Interventions at Hospital Discharge to Guide Caregivers in Medication Management for People Living with Dementia: a Systematic Review

Mouna J. Sawan, B.Pharm, Hons, PhD¹ ,

Damian Wennekers, Bachelor of science in Pharmacy (Bsc.)²,

Marissa Sakiris, B.Pharm, Hons¹, and Danijela Gnjidic, BSc (Hons) PhD MPH^{1,3}

¹School of Pharmacy School, Faculty of Medicine and Health, The University of Sydney, Camperdown, NSW, Australia; ²School of Pharmacy, Faculty of Science, University of Utrecht, Utrecht, The Netherlands; ³Charles Perkins Centre, The University of Sydney, Camperdown, NSW, Australia.

BACKGROUND: Hospital discharge has a significant impact on the continuity of care for people living with dementia. Clear guidance on medication management should be provided to caregivers of people living with dementia to ensure appropriate use of medications post-discharge.

AIM: Identify and appraise the impact of interventions at hospital discharge to guide caregivers in the medication management for people living with dementia.

METHOD: A systematic search of original studies was performed in Medline, Embase, PsycINFO, and CINAHL. Articles published in English that reported on interventions to guide caregivers in medication management for people living with dementia were included. Two authors independently reviewed titles and abstract. Full-text articles were assessed for eligibility and quality assessment was conducted by two authors.

RESULTS: A total of five studies were included with a range of interventions that were typically delivered post-discharge by a multidisciplinary team and most targeted administration of medications by caregivers. Overall, three types of discharge interventions were identified including a pre-discharge caregiver educational intervention, a post-discharge multidisciplinary team intervention, and discharge summary documentation intervention at transitions of care. Of these, a pre-discharge caregiver education led to shorter hospital stay (25 days vs. 31 days, $p = 0.005$). A post-discharge intervention that included follow-up visits resulted in lower use of high-risk medications (19% vs. 40%), and reduction in 30-day re-hospitalization rates (11% vs. 20%). In contrast, in another post-discharge intervention study, no difference in one-month re-hospitalization rates (8.4% vs. 8.0%, $p = 0.82$) was demonstrated. In another study, a post-discharge hospital educational program provided to caregivers led to significantly reduced caregiver burden (31.7 ± 17.6 (SD) pre-intervention to 27.7 ± 16.9 (SD) post-intervention ($p = 0.037$)).

DISCUSSION: Current findings suggest there is a need for well-designed interventions to guide caregivers in all aspects of medication management for people living with dementia, and should include support for caregivers in care coordination.

KEY WORDS: dementia; caregivers; hospitalization; discharge planning; transitions of care; medication safety.

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INTRODUCTION

Dementia is one of the major causes of disability among older adults worldwide.¹ People living with dementia place a high burden on acute care services due to frequent and longer hospitalizations compared to older adults without dementia.^{2,3} Hospital admissions caused by adverse drug events are three times higher in people living with dementia, compared with people without dementia, respectively, 14.0% and 4.2%.^{2,4} People living with dementia often have multi-morbidities and are frequently prescribed multiple medications, leading to an increased risk of preventable medication-related hospital admissions.^{3–5} The informal caregiver plays an important role in managing medications for a person with dementia, as they may conduct up to 10 medication management activities per day.^{6,7} The complexities of managing medications increase with the progression of their care recipient's dementia which also contributes to caregiver burden.⁸

Caregivers' role in medication management includes not only maintaining supply and assisting with the administration of medications but also communicating with health care providers and the person they care for.^{9,10} Medication management also includes staying informed about the prescribed medication, monitoring for medication-related harm, and making decisions about medications when the person living with dementia is no longer able to do this.¹¹ It is estimated that 54% of caregivers are actively involved in medication management of a person living with dementia, which is almost two times greater compared with caregivers of people with other diseases.^{12,13} In later stages of dementia, over 90% of caregivers are actively involved in medication management.^{12,13} Due to unique responsibilities of managing medications for a person living with dementia, it is important to provide caregivers with tailored medication management guidance at discharge.

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In 2016, the World Health Organization recognized the transition of care to be high-risk and endorsed a set of actions to ensure coordination and continuity of transitions of care between health care settings. One of these actions is to support and educate the person living with dementia and their caregiver to improve medication safety. The discharge process includes verifying patients' medication lists, ensuring patients understand what medications they are taking, how long and why, and communicating the discharge summary to the patient's primary care physician.¹⁴ Caregivers of people with dementia have described that the medication guidance provided at discharge is limited due to a lack of information and support.⁹ Therefore, the aim of our systematic review was to identify and appraise the impact of interventions at hospital discharge to guide caregivers in medication management for people living with dementia.

METHODS

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).¹⁵ The systematic review protocol was not registered.

Eligibility Criteria

Original quantitative and mixed methods studies which evaluated discharge interventions to guide caregivers in medication management for people living with dementia were included. Studies were included if they tested an intervention that provided medication guidance to caregivers at pre-discharge, post-discharge, or transitions of care interventions (bridging interventions). Intervention studies that aimed to improve the management of dementia were also included, if it was related to medication management guidance provided to caregivers of people living with dementia. Studies published in any year were included. Studies were excluded if they (i) were unrelated to discharge interventions to guide caregivers in medication management for people living with dementia; (ii) involved caregivers of people without a dementia diagnosis; (iii) were written in languages other than English; or (iv) were case reports, expert opinion, reviews, or abstracts.

Identification of Studies

Systematic searches for relevant articles were conducted in four electronic databases, namely Medline, Embase, PsychINFO, and CINAHL from inception until 17 January 2020. Medical Subject Headings and key words were chosen in collaboration with a reference librarian which were searched in a Boolean search strategy. The search strategy included four concepts: caregivers, dementia, hospitalization, and medication management (see Supplementary Appendix table S1). This key word search was employed across all four databases and when available, was supplemented with relevant thesaurus (MeSH or Emtree) terms.

Following the removal of duplicates, articles were initially screened according to title and abstract independently by two reviewers (MAS and DW). Subsequently, the remaining full-text articles were assessed for eligibility independently by two reviewers (MJS and DW). Articles searched through the reference list of full-text articles by two reviewers (MJS and DW) were also included. Where there was disagreement between reviewers, discrepancies were resolved by a third reviewer (DG).

Data Extraction and Analysis

Data extraction was performed independently by two investigators (MJS, DW) using a standardized data extraction tool. Data extracted included author, year, country, study design, participant characteristics, number of medications, type of discharge intervention, aspect of medication management targeted, component and description of the discharge intervention, provider, and key findings. We also extracted information on any medication, caregiver, and clinical study outcome reported, such as quality indicators for prescribing, caregiver burden, re-hospitalization, and length of hospital stay. For the purpose of this review, medication management was defined as steps underpinning medication management, and included the initiation, supply, administration, review, monitoring, and cessation of medications.¹⁶ The discharge intervention was defined according to the taxonomy developed by Hansen et al.¹⁷ to categorize discharge interventions. The categories are separated into three domains: pre-discharge, post-discharge, and transitions of care (bridging interventions). The categories are not mutually exclusive and were used as a guide for the systematic review.

Given the heterogeneity of the study designs and interventions in the included studies, a meta-analysis was not be feasible.

Quality Assessment

An assessment of quality was completed for all articles using the Mixed Methods Appraisal Tool (MMAT) as it can be applied to quantitative, qualitative, and mixed methods studies.^{18,19} Quality assessment was conducted by DW and MJS. Disagreements were resolved by a third reviewer (DG). Studies were not excluded based on quality.

RESULTS

Study Selection

A total of 12,632 articles were identified, with an additional article identified from screening reference lists. After removal of duplicates, 7397 articles were screened for eligibility based on title and abstracts (Fig. 1). The process resulted in 205 potentially relevant articles that were screened for full text. The aspect of medication management was not specified in two studies; however, these studies were included in the systematic review as caregivers were advised on medications

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flowchart depicting study exclusion and inclusion criteria.

during admission.^{20,21} A total of five articles met the inclusion criteria and were included in the systematic review.

Study Characteristics

The five included studies were from four countries: one in Australia,²² two in Japan,^{20,23} one in the USA,²⁴ and one in

France.²¹ Of the included studies, three were non-randomized controlled trials (RCT),^{20,23,24} one was a quasi-experimental before and after comparison study,²¹ and one used mixed methods (cross-sectional study and questionnaire administration).²² Most studies investigated interventions delivered post-discharge that were typically delivered by a multidisciplinary

Table 1 Characteristics of Included Studies ($n = 5$)

Authors (year), country	1. Study design 2. Participants (I = intervention; C = control) [‡] 3. Age, mean (SD)	1. Type of discharge intervention 2. Health professionals involved 3. Component and description of discharge intervention	Aspect of medication management	Outcomes measured*	Key findings
Boustani et al. (2011), USA ²⁴	1. Non-randomized controlled trial 2. I: 208 C: 1008 3. I: 73.8 (9.5) C: NR	1. Post-discharge 2. Geriatric team 3. Discharge planning, follow-up (face-to-face) visits, telephone and/or email, comprehensive assessment of caregiver's stress and the patient's behavioral and psychological condition; caregiver counselling; medication review and simplification of the patient's medical regimen	Administration (adherence), medication review	Hospitalizations. High-risk medication use. Diabetics: HgbA1c; LDL < 130; 30-day re-hospitalization rates	Compared to the control group, intervention group had lower use of high-risk medications (19% vs. 40%) and reduction in the proportion of patients hospitalized within 30 days of discharge (11% vs. 20%). Adherence not reported; however, the authors reported higher rates of disease state control for hyperlipidemia (45% vs. 23%) and diabetes (78% vs. 51%) compared to a control group
Kable et al. (2019), Australia ²²	1. Mixed methods study (cross-sectional study and surveys) 2. 73 patients 3. NR	1. Bridging intervention 2. NR 3. Discharge summary documentation provided to primary care physician and patients living with dementia and their caregivers	Medication administration, medication monitoring	A compliance score of the discharge information provided to patients and caregivers was calculated as the proportion of discharge information that complied with the requirements of the 11 expected criteria outlined in state-based guidelines. Re-hospitalization at 3 months	Missing items on the discharge summary documentation for the community physician included provision of medication dose-decision aids (53%), provision of contact information for patient support groups (6%), and advance care planning (9%). Over 80% included documentation about medication and significant medication changes. Missing items on the discharge summary documentation for the patient/caregiver included: 7-week supply of medications at discharge (67%), requests for medication dose-decision aids to be prepared by the community pharmacist (49%), signs and symptoms that require monitoring (56%), recommended home medication review by pharmacist (1%). Almost 90% of discharge summary documentation included instructions for routine medications. There was no evidence that re-hospitalization at 3 months decreased as the compliance score increased (OR 0.99, $p = 0.33$)
Kazui et al. (2004), Japan ²⁰	1. Non-randomized controlled trial 2. I: 23 C: 20 3. I: 72.7 (9.5) C: 77.6 (6)	1. Pre-discharge 2. Geriatric team 3. Caregiver education and discharge planning. The physician consulted with the caregiver and patient to explain treatment plan, patient's disease and symptoms, and appropriate treatment; the nurse advised the caregiver on strategies to manage BPSD; social worker explained care systems	NR	Survey to evaluate the general usefulness, advantages and disadvantages of using the intervention in patients with dementia. Length of hospital stay (days)	Over 80% of the caregivers in the intervention group were satisfied with the medical care provided. Most caregivers (71%) in the intervention group reported advice provided by the medical staff was easily understood. However, 22% of nurses and 39% of physicians reported that intervention increased amount of work. Compared to the control group, length of hospital stay was significantly shorter in the intervention group (25 days vs. 31 days, $p = 0.005$)
Terayama et al. (2018), Japan ²³	1. Non-randomized controlled trial 2. I: 47 C: 36 3. I: 65.3 (14.5) C: 62.7 (11.6)	1. Post-discharge 2. Geriatric team 3. Hospital caregiver education; 2 consecutive 1.5-h lectures per month explaining symptoms and progression of dementia, medication adherence, and	Medication administration (adherence)	Caregiver burden measured using the Zarit Caregiver Burden Interview (ZBI). Depression symptoms measured using Center for Epidemiologic	Caregiver burden significantly decreased in the intervention group; mean scores on the ZBI decreased from 31.7 ± 17.6 (SD) pre-intervention to 27.7 ± 16.9 (SD) post-intervention ($p = 0.037$). In the control group, mean score on the ZBI

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Table 1. (continued)

Authors (year), country	1. Study design 2. Participants (I = intervention; C = control) [†] 3. Age, mean (SD)	1. Type of discharge intervention 2. Health professionals involved 3. Component and description of discharge intervention	Aspect of medication management	Outcomes measured*	Key findings
		management of medical complications		Studies Depression Scale (CES-D). EuroQoL-5 Dimensions (EQ5D) was used to measure QoL of the caregiver	significantly increased from 24.9 ± 13 to 35.6 ± 16.1 ($p = 0.003$). In the intervention group, depressive symptoms significantly decreased; mean scores on the CES-D decreased from 14.5 ± 9.2 (SD) to 12.1 ± 7.5 (SD) ($p = 0.039$). The control group resulted in significant increase in symptoms of depression, 12.4 ± 7.3 pre-intervention to 16.0 ± 10 post-intervention, $p = 0.004$. No difference in QoL of caregivers and patients was reported
Villars et al. (2013), ²¹ France	1. Quasi-experimental before and after comparison 2. 390 patients 3. $81.79 (\pm 7.37)$	1. Post-discharge 2. Geriatric team 3. Caregiver support via discharge planning, timely follow-up, home visit, telephone call, caregiver hotline; discharge plan implemented in the first week after discharge and at 1, 3 and 6 months; telephone contact included (1) tailored advice on nonpharmacological and pharmacological management; (2) tailored advice on home supports. Medical consultation with consultant at 1 month after discharge and home visits	NR	Emergency room re-hospitalization rate at 1-month	No difference in 1-month emergency room re-hospitalization rates (8.4% vs. 8.0%, $p = 0.82$) when compared with re-hospitalization rates in the year prior to the intervention

RCT, randomized controlled trial; NR, not reported; NA, not applicable; BPSD, behavioral and psychological symptoms of dementia; ZBI, Zarit Caregiver Burden Interview; QoL, quality of life; *All included studies did not report on the number of medications; [†]in all included studies, the control group was usual care

team and targeted administration of medications by caregivers. Characteristics and summary of the key findings of the included studies are summarized in Table 1.

Four studies tested the impact of post-discharge interventions on patient or caregiver outcomes.^{20,21,23,24} The intervention components varied; one study tested only caregiver education²³ while the remaining studies tested two or more components including caregiver education,²⁰ discharge planning,^{20,21,24} follow-up visits,^{21,24} caregiver hotline,²¹ consultation with the geriatric team,^{20,21,24} counselling on caregiving skills,²⁴ and medication review.²⁴ One study used mixed methods to evaluate the content of a transitions of care intervention (caregiver instructions/information via discharge documentation).²²

Pre-discharge Interventions. Kazui et al.²⁰ tested a pre-discharge intervention which included two components: caregiver education and discharge planning. The intervention group targeted patients with dementia and their caregivers. A multidisciplinary intervention was delivered to caregivers

during admission, where the nurse engaged with the patient to discuss strategies for management of behavioral and psychological symptoms of dementia (BPSD). Also, a meeting was held with the caregiver and physician to explain the treatment plan, patient's disease, and appropriate treatment.²⁰ Caregivers were surveyed, and 71% reported that they understood the advice provided during hospitalization. The duration of hospital stay was shorter in the intervention group (25 days vs. 31 days, $p = 0.005$) compared to the control though, 22% of nurses and 39% of physicians reported that the intervention increased the amount of work.

Post-discharge Interventions. Three studies evaluated post-discharge interventions which had a number of components including caregiver education, caregiver support, follow-up (face-to-face) visits, home visits, telephone call/email, caregiver hot-line, and medication review.^{21,23,24} Only two studies tested a post-discharge intervention that had more than one component.^{21,24} Boustani et al.²⁴ non-randomly assigned 208

patients living with dementia and their caregivers to a post-discharge program which involved follow-up (face-to-face) visits, telephone, and/or email and medication review. The goal of the intervention was to provide supportive management strategies based on assessment of caregiver stress and the patient's behavioral and psychological condition. The intervention was delivered by a geriatric team and included medication review for appropriateness and simplification of the patient's medical regimen. The intervention resulted in lower use of high-risk medications (19% vs. 40%) and reduction in 30-day re-hospitalization rates (11% vs. 20%).

Villars et al.²¹ examined a multi-component post-discharge intervention (timely follow-up, home visit, telephone call, caregiver hotline) led by a geriatric team in patients with Alzheimer's disease ($n = 390$) and their caregivers. The discharge plan was implemented among patients who had been discharged from a special Alzheimer's acute care unit using telephone contact between geriatric team and the caregiver in the first week after discharge, before the end of the first month and at three and six months. There was no difference in one-month emergency room re-hospitalization rates (8.4% vs. 8.0%, $p = 0.82$) when compared with re-hospitalization rates in the year prior to the intervention.

Terayama et al.²³ evaluated a hospital education program provided to caregivers of outpatients living with dementia ($n = 47$). The education program involved two 1.5-h lectures delivered by physicians, nurses, and social workers over two months, with the initial session addressing medication adherence and management of medical complications. The intervention resulted in significant reduction of caregiver burden; mean scores on the Zarit Caregiver Burden decreased from 31.7 ± 17.6 (SD) pre-intervention to 27.7 ± 16.9 (SD) post-intervention ($p = 0.037$). In addition, caregiver depressive symptoms decreased significantly; mean scores on the Center for Epidemiologic Studies Depression Scale (CES-D) decreased from 14.5 ± 9.2 (SD) pre-intervention to 12.1 ± 7.5 post-intervention ($p = 0.039$). No significant changes in quality of life of caregivers and patients were reported.

Transitions of Care Interventions. Kable et al.²² conducted a mixed methods study which audited medical discharge summaries provided to the primary care physician and caregiver ($n = 73$). The study found that out of the 73 eligible discharges, over 80% included documentation about medication and significant medication changes, and almost 90% included documentation about instructions for routine medications. A compliance score of the discharge information provided to patients and caregivers was calculated as the proportion of discharge information that complied with the requirements of the 11 expected criteria outlined in state-based guidelines. The study found no evidence that re-hospitalization decreased as the compliance score increased (OR 0.99, $p = 0.33$). The study had no information about the readability of the discharge summary provided caregivers.

Quality Appraisal

Table 2 shows the methodological quality of each of the included studies. One out of the four non-randomized studies were assessed as having high quality. The remaining studies were judged as having unclear quality.

DISCUSSION

The systematic review highlights that there is limited research on interventions at hospital discharge to guide caregivers in medication management for people living with dementia. Interventions were typically delivered post-discharge by a multidisciplinary team and most targeted administration of medications by caregivers. Of these, two studies reported that discharge interventions had no statistically significant effect on re-hospitalization rates.^{21,22} However, in another study, which employed a multi-component post-discharge intervention, reduction in the proportion of patients hospitalized within 30 days of discharge was reported.²⁴ Furthermore, discharge interventions had led to significant reduction in length of stay and caregiver burden.^{23,24} No study addressed all aspects of medication management, and outcomes reported in the included studies were heterogeneous.

In this review, two studies tested interventions that extended beyond in-patient care and included multiple components. However, of these, only one reported reduction in 30-day re-hospitalization rates.²⁴ This was the only study to include medication review component that involved simplification of the patient's medical regimen and targeted medication appropriateness. Studies suggest that 19% of older adults have a medication-related adverse event immediately after hospital discharge, of which 35% are deemed to be preventable.²⁵ Factors contributing to adverse outcomes include complexities in medication management as well as polypharmacy and inappropriate medication use which contribute to caregiver burden.²⁶ Comprehensive medication reviews have been shown to successfully reduce inappropriate medication use and improve caregiver understanding in medication management.^{27,28} Pharmacists conducting post-discharge medication review in collaboration with the primary care physician was reported to reduce medication-related problems among older adults.²⁹ Therefore, further work should identify opportunities for incorporating post-discharge comprehensive medication reviews in multi-disciplinary interventions that extend beyond in-patient care to facilitate caregiver management of medications in people with dementia at discharge.

Hospital discharge has been reported to be a vulnerable stage in the patient pathway, and communication failures across transitions of care contribute to preventable medication-related problems.^{25,30–32} Two out of the five studies tested discharge interventions that involved communication with the primary care physician.^{22,24} The discharge summary documentation had no effect on outcomes,²² while the multidisciplinary team intervention involving collaboration with the primary care

Table 2 Quality Assessment¹⁹

(In alphabetical order): Author, year, reference	3. Quantitative non-randomized					5. Mixed methods				
	3.1	3.2	3.3	3.4	3.5	5.1	5.2	5.3	5.4	5.5
Boustani et al., 2011 ²⁴	No	No	Can't tell	No	Yes	No	Yes	No	No	Can't tell
Kable et al., 2019 ²²	No	No	Yes	Yes	Yes					
Kazui et al., 2004 ²⁰	No	Yes	Yes	Yes	Yes					
Terayama et al., 2018 ²³	No	Yes	Yes	No	Yes					
Villars et al., 2013 ²¹	No	Yes	Yes	No	Yes					

physician to discuss medications showed reduction in the proportion of patients re-hospitalized within 30 days of discharge.²⁴ Barriers to effective coordination at transitions of care include incomplete, unclear content and instructions in discharge summaries.³³ To address the challenge of care transitions for patients and their caregivers, interventions to support effective communication and team-work across transitions of care are important.^{34–36}

Most interventions included in this review targeted administration of medications by caregivers.^{22–24} While studies have shown that 50 to 70% of caregivers assist with medication administration in people living with dementia, caregivers are also engaged in other aspects of medication management.^{12,37,38} These include medication supply, monitoring, and avoiding medication-related harm (making judgement regarding when to decrease or discontinue treatment) as well as communicating with the physician about medications that require review.^{12,37} Caregivers of individuals with dementia have reported that useful interventions to optimize medication management include establishing medication routines, using dose administration aids, and simplifying medication regimens.⁹ However, studies report caregivers of people living with dementia receive limited information at discharge to support them in their medication management roles.^{32,39} The caregiver of an individual with dementia also plays an important role in actively assist with care coordination and communicate with primary care physician.⁴⁰ Therefore, discharge interventions that aim to provide specific guidance to caregivers in all aspects of medication management for people living with dementia and support caregivers in care coordination are needed.

The outcomes measured in the included studies ranged widely. Limited studies assessed clinical outcomes including re-hospitalization ($n = 3$), and most found no significant impact on outcomes assessed. With respect to outcomes reported, quality indicators for medication use were only reported by one study which found lower use of high-risk medications.²⁴ Other indicators, such as medication-related harm, difference in inappropriate medications, and adherence, were also not captured. Interestingly, only one study reported caregiver outcomes, the effect of interventions on caregiver burden and strain.²³ Caregivers are reported to experience significant burden in medication management at transition from the hospital to the home.^{32,41} There is a need for future studies to

select appropriate and clinically meaningful measures reporting on medication management measures and patient and caregiver health outcomes.

A comprehensive search strategy was employed across five databases and further searching of reference list, and two authors screened studies by title and abstract, as well as screened full-text studies to determine eligible studies. However, there are several limitations to this review. We only included studies published in English; thus, we may have missed other studies of relevance to international patient populations. This review identified the lack of interventions tested in a clinical trial setting, and most studies reported no effect on patient and caregiver outcomes. Due to heterogeneity of the interventions and outcomes of the included studies, the results were summarized descriptively. Most of the included studies have methodological limitations. In addition, the results of this review were limited to a small number of studies and locations, restricting the generalizability of our findings. Therefore, research is needed to investigate the impact of discharge interventions to guide caregivers in medication management for people living with dementia.

In conclusion, this systematic review illustrates that the evidence on discharge interventions to guide caregivers in medication management for people living with dementia is limited. Multi-disciplinary interventions that extend beyond in-patient care, effective communication to achieve coordination at transitions of care, and specific guidance to caregivers on all aspects of medication management are characteristics that are key to intervention design. Interventions that guide caregivers in all aspects of medication management for people living with dementia and include support for caregivers in care coordination are needed. Measurement of patient and caregiver-centered outcomes, including quality indicators for medication use, are a step forward to expand research in this field.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11606-020-06442-5>.

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Corresponding Author: Mouna J. Sawan, B.Pharm, Hons, PhD; School of Pharmacy School, Faculty of Medicine and Health, The University of Sydney, Camperdown, NSW, Australia (e-mail: mouna.sawan@sydney.edu.au).

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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