion of residents who were prescribed more than 6 different types of medication before and after interventions (68% to 66%); in addition, there were no significant differences in numbers of different types of medication (7.3 to 7.0). However, from an economic perspective, reductions in drug costs could occur regardless of changes in the numbers of drugs, as shown in Table 4. This suggested that pharmacists’ intervention not only led to a reduction in the number of different types of medication prescribed but also facilitated appropriate drug use via changes in drug

### Table 2: Number of Cases and Outcomes of Pharmaceutical Interventions Provided by Pharmacists

| Item                                      | Outcome                        | No. of cases |
|-------------------------------------------|--------------------------------|--------------|
| (1) Education and awareness building      | Improvement in drug-related    | 8            |
| for nurses and care workers               | knowledge                      |              |
|                                           | Awareness of supervised        | 4            |
|                                           | administration                 |              |
|                                           | Appropriate drug administration| 5            |
|                                           | Other                          | 0            |
| (2) Medication monitoring                 | Improvement in drug adherence  | 9            |
|                                           | Other                          | 1            |
| (3) Pharmaceutical consultation following | Identification and prevention  | 6            |
| medication use                            | of adverse drug events         |              |
|                                           | Improvement in prescription    | 16           |
|                                           | content                        |              |
|                                           | Improvement in activities of   | 7            |
|                                           | daily living                   |              |
|                                           | Improvement in test results    | 4            |
|                                           | Sleep control                  | 2            |
|                                           | Urination/bowel control        | 7            |
|                                           | Other                          | 0            |

*Multiple outcomes could apply to the case.*
| Case No. | Classification of outcomes | Patient Age | Sex | Medicine | Information acquired | Pharmacist’s assessment | Result |
|----------|---------------------------|-------------|-----|----------|----------------------|------------------------|--------|
| 1        | Appropriate drug dosing    | 90          | Female | Lansoprazole OD tablet | Orally disintegrable tablets are crushed immediately before drug administration for a patient who takes drugs after crushing them | Care workers are unaware that enteric is lost through crushing | Patient was able to take drug dissolved in water |
| 2        | Improvement in drug adherence | 85          | Female | Aspirin/lansoprazole combination tablet | Patient tries to chew to swallow medicine, as the tablet is large | Tablet cannot be chewed, as it is enteric. Taking smaller doses by changing to two single agents is preferable | Changed to Rabeprazole 5 mg + Aspirin 100 mg tablets; patient is able to swallow drugs |
| 3        | Improvement in drug adherence | 96          | Female | Methotrexate capsule | Swallowing is difficult; patient can eat bread, but capsule remains in mouth | Generic tablets are slightly smaller in size and will not stick inside the mouth | Changed to methotrexate tablet; patient is able to swallow drug |
| 4        | Identification and prevention of adverse drug events Improvement in activities of daily living | 88          | Female | Risperidone | Movement has become sluggish | Patient could be exhibiting extrapyramidal symptoms. Dosage decrease should be considered while monitoring restlessness | Patient discontinued intake after dosage decrease; body movement improved |
| 5        | Improvement in prescription content Sleep control | 88          | Female | Tiapride | Wandering at night is an issue | Patient takes drug at 8 pm; as effects appear within 1–2 h and T1/2 is 3.9 h, intake timing should be delayed | Intake time changed to 10 pm. Patient slept well from 11 pm to 6 am, reducing the burden for night-shift care workers |
| 6        | Identification and prevention of adverse drug events Urination/bowel control | 90          | Female | Distigmine | Drug taken for anuria, but diarrhea has continued | Side effects could occur with ingestion of 2.5 mg daily | Intake decreased to 2.5 mg twice per week on Mondays and Thursdays; diarrhea improved |
| 7        | Identification and prevention of adverse drug events | 100         | Female | Memantine | Drowsiness during the day. Appetite and food consumption is decreasing | Yokukansan intake before meals is challenging and affects food consumption. Possibility of drowsiness from memantine | Discontinuing intake improved drowsiness; food consumption increased |
Table 3. Acquisition Methods and Sources of Information That Facilitated Pharmacists’ Intervention

| Information source                  | No. of cases\(^a\) (%) | Physician  | Nurse    | Care worker | Functional training instructor | Patient       | Patient’s family member | Other |
|------------------------------------|-------------------------|------------|----------|-------------|-------------------------------|---------------|-------------------------|-------|
| Conversations in the facilities    | 39(67.2)                | 0          | 9        | 31          | 3                             | 2             | 3                       | 0     |
| Conferences in the facilities      | 14(24.1)                | 3          | 11       | 9           | 1                             | 0             | 0                       | 0     |
| Telephone calls                    | 2 (3.4)                 | 1          | 1        | 1           | 0                             | 0             | 0                       | 0     |
| Emails                             | 0 (0.0)                 | 0          | 0        | 0           | 0                             | 0             | 0                       | 0     |
| Records                            | 7 (12.1)                | 0          | 3        | 4           | 2                             | 0             | 0                       | 1     |

Unit: cases. * Multiple sources of information and acquisition methods could apply to the case.

Table 4. Changes in Drug Costs Resulting from Pharmaceutical Interventions by Pharmacists

| Classification of outcomes                  | Change in the number of different types of internal medicines | Cases   | Daily drug cost | Drug cost over a 30-day period | Change in drug costs per outcome |
|---------------------------------------------|---------------------------------------------------------------|---------|-----------------|---------------------------------|---------------------------------|
| (1) Education and awareness building for nurses and care workers | −1 | 1 | −14.2 | −426.0 | −997.5 |
| (2) Medication monitoring                   | ±0 | 4 | −19.05 | −571.5 | −540.0 |
| (3) Pharmaceutical consultation following medication use | ±9 | 1 | −747.75 | −22,432.5 | −56,316.6 |
|                                              | −5 | 1 | −340.8 | −10,224.0 |                          |
|                                              | −2 | 1 | −525.2 | −15,756.0 |                          |
|                                              | −1 | 7 | −263.47 | −7,904.1 | −56,316.6 |
|                                              | ±0 | 15 | −442.4 | −13,272.0 | −13,272.0 |
|                                              | +1 | 4 | +319.3 | 9,579.0 |                              |
|                                              | +2 | 1 | +590.5 | 17,715.0 |                              |
|                                              | +3 | 1 | +21.4 | 642.0 | 27,936.0 | −41,652.6 |
| Total                                       | 45 | −1,439.7 | −43,190.1 |                          |
selection of appropriate drugs without compromising effectiveness, minimizing risk and easing care burden.

With regard to pharmacotherapy for nursing facility residents, the frequent occurrence of adverse drug events resulting from the prescription of potentially inappropriate medication (PIM) highlighted the importance of regular prescription reviews in accordance with the Japan Geriatrics Society’s “Guidelines for Medical Treatment and Its Safety in the Elderly 2015.” Furthermore, international studies have reported reductions in the number of fall-related incidents, number of types of medication, administration costs, and PIMs through pharmacists’ involvement in pharmacotherapy for nursing home residents, using PIM screening tools such as the Beers and STOPP/START criteria. While data regarding facilities for the elderly are currently scarce in Japan, one study reported that, of elderly people aged 65 years or older who lived at home and received visits from pharmacists, 48.4% took at least 1 type of drug classified as PIM according to the Beers criteria, and pharmacists identified adverse drug events arising from PIMs in 8.0% of patients during visits. In addition, PIM was observed in 32.5% of dementia outpatients aged 65 years or older, because they were prescribed medication that affects the central nervous system. It would be particularly meaningful for pharmacists to focus on the prescription of PIM in special nursing home residents and collaborate with other professionals using the abovementioned guidelines, particularly as 58.5% of the residents in the current study had been diagnosed with dementia.

The study was subject to some limitations and challenges. For example, intervention methods were left to the pharmacists’ discretion. In addition, as it was a retrospective observational study, outcome assessment for objective end points was difficult. Moreover, information regarding residents was separated according to divisions in hard copies of files; therefore, information collection was a time-consuming process. Furthermore, knowledge of patients’ conditions when pharmacists were absent was limited, and the study did not account for individual differences in perception regarding the aim and meaningfulness of collaboration between various professionals including pharmacists. Despite these limitations, the study was important, and its strength lay in the illustration of these insights for the first time in Japan, the diversity of outcomes of pharmacists’ involvement with special nursing home residents, and the significance of “face-to-face collaboration of various professionals” inside the facility.

In a 2014 study examining collaboration in home-based healthcare and elderly care, emails, telephone calls, and faxes were used effectively in interprofessional collaboration in pharmacies. We plan to address the challenges identified in this study, by exploring collaboration methods based on interprofessional communication and education, intervention methods for pharmacists, and end points that can be used to assess these outcomes. Ultimately, we aim to develop and test the feasibility of a collaboration system involving information and communication technology.

In fact, this paper gives useful implication for constructing future research protocols, including the intervention of pharmacists, the timing and content of collaboration with other professionals, setting of objective evaluation indicators of intervention effect.

**Conflicts of Interest** We have no conflicts of interest to declare.

**REFERENCES**

1) Japan Pharmaceutical Association. “Chiiki yakkyoku ni yoru zaitaku fukuyaku shien (zaitaku iryo kyotaku ryoyo) ni okeru yakubutsu ryoho no koji to kanshu-ka no tame no chosa kenshu, Chapter 2.” <http://www.nihon-yakuyaku.or.jp/action/wp-content/uploads/2010/08/21zaitaku_sien2.pdf>, cited 29 March, 2017.
2) Nanaumi Y., Matoba S., Onda M., Tanaka R., Tsubota K., Mukai Y., Sakurai H., Hayase Y., Arakawa Y., Yakugaku Zasshi, **132**, 387–393 (2012).
3) Anrys P., Strauven G., Boland B., Dalleur O., Declercq A., Degryse J. M., De Lepeleire J., Henrard S., Lacour V., Simoens S., Speybroeck N., Vanhaeckt K., Spinewine A., Foulon V., *Implement. Sci*, **11**, 35 (2016).
4) Wouters H., Quik E. H., Boersma F., Ngyard P., Bosman J., Böttger W. M., Mulder H., Maring J. G., Wijma-Vos L., Beerden T., van Doormaal J., Postma M. J., Zuidema S. U., Taxis K., *BMJ Open*, **4**, e006082 (2014).
5) Smeets C. H., Smalbrugge M., Gerritsen D. L., Nelissen-Vrancken M. H., Wetzels R. B.,
van der Spek K., Zuidema S. U., Koopmans R. T., *BMC Psychiatry*, **13**, 280 (2013).

6) Mestres Gonzalvo C., de Wit H. A., van Oijen B. P., Hurkens K. P., Janknegt R., Schols J. M., Mulder W. J., Verhey F. R., Winkens B., van der Kuy P. M., *BMC Geriatr.*, **17**, 35 (2017).

7) Nazir A., Unroe K., Tegeler M., Khan B., Azar J., Boustani M., *J. Am. Med. Dir. Assoc.*, **14**, 471–478 (2013).

8) Doi N., Saito M., Sato A., Nakano T., *J. Jpn. Soc. Dement. Care*, **12**, 440–445 (2013).

9) Kawai Y., Miyazaki E., Onda S., *Aichi Prefetural J. Hosp. Pharm.*, **45**, 6–12 (2017).

10) Takahashi S., Moriyama H., Natsume T., Nakao M., Hiejima Y., *J. Jpn. Soc. Health Care Manag.*, **17**, 66–71 (2016).

11) Nakata H., *J. Kyoto Med. Assoc.*, **59** (1), 83–85 (2012).

12) Nakata H., *J. Kyoto Med. Assoc.*, **59** (2), 83–86 (2012).

13) The Japan Geriatrics Society, “Guidelines for Medical Treatment and Its Safety in the Elderly 2015,” Medical View Co., Ltd., Tokyo, 2015.

14) Kojima T., *Jpn. J. Geriatr.*, **53** 102–106 (2016).

15) Frankenthal D., Lerman Y., Kalendaryev E., Lerman Y., *J. Am. Geriatr. Soc.*, **62**, 1658–1665 (2014).

16) Milos V., Rekman E., Bondesson Å., Eriksson T., Jakobsson U., Westerlund T., Midlöv P., *Drugs Aging*, **30**, 235–246 (2013).

17) Gallagher P., Ryan C., Byrne S., Kennedy J., O’Mahony D., *Int. J. Clin. Pharmacol. Ther.*, **46**, 72–83 (2008).

18) Onda M., Imai H., Takada Y., Fujii S., Shono T., Nanaumi Y., *BMJ Open*, **5**, e007581 (2015).

19) Tanaka Y., Onda M., Nanaumi Y., Tanaka R., Tsubota K., Matoba S., Mukai Y., Arakawa Y., *Jpn. J. Drug Inform.*, **15**, 155–164 (2014).

20) The University of Tokyo. “Zaitaku iryo to kaigo no renkei no tame no johe system no kyotsu kiban no arikata ni kansuru chosa kenkyu hokoku-sho, March 2015.”: (http://www.iog.u-tokyo.ac.jp/wp-content/uploads/2015/04/01667f78127f3599de2c25a6906f782.pdf), cited 29 March, 2017.