THE ROLE OF THE NURSE PRACTITIONER IN PROMOTING A REDUCTION IN THE CAUSES AND OUTCOMES OF PROBLEMATIC POLYPHARMACY AMONG NURSING HOME RESIDENTS IN BRITISH COLUMBIA

by

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Abstract

Problematic polypharmacy is an ongoing issue for older adults throughout Canada, and specifically among nursing home residents (Maher, Hanion, & Hajjar, 2013). Despite interventions that are currently in place in British Columbia (BC) to reduce the causes and outcomes of this issue, problematic polypharmacy continues to pose a risk for residents among BC nursing homes. This integrative review asks how nurse practitioners (NPs) can best promote a reduction in the causes and outcomes of problematic polypharmacy among residents in BC nursing homes.

The background information of this project outlines the concept of problematic polypharmacy and the prevalence of contributing factors and outcomes. Nursing home demographics are also highlighted to demonstrate the risk this population faces to the causes and outcomes of problematic polypharmacy, and the subsequent effect this issue has on the health care system. Furthermore, the background provides an overview of the concept role overlap which exists between health care professionals in order to demonstrate how multiple health care professionals may share roles or parts of roles in reducing the causes and outcomes of problematic polypharmacy. Barriers faced by staff are also examined.

Through a comprehensive review of the literature and critical appraisal, nine articles are found to address the research question. Key interventions that specifically demonstrate effectiveness in reducing causes and outcomes of problematic polypharmacy in the context of nursing homes emerged. These interventions are put forth as recommendations for NP practice and include: medication reviews while screening for inappropriate medications by using the Beers Criteria, computerized clinical decision support systems (CCDSS), and the Cockcroft Gault Score; assessing functional status for changes to assure instances of problematic

polypharmacy are not missed by using the Minimum Data Set – Activity of Daily Living (MDS-ADL) scale; education targeted for all staff members to detect, prevent, and manage problematic polypharmacy; multidisciplinary team meetings to facilitate a collaborative approach in reducing problematic polypharmacy and case conferences to provide resident-centered care.

An important finding is that most interventions require participation from two or more health professionals, highlighting the concept of role overlap and the necessity of a multidisciplinary approach. In light of NP practice, this provides insight surrounding how NPs can influence and encourage other staff members to sustain their roles and overcome barriers for an ultimate reduction in the causes and outcomes of problematic polypharmacy with implications for practice, policy, education, and research.

Key words: polypharmacy, problematic polypharmacy, inappropriate medication, inappropriate prescribing, medication management, nursing home, long term care, intervention, nurse practitioner

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Glossary

Adverse drug reaction
"Adverse reactions are undesirable effects to [drugs] … drugs include both prescription and non-prescription pharmaceuticals."

(Health Canada, 2012, para 1)

Collaboration
"Multiple health workers from different professional backgrounds provide comprehensive services by working with patients, their families, caregivers and communities to deliver the highest quality of care across settings."

(World Health Organization [WHO], 2010, p. 13).

Drug-Related Problems
Drug-related problems can be described by seven different categories including unnecessary drug therapy, wrong drug, dose too low, dose too high, adverse drug reactions, inappropriate adherence, and need for additional drug therapy.

(Cipolle, Strand, & Morley, 2012)

Frail elderly
"Health state associated with getting older; involving multiple serious health issues that increase an individual's vulnerability for extended acute care or end-of-life care … usually associate with noticeable losses in person's physical, mental or social function."

(Canadian Frailty Network, 2013, para. 1)

General Physician
"Provide broad care and medical attention to individuals and families and refer patients to specialist physicians when needed."

(Province of British Columbia [PBC] 2016a, para. 2)

Geriatric syndromes
"[Term] used to capture those clinical conditions in older persons that do not fit into discrete disease categories. Many of the most common conditions cared for by geriatricians, including delirium, falls, frailty, dizziness, syncope, and urinary incontinence, are classified as geriatric syndromes."

(Inouye, Studenski, Tinetti, Kuchel, 2007)

Health Authority
"The Ministry of Health works together with a provincial health authority [delivers provincial programs and specialized services], five regional health authorities [plan and deliver care within their geographical areas], and a First Nations health authority [aims to improve health outcomes for First Nations people in BC] to provide high quality, appropriate and timely health services."

(PBC, 2016b, para. 1)

Interdisciplinary
"Coordinated and coherent linkages between disciplines resulting in reciprocal interactions that overlap disciplinary boundaries, generating new common methods, knowledge, or perspectives."
(Newhouse & Spring, 2010, p. 2)

Medication Management
"Patient-centered care to optimize safe, effective and appropriate drug therapy."
(Institute for Safe Medication Practices Canada, 2016)

Multidisciplinary
"The basic efforts of multiple disciplines working together to solve a problem without challenging disciplinary boundaries."
(Newhouse & Spring, 2010, p. 2)

Nursing Home
"A facility with a domestic-styled environment that provides 24-hour functional support and care for persons who require assistance with activities of daily living and who often have complex health needs and increased vulnerability"
(Sanford et al., 2015, p. 183)

Older Adult
"Most developed world countries have accepted the chronological age of 65 year as a definition of 'elderly' or older person/[older adult]."
(WHO, 2016, para. 1)

Potentially Inappropriate Medications
"Prescriptions in which risks outweigh benefits."
(Rancourt et al., 2004, p. 2)

CHAPTER 1

Introduction

Problematic polypharmacy is a growing issue among Canadian older adults. This issue is particularly a concern among older adults residing within nursing homes (Maher, Hanion, & Hajjar, 2013). The concept of problematic polypharmacy is multifaceted and is discussed in detail in the background, along with its causes and outcomes. There is a need to address this issue as it is linked to detrimental effects for nursing home residents, including increased mortality (Gill et al., 2007; Liperoti et al., 2009; Musicco et al., 2011).

Health care professionals who work within nursing homes, such as nurses, health care assistants (HCA), NPs, physicians, and pharmacists, have roles to address and reduce the causes and outcomes of problematic polypharmacy. Interventions that address these concerns are available for use within a multitude of contexts. However, within some nursing homes, including facilities in BC, staff face barriers that impede the optimal integration of interventions. For example, funding (McGrail, McGregor, Cohen, Tate, & Ronald, 2007), co-location (Divisions of Family Practice [DOFP], 2016), and time constraints (Murphy, 2006; Singh, 2016) are some factors that pose a barrier for health care professionals to prioritize their focus on implementing interventions to reduce the causes and outcomes of problematic polypharmacy.

This integrative review focuses on reviewing interventions implemented in the context of nursing homes to answer the research question: how can NPs best promote a reduction in the causes and outcomes of problematic polypharmacy among BC nursing home residents? The Methods chapter describes the approach taken to gather literature to inform the research question, and the findings include critical analyses of literature meeting the inclusion and exclusion criteria. The goal of this integrative review is to reveal evidence-based implications for

NP practice to reduce the causes and outcomes of problematic polypharmacy in a way that considers the complexity of resident care needs, and barriers faced by staff, as well as implications for policy, education, and research.

CHAPTER 2

Background

To gain perspective surrounding the complexity of problematic polypharmacy, and to acknowledge when it is in effect, the causes and outcomes of this issue are put forth. Nursing home demographics are also shared to address why there is an increasing likelihood of problematic polypharmacy within this context. Furthermore, an overview of health care professionals' roles within nursing homes is warranted to ascertain their individual functions with medications prescribed, such as assessing residents, dispensing medications, and monitoring for side effects. Clarifying these responsibilities may allow targeting interventions among health care professionals appropriately. This process also provides clarity in how NPs may address problematic polypharmacy both independently and through ensuring how interventions that are best implemented by other health care professionals can be sustained.

Concept of Problematic Polypharmacy

The overall concept of polypharmacy is often interpreted in a negative light, though this is a misconception. Polypharmacy is described as the use of multiple medications (Duerden, Avery, Payne, 2013). A numerical threshold to define this concept is controversial due to the wide range in number of medications said to define polypharmacy. For example, definitions can range from between three medications to 10 or more medications (Hajjar, Cafiero, Hanlon, 2007). Given this variance, it is less accurate to describe polypharmacy in this manner; however, there is still a place to consider the quantity of medications within a regimen. For instance, an increasing amount of medications could subject residents to a greater likelihood of drug-to-drug interactions and adverse effects. Thus, researchers most often examine the effects of an

intervention on reducing polypharmacy, referring to the number of medications, as a specific outcome measure.

A way in which polypharmacy can be identified more accurately is by determining if it is either appropriate or problematic. These instances can be further identified by causes and outcomes. Causes of problematic polypharmacy include, but are not limited to when: interactions between medications are missed; unsafe medications are inappropriately prescribed; the resident's choice is overlooked (Duerden et al., 2013). Causes of problematic polypharmacy also includes polypharmacy that increases the likelihood of drug-to-drug interactions. Outcomes that indicate medications are problematic include, but are not limited to when: medications cause adverse effects; medications do not reach their postulated benefit; the harm of medications outweighs the benefit (Duerden et al., 2013). Given the factors that are causes and outcomes of problematic polypharmacy, there are various terms within the literature that refer to this issue. Examples of these terms include inappropriate medications, potentially inappropriate medications, inappropriate prescriptions, polypharmacy, drug-related problems, and adverse drug reactions. Reductions in these terms are often sought as effective outcome measures in research studies. For the purpose of this paper, problematic polypharmacy can be considered an over-arching term referring to the causes and outcomes listed above.

Appropriate polypharmacy can be described as when the "use of medications has been optimised, [medications] are prescribed according to best evidence, can extend life expectancy, and improve a patient's quality of life" (Wise, 2013, p. 1). Given the definition of appropriate polypharmacy, there are also various terms within the literature that are used to address problematic polypharmacy, such as optimizing prescribing, and medication management. Reducing problematic polypharmacy helps promote and can result in appropriate polypharmacy.

To better understand why those residing within nursing homes are particularly at risk for problematic polypharmacy, I now turn to examine nursing home demographics. Factors that impact the complexity and unique needs of residents helps highlight why problematic polypharmacy in this population is an important issue requiring sustained attention from NPs.

Nursing Home Population Demographics

As of July, 2015, nearly one in six Canadians (16.1%) is 65 years or older (Statistics Canada, 2015). The growth rate of this cohort is 3.5%, which is approximately four times the growth rate of the total population (Statistics Canada, 2015). This trend is expected to continue to rise, as the baby boom population continues to age (Statistics Canada, 2015). By July 2, 2024, those 65 years and above are expected to reach 20.1% of the population (Statistics Canada, 2015).

With aging, the probability of comorbid disease is likely to increase. For instance, in 2012, 85% of older adults between the ages of 65 to 79 years, and 90% of older adults aged over 80 years, reported having at least one chronic condition (Canadian Institute for Health Research [CIHR], 2013). Approximately 24% of all older adults reported having three or more chronic diseases (CIHR, 2013). Increasing comorbidity with aging subjects this population to greater risk of being prescribed multiple medications and inappropriate medications over the years, and this contributes to the likelihood of problematic polypharmacy (Nobili, Garattini, & Mannucci, 2011). Furthermore, older adults are particularly at risk for problematic polypharmacy as the use of multiple medications may have a different impact on them compared to younger cohorts. For example, physiological changes which come with aging vary among individuals and can have different impacts upon drug metabolism (Heppner et al., 2012). Also, many medications have not been adequately studied among older adults, as older adults are often excluded from clinical

trials (Zulman et al., 2011), subjecting this population to potential adverse effects that are not seen in the general population.

Aging and comorbidity are two main factors patients have to contend with. Older and sicker patients may move to nursing homes due to a loss of independence and for increased and ongoing support (Statistics Canada, 2011). Common problems affecting nursing home residents, which may also be factors that cause older adults to relocate to nursing homes for ongoing support services, include dementia, musculoskeletal conditions such as fractures and missing limbs, urinary and bowel incontinence, diabetes, chronic lung or heart conditions, chronic pain, and cancer diagnoses (Canadian Institute for Health Information [CIHI], 2013).

Older adults account for the majority of nursing home residents, which may increase the likelihood of comorbidity in this context. For example, in 2011 a total of 352,205 (7.1%) of Canadians over the age of 65 lived in a nursing homes, and of the 7.1%, a total of 30% were above the age of 85 (Statistics Canada, 2011). Increased age and comorbidity necessitate recognition as they also suggest an increased likelihood of problematic polypharmacy within nursing homes. Thus, next I turn to examine the prevalence of this issue in the context of nursing homes.

Prevalence of Problematic Polypharmacy

Available research surrounding the prevalence of problematic polypharmacy usually focuses on the quantity of medications residents take. For instance, Ramage-Morin (2009) found that more than half of nursing home residents were taking more than five medications per day, which may be a higher value compared to other contexts given aging and comorbidity among this population.

Referring to problematic polypharmacy solely based on the quantity of medications, for which the number varies throughout the literature, may inaccurately represent this issue, and create difficulty in determining a reduction in outcome measures. Problematic polypharmacy may also be bigger than is currently understood, as causes other than quantity, and outcomes of problematic polypharmacy are overlooked. Finally, basing the prevalence of problematic polypharmacy solely on the quantity of medications may not be appropriate among nursing home residents who are more likely to have multiple comorbidities requiring multiple medications compared to a younger population.

There are some known data surrounding factors that are concrete causes and outcomes of problematic polypharmacy, which provides more accurate insight surrounding the prevalence of this issue. For instance, some medications have been studied among older adults and are found to be unsafe as they cause adverse effects. However, these inappropriate or potentially inappropriate medications continue to be commonly prescribed. Examples of these medications include antipsychotics, benzodiazepines, tricyclic antidepressants, and anticholinergics. (Campanelli, 2012).

Focusing on antipsychotics, Health Canada (2013) issued a warning in 2005 advising about the risks of antipsychotic use among older adults with dementia, especially atypical antipsychotics (Liperoti et al., 2009). Studies of older adults taking these medications demonstrated links to increased mortality (Gill et al., 2007; Liperoti et al., 2009; Musicco et al., 2011). The National Institute of Mental Health (2015) advised that antipsychotic use among older adults may also lead to stroke, fractures, kidney injury, as well as increased risk of mortality.

In light of these warnings, the Ministry of Health (MOH, 2011) examined the use of antipsychotics among older adults throughout BC nursing homes from April 2010 to June 2011. They used family and stakeholder consultations, as well as PharmaNet (MOH, 2011), a patient medication profile database used widely in BC (Government of BC, 2016). The data put forth by the MOH (2011) indicated that 50.3% of nursing home residents in BC were prescribed an antipsychotic. However, information surrounding how long each medication was used, and the condition for which the medication was prescribed, was not provided. This information is required in order to decipher whether there was a rational and well-informed indication to the use of antipsychotics, or if these instances were truly problematic.

CIHI (2013) collected data pertaining to antipsychotic use through 2011 to 2012 from nursing homes across Canada, and found an average of 32% of residents were receiving antipsychotic medications in the absence of a mental health condition, such as schizophrenia. Upon investigating reasons for antipsychotic use, a CIHI (2009) review found that the majority of antipsychotic use among older adults was used to treat behavioural and psychological symptoms of dementia. Antipsychotics were prescribed to attempt to manage symptoms of delusions, aggression, and agitation (CIHI, 2009), despite a lack of support for these indications.

The use of medications for the indications listed above are clear examples of problematic polypharmacy and its prevalence. It is more accurate to target a reduction in comprehensive causes and outcomes of problematic polypharmacy to guide outcome measures, rather than referring to the quantity of medications that varies within the literature. Timely inquiry into how these causes and outcomes can be best reduced in nursing homes is necessary. For further rationale surrounding the necessity of ongoing recognition and intervention for this issue, consider the next section which discusses consequences of problematic polypharmacy.

Consequences of Problematic Polypharmacy

Problematic polypharmacy is directly linked to adverse resident outcomes. For example, the relationship between problematic polypharmacy and falls is explicitly related to medications that influence balance or alertness (Hammond & Wilson, 2013). Residents are already at greater risk for falls due to mobility issues, advanced dementia, and other comorbidity (Public Health Agency of Canada [PHAC], 2014). Research suggests that falls in general have been the direct cause of 95% of all hip fractures (PHAC, 2014). Unfortunately, after falling and sustaining a hip fracture, survival and functional outcomes is poor for nursing home residents (Neuman et al., 2014). As problematic polypharmacy may cause falls, and falls lead to fractures, which potentially result in death, it is crucial to reduce falls by preventing problematic polypharmacy. Adverse resident outcomes caused by problematic polypharamacy also increase the use of emergency departments and resulting hospitalizations (McGregor et al., 2014). These consequences are preventable and can be reduced with ongoing and persistent interventions that address problematic polypharmacy among nursing home residents.

Not only has problematic polypharmacy had a direct negative impact on residents, but it also contributes to high costs within the health care system. Prescription medications are a significant portion of Canada's health care expenses, as it was forecasted to reach $33.0 billion dollars in 2012 (CIHI, 2012a), coming second after hospital usage (CIHI, 2012b). Furthermore, a study conducted by Morgan et al. (2016) aimed to quantify the cost and frequency of inappropriate prescribing among older adults in Canada, and found that $419 million dollars were spent in 2013 alone. Considering a large portion of funding spent on medications is inappropriate and unwarranted, considerable savings and improved resident outcomes could be seen with appropriate intervention.

Next, an overview of the organization of nursing homes is put forth. This is to provide insight as to how implementing interventions to reduce the causes and outcomes of problematic polypharmacy can be understood in this context.

Nursing Home Organization

In BC, nursing homes are owned and operated by either for-profit or not-for-profit agencies. Not-for-profit care is delivered by religious, cultural, other community-based societies, regional health authorities, or by publicly owned acute care hospitals (McGregor et al., 2005). For-profit care is delivered by sole operators or by management groups that are part of larger business entities (McGregor et al., 2005). For the purpose of this integrative review, how problematic polypharmacy can be best reduced will be considered among both organizational models. Interventions can be applied regardless of the organizational model, as both models employ the same health care professionals. However, both models face varying degrees of challenges that impede the optimal implementation of interventions to reduce the causes and outcomes of problematic polypharmacy.

Both for-profit and not-for-profit facilities are allotted the same amount of public funds per resident for care requirements (McGrail et al., 2007). However, there is no legislated minimal requirements for staffing in nursing homes (McGrail et al., 2007), thus how funds are allocated can be dependent on the organizational model. For example, in BC not-for-profit facilities provide more hours of direct resident care by health care professionals than for-profit facilities (McGregor et al., 2005). Less resident care hours within for-profit facilities may reflect a situation of understaffing in these facilities, in order to divert some funding to profit (McGrail et al., 2007).

Not-for-profit facilities in BC also demonstrate lower hospital transfer rates (McGregor et al., 2014). Lower hospital transfer rates may be facilitated in not-for-profit facilities by providing more time on direct resident care (McGregor et al., 2005), and connections and collaboration with acute care hospitals and health authorities (McGrail et al., 2007). This allows not-for-profit facilities to benefit from these affiliations through greater access to specialized professionals, who are able to develop and implement care policies (McGrail et al., 2007).

Overall, these factors highlight how understaffing and subsequent reduced time spent on resident care may negatively impact residents. For instance, interventions include appropriate follow-up and discussions with residents to assess the effects of medications. Follow-up is less likely in understaffed facilities where insufficient time may be a barrier in appropriately implementing time-sensitive interventions

Regardless of the funding model, nursing home residents are cared for by multiple health care professionals who spend varying amounts of time with residents. Although the main focus of this review is NPs, as residents are cared for a multitude of health care professionals, deciphering the roles of how they each influence decisions about medications prescribed is warranted. This provides clarity in how NPs may address problematic polypharmacy partly through ensuring interventions best implemented by other health care professionals are sustained. Thus, this integrative review also focuses on the roles of HCAs, registered nurses (RN), licensed practical nurses (LPN), pharmacists, and physicians.

Health Care Professional Roles & Barriers

It is important to discuss role overlap between health care professionals to provide clarity surrounding how and why more than one particular professional may influence similar decisions surrounding medications prescribed, such as prescribing medications, and monitoring for adverse

effects. For the purpose of this integrative review NP roles are explored alongside physician roles as their roles are more comparable and influence medication use alike.

In BC, there are 26 health care professionals covered under the Health Professions Act (HPA), including physicians, NPs, RNs, LPNs, pharmacists (PBC, 2016c), and excluding HCAs. Within the HPA, health care professionals are not bound by exclusive scopes of practice, but are rather subject to controlled and uncontrolled acts (Baranek, 2005). Controlled acts are performed by health care professionals who are designated to these acts by law, and more than one profession can be authorized to perform the same, or parts of the same controlled acts (Baranek, 2005). Uncontrolled acts are under the public domain and may be performed by anyone (Baranek, 2005).

The variability in who may perform acts allows for greater flexibility as to which health care professional delivers health care services. This in turn allows for a measure of cost-savings seen with staffing choices (CIHI, 2012b), which may also help explain staffing choices in some nursing homes. The organization of the HPA also allows for advances in health professions' scopes of practice, in order to meet changing population health needs (Nelson et al., 2014), decreasing wait times, while increasing access to care across Canada (Royal College of Physicians and Surgeons of Canada, 2013).

In nursing homes, RNs, LPNs, and HCAs spend the most direct time with residents. While they are each required to uphold many competencies to adequately care for nursing home residents, I will focus on those related to the causes and outcomes of problematic polypharmacy. In comparing nursing, including RNs and LPNs, roles to HCA roles related to medication use, it is apparent that there is role overlap. For instance, they are all responsible for maintaining the physical and psychological health of residents, and a safe environment, such that the use of

physical and chemical restraints can be minimized, and rather nonpharmacological approaches are promoted to manage behavioural symptoms (Acker et al., 2014; Canadian Gerontological Nursing Association [CGNA], 2010. They are all also responsible for recognizing changes in health status and communicating these promptly to the team, including family members (Acker et al., 2014; CGNA, 2010). These competencies demonstrate where nurses and HCAs both play a part in the process of reducing the causes and outcomes of problematic polypharmacy at the front-line. Nurses and HCAs are present to detect changes with resident behaviour and alertness, while minimizing the use of optional inappropriate medications, such as antipsychotics.

Nurses have additional education and subsequently additional competencies that influence medications prescribed. These include specialized assessment skills, such as conducting risk assessments, including falls risks, to prevent adverse effects that can be related to problematic polypharmacy (CGNA, 2010). Nurses are responsible for administering medications that also require resident assessments and clinical reasoning before administrating (College of Registered Nurses of British Columbia [CRNBC], 2016a). However, it is important to note that some nurses are found to lack knowledge surrounding medication management and adverse drug reactions (Lim, Chiu, Dohrmann, & Tan, 2010).

Despite nurses who have a broader range of roles, and specialized roles that impact medication use and other care requirements for residents, HCAs have had increased contact time with residents compared to nurses over the years (Hospital Employees Union [HEU], 2009). This is made feasible due to role overlap related to direct resident care where agencies and management groups are able to cut costs by staffing more HCAs over nurses. However, HCAs have not received the same degree of educational preparedness as nurses. A lack of consideration of educational preparedness by agencies and management groups can lead to errors with the mix

of staff and nurse-to-resident ratios (Baranek, 2005). This can result with clinical errors and adverse resident outcomes (Baranek, 2005).

Errors with staff mix in terms of nurse-to-resident ratios are further complicated by current staffing recommendations put forth by the British Columbia Nurses Union, the voice for BC RNs and LPNs (BCNU, 2015). Within nursing homes, BCNU (2015) suggests only one full-time RN supervisor is required on site at all times. For facilities with 100 beds or more, only one RN assistant director of nursing, and only one full-time RN director of in-service education are mandatory (BCNU, 2015). Additionally, only one regulated nurse such as a RN, LPN, and/or an HCA is required for every 25 residents (BCNU, 2015). These recommendations advocate for nurses to move away from bedside care, and rather be occupied in supervisory and leadership roles within nursing homes.

Inadequate staffing and current staffing recommendations are increasingly problematic within nursing homes, making many BC nursing homes below provincial guidelines for resident care hours (Office of the Seniors Advocate, 2016), which subjects residents to poor outcomes (Clarke & Donaldson, 2008). Staffing fewer nurses, and solely staffing nurses in a supervisory role, may subject nurses to feelings of increasing liability, less support, decreased job satisfaction (Berry, 2012), suboptimal quality of care measures, and adverse resident outcomes (Murphy, 2006). A supervisory role takes nurses away from specialized bedside assessments, and informed medication administration. This may be further complicated by time constraints experienced by HCAs. For example, there is also a degree of inadequate HCA staffing (HEU, 2009), that may impede their careful assessment of residents, and communication of their findings with the team to inform medication use. Essentially, the staffing choices add constraints for the team from

direct-care staff, to supervisory staff, and residents pay the ultimate price with less-informed medications administration and suboptimal follow-up for monitoring.

Given the issues raised above, consider how a reduction in problematic polypharmacy may be difficult to achieve among residents with dementia, which is a common diagnosis in nursing homes (CIHI, 2013). Dementia requires well-planned approaches to care, in order to avoid relying on inappropriate medications for behavioural management, which some facilities rely upon (MOH, 2011; CIHI, 2013). The Alzheimer's Association (2009) states many elements are required for effective dementia care, including a dependency on therapeutic relationships between care staff and residents. This is a prominent focus for nurses and HCAs who are held to spending the most amount of time with residents, which is not feasible due to current staffing models. Effective dementia care also involves interdisciplinary efforts in assessing the resident's abilities, updating care plans with effective strategies to reduce behavioural symptoms, appropriate staffing patterns, and it is important to create an environment which fosters community (Alzheimer's Association, 2009).

Facilitating interdisciplinary efforts, updating care plans, implementing appropriate staffing patterns, and creating an environment which fosters community are not well-defined as functions for particular health care professionals. Rather, these efforts are made by and decided upon by the collective team, and those who take leadership, in facilitating a culture that strives to improve resident outcomes, and advocates for practice and policy changes. These unspecific but critical functions inform the research question of this project, as each of the functions mentioned above require recognition and proper facilitation to be successfully implemented and evaluated.

Pharmacists are health care professionals who are particularly important to discuss considering problematic polypharmacy, as they encompass expertise in pharmacology.

Pharmacists have some role overlap with physicians and NPs, as they also conduct patient assessments and make medication-related therapeutic substitutions when they are warranted (Canadian Pharmacists Association, 2016). A pharmacist may also identify potential avoidable side effects and suggest an alternative medication (College of Pharmacists of BC [CPBC], 2016a). This instance reduces aspects of problematic polypharmacy that is often overlooked. Additionally, pharmacists can hold prescriptions of medications recognized to be unsafe, and clarify the order with the prescriber prior to dispensing rather than risk harming the resident (CPBC 2016b). Nurse practitioners require a comprehensive understanding of pharmacists' roles and functions in order to best support their ability to prevent problematic polypharmacy.

According to the HPA, and specifically within BC nursing homes, pharmacists are responsible for conducting thorough medication reviews, health histories, making medication recommendations, and reviewing drug regimens with the resident's provider every six months, given the provider is available (CPBC, 2014). If providers are unavailable, pharmacists are to collaborate with RNs or facility staff members who are approved by the medication safety and advisory committee (CPBC, 2014). It is important to note that a lack of direct communication between pharmacists and providers can lead to disagreement and failed collaboration (Rigby, 2010). Thus, as physicians or NPs have the ultimate prescriptive authority within nursing homes, the CPBC (2014) state effective communication between physicians/NPs and pharmacists is key. In light of the research question, collaboration and communication between NPs and the care team is important in order to take advantage of the team's individual abilities to impact medications prescribed, and to collectively reduce the causes and outcomes of problematic polypharmacy.

Collaboration involving effective communication specifically between pharmacists and physicians is not without limitations. Pharmacists have suggested that physician attitudes and practices are critical for facilitating or impeding prescription adaptation (Marra, Lynd, Henrich, Joshi, & Grindrod, 2010). Perceptions, attitudes, and practices of physicians in relation to adaptation services conducted by pharmacists identified six key concerns including: compromised patient monitoring; physician liability; physician burden; pharmacist's abilities to make appropriate adaptation; conflict of interest; and impact on physician-pharmacist relationships. Specifically to the concern regarding the pharmacist's abilities to make appropriate adaptations, physicians lack information surrounding the clinical background and training of pharmacists (Marra et al., 2010). Barriers in collaborating with pharmacists requires recognition and intervention as pharmacists are a valuable health care professional in reducing problematic polypharmacy, as demonstrated with their ability to identify inappropriate medications that subject residents to side effects.

Physician roles related to medication use are often faced by many barriers within nursing homes. Given role overlap and similar practice models between physicians and NPs, exploring these roles and barriers also help inform NP practice in reducing causes and outcomes of problematic polypharmacy.

Physician practice models impact time spent with nursing home residents. Less time with residents may mean shorter assessments, and this may overlook instances where desprescribing is warranted. For example, in Vancouver, BC most physicians who work for nursing homes are paid on a fee-for-service basis. These physicians also run their own personal office practices. Despite compensation for more time-consuming tasks within nursing homes, these tasks may compete with personal office practice priorities. The DOFP (2016) highlight challenges that can

exacerbate these barriers, such as time required to commute to different facilities, challenges with locum coverage, and insufficient remuneration that may lead to unsustainable practice patterns. Due to these limitations, many physicians care for few residents and struggle to visit residents proactively (DOFP, 2016). On the other end, a few physicians take many residents under their care, which results in gaps in care for many residents when these physicians become unavailable (DOFP, 2016). These factors highlight how it may be difficult to follow-up on residents and assure limited consequences. They also suggest there may be limited access to the physician for the health care team. These circumstances have implications for how NPs select and advocate for practice models in their roles.

Some physicians are contracted independently to provide services to nursing homes. This means that they decide their own resident roster and on-call terms. Harriman et al. (2014) found that these models may promote suboptimal communication with the care team as interdisciplinary approaches are not optimally upheld. The timing of meetings may not be suitable for physicians who are contracted independently and have competing priorities. Interdisciplinary team meetings offer a time when the care team may come together to discuss resident status updates and thoughts surrounding their medication regimen. These are times especially informative for physicians who spend less time on direct resident care to learn more about the status of residents under their care.

While nursing home staff members recognize the barriers inherent in this model, physicians working within this model see other issues that hinder deprescribing and allow problematic polypharmacy to persist. Physicians mention nursing unavailability, and subsequent insufficient resident supervision, and a lack of detecting and reporting of symptoms as barriers to deprescribing medications that are problematic in some form (Harriman et al., 2014). Physicians

also voice family member unavailability as a barrier to deprescribing medications (Harriman et al., 2014), as family availability may not overlap with physician time on-site to gather and incorporate family decisions surrounding medications.

Physician roles in reducing the causes and outcomes of problematic polypharmacy are similar for NPs. Nurse practitioners are registered nurses, who have a Master's degree, and advanced nurse practice competencies, such that they are able to autonomously diagnose and treat acute and chronic illnesses, including prescribe most medications (CRNBC, 2016b). Their autonomy, advanced education, and regulated scope of practice distinguishes their roles from nurses and pharmacists, and provides role overlap that most closely correlates with physicians. For example, NPs have full prescriptive authority, are able to independently plan care for residents, and are obligated to use strategies to reduce problematic polypharmacy, such as deprescribing medications no longer necessary.

The ongoing complex health care needs of nursing home residents are recognized by health care authorities, and as a result many health authorities have implemented a role for NPs within nursing homes (Canadian Nurses Association, 2013). Researchers from the University of Victoria conducted a survey to examine practice patterns of NPs across BC (Sangster-Gormley, 2012). Though it is unclear how many NPs were contacted, 31 responded, and out of the 31 respondents, 48% were community/primary health care practice NPs (n=15), and 16% of NPs worked within nursing homes (n=5) (Sangster-Gormley, 2012). For NPs working for nursing homes throughout Canada, including BC, practice patterns vary. Practice models that have been studied include full-time NPs who are employed in one or multiple sites, community NPs who devote practice time to individual residents, and NPs employed as on-call for nursing homes (Donald & Martin-Misener, 2011). The different practice patterns among for-profit and not-for-

profit nursing homes demonstrates on-going experimentation in the degree of NP utilization to meet needs (Donald & Martin-Misener, 2011). Nurse practitioners who work among these various practice patterns may experience similar barriers faced and voiced by physicians seeking to reduce the causes and outcomes of problematic polypharmacy.

This section illustrates that there are many health care professionals involved in the reduction of causes and outcomes of problematic polypharmacy. Many of the roles of these professionals overlap, allowing agencies and management bodies to choose more affordable staffing. However this may result in some resident care being administered under conditions whereby professionals and staff have gaps in educational preparedness, and there may be staffing shortages. Also practice models are less than ideal in terms of time primary care providers, such as NPs or physicians, are able to spend with residents, family, or other team members. These barriers lead to challenges with gathering accurate resident assessments and also issues in effectively communicating these findings between health care professionals to inform a reduction in the causes and outcomes of problematic polypharmacy.

The work environment within nursing homes is quite complicated. Fortunately, there are various interventions that aim to help health care professionals identify and facilitate a reduction in causes and outcomes of problematic polypharmacy, and some are specific to BC. These are examined next, though to inform the findings, as it is not known if these are best promoted within the context of nursing homes.

Problematic Polypharmacy Reduction Strategies

Strategies currently in place begin with those that provide a base for screening causes of problematic polypharmacy, such as inappropriate medications. In BC, the PharmaNet program provides those with access to the resident's purchased medication history (Government of BC,

2016). Prescribers can scan this list of medications to prevent medication duplications and interactions (Government of BC, 2016). An additional second scan can be conducted by pharmacists before the medications are dispensed. However, a study conducted by Price, Bowen, Lau, Kitson, & Bardal (2012) compared the accuracy of PharmaNet profiles against medication histories taken by pharmacists, and found that 16% of medication profiles were accurate, while 48% of the discrepant profiles were considered clinically significant in inaccuracy. The most common error was missing medications, and medications that appear falsely inactive (Price et al., 2012). Also herbal, over-the-counter, HIV, and hospital dispensed medications are not included within PharmaNet (Government of BC, 2016; Price et al., 2012). Discussing the comprehensive list of medications with residents, and/or their family members, by means of medication reviews, and using other tools in conjunction, is important.

Upon conducting medication reviews, there are many criteria from around the world that can be used to identify inappropriate medications among older adults. The Beers Criteria is evidence-informed, has recently demonstrated superiority in identifying potentially inappropriate medications (Oliveira et al., 2015), and it is the most utilized criteria over the past 20 years (Lemay & Dalziel, 2012). This demonstrates its ongoing clinical usefulness. Some of the medications included within the list to avoid, or to use with caution among older adults include: medications with high anticholinergic properties such as first-generation antihistamines, antispasmodics, and tricyclic antidepressants; antipsychotics that can increase the risk of strokes and mortality in those with dementia; benzodiazepines that can increase the risk for cognitive impairment, delirium, falls, and fractures; hypoglycemic agents such as glyburide that can cause prolonged hypoglycemia; non-selective anti-inflammatories (NSAIDs) that can increase the risk of gastrointestinal bleeding (American Geriatrics Association, 2012).

Computerized systems are also largely available across practice settings, such as the electronic medical record (EMR) and electronic health record (EHR). These systems provide clinical information to improve efficiency and workflow (PBC, 2016d). For example, the EMR allows for tracking data over time, such as blood pressure readings, enabling providers to conduct accurate assessments surrounding the continuation or deprescribing of medications (Garrett & Seidman, 2011). However, the EMR is limited to one practice setting and does not allow for information exchange between providers (Garrett & Seidman, 2011). The EHR provides comprehensive information exchange through multiple settings allowing providers to be aware of the resident's health history and potential medications also provided or prescribed within the hospital setting. These are often factors that are missed and can exacerbate problematic polypharmacy (Rambhade, Chakarborty, Shrivastava, Patil, & Rambhade, 2012).

Another useful tool used in reducing problematic polypharmacy includes the MedStopper application, which has been available since 2015. It is a decision support tool developed largely through expert opinion to help prescribers prioritise individual patient medications for potential discontinuation, or dose reduction based on the drug's ability to improve symptoms, reduce future illness, and avoid harm (MedStopper Beta, 2015). It also guides the prescriber through a safe discontinuation process (MedStopper Beta, 2015). A lack of deprescribing guides have been a barrier voiced by physicians (Harriman et al., 2014). Physicians working within nursing homes have rated the MedStopper application useful overall (Cassels et al., 2015).

Launched in 2013, another guide aimed at helping prescribers deprescribe specifically in nursing homes is put forth by the Ontario Pharmacy Research Collaboration (OPRC). The guidelines developed by OPRC appear to be the first of their kind in that they guide prescribers through instances where it is appropriate to stop/taper a medication, while monitoring for adverse

drug reactions (OPRC, n.d.). Thus far, three specific guidelines have been produced pertaining to proton pump inhibitors, benzodiazepines, and antipsychotics (OPRC, n.d.). The guidelines encompass algorithms to help in the process of deprescribing that include assessing for symptoms to determine the next steps (OPRC, 2015).

There are also educational services to help providers improve their prescribing practices that include the Provincial Academic Detailing Service (PADS) and the Therapeutics Initiative (TI). The PAD service is led by pharmacists where they offer 30 to 40 minute evidence-based onsite and web-based seminars for prescribers to enhance prescribing practices throughout BC (PADS, n.d.).

The TI is a great resource that provides health care professionals with information to make overall informed medication decisions (TI, 2010). Because of the TI's research, BC spends on average 8.2% less per capita for their drugs compared to other provinces (Gagnon, 2010). The team conducts independent assessments of drug therapy despite information put forth by drug industries (TI, 2010). They have many working groups, one of which conducts regular drug assessments and publishes letters bimonthly (TI, 2010). The TI also produces evidence-based clinical guidelines that are accessible online surrounding medications that are more affordable and demonstrate comparable efficacy (Gagnon, 2011). The TI's information is also available via podcasts (TI, 2010), and they hold many conferences featuring problematic polypharmacy, where they introduce their systematic reviews and steps to deprescribing (TI, 2014).

Introduced in 2014 by the General Practice Services Committee (GPSC), is an intervention specifically targeted for physicians referred to as the Residential Care Initiative. The goals of this initiative are to improve resident services and outcomes including those related to problematic polypharmacy (GPSC, 2015a). Medication reviews are to be completed by

physicians, and preferably with expertise provided by pharmacists upon admission into a nursing home, and at least every six months thereafter, as well as in instances of resident status changes or transfer back from acute care (GPSC, 2015b). Physicians and pharmacists are to collectively address the goals of care for the individual resident, current medication indications versus potential for adverse events, total number of medications, medications that may be of low value or no longer needed, and care staff time taken to administer multiple medications (GPSC, 2015b).

Many strategies reviewed within this section are not specifically mentioned within the findings as they have not been studied in the context of nursing homes, and many are not specifically targeted to an isolated issue of problematic polypharmacy. The strategies are also generally focused on improving prescribing. For instance, they do not explicitly indicate how different team members are involved in reducing the causes and outcomes of a comprehensive problematic polypharmacy issue. Many strategies are also fairly new and have not been rigorously studied. However, these strategies can be used to inform successful interventions that are identified within the findings.

Next, the Methods chapter outlines the approach taken to gather literature to inform the research question of this project. The research question is to ascertain how NPs can best promote a reduction in the causes and outcomes of problematic polypharmacy among residents in BC nursing homes. A review of the literature that is specific to the context of nursing homes is required in order to consider the complexity of resident care needs, and barriers faced by nursing home staff.

CHAPTER 3

Methods

An integrative review of the literature is undertaken to answer the research question. The search is organized below guided by Whittemore and Knafl's (2005) approach to integrative reviews.

Search Databases

In order to enhance the rigour of this review per Whittemore and Knafl (2005), multiple databases were used for a comprehensive search of the literature. Databases included PubMed, CINAHL, and Cochrane Collaboration, as well as grey literature through Google Scholar for unpublished and published data. A hand search of references from key articles was also conducted.

Search Terms

The following terms were searched in various combinations: polypharmacy; inappropriate medication; inappropriate prescribing; medication; nursing home; long term care; nurse practitioner. Combinations of search terms with numerical results are found in Appendix A. The search term combinations are intended to bring forth evidence-informed interventions that help reduce the causes and outcomes of problematic polypharmacy.

The term problematic, which is used to describe polypharmacy in this review, was not among search terms. This is because polypharmacy has not been universally described using the term problematic, and using this term limits the search. The search term polypharmacy, which is a cause of problematic polypharmacy, was the foundation of most searches, as it is an issue of interest, is not universally isolated to the number of medications, and brings forth an array of

literature inclusive of interventions to reduce the causes and outcomes of problematic polypharmacy.

Literature brought forth while using the search term combinations target health care professionals who work in nursing homes, with the exception of NPs. Some interventions are specifically applicable to NPs given role overlap, and some interventions allow an assessment of how NPs can support other care staff to sustain their roles in reducing causes and outcomes of problematic polypharmacy.

A lack of literature that specifically informs NP practice in reducing causes and outcomes of problematic polypharmacy prompted the addition of the term nurse practitioner to search term combinations. These limitations in literature may relate to the specificity of the issue of interest and the specificity of the context that may not have received specific attention from NPs. This may be the case as the integration of NPs is fairly new, especially in BC (CRNBC, 2015), thus attention may be focused on broader health care concerns.

Due to limited randomised-controlled trials encompassing NPs, a practical hand search of articles related to problematic polypharmacy within nursing homes was undertaken. There were few articles found with the search term combination nurse practitioner, nursing homes, and polypharmacy. These studies explored broader primary practice gaps within nursing homes, such as emergency transfers and hospitalization. Some included brief discussions surrounding problematic polypharmacy. Thus these articles were included for an analysis of how NPs have specifically facilitated a reduction in the causes and outcomes of problematic polypharmacy.

Inclusion and Exclusion Criteria

The inclusion criteria consisted of a timeframe from 2005 to 2016 in order to obtain current data to inform practice. Evidence-based health care is recognized as being informed by

research from different disciplines and conducted through various research methodologies (Flemming, 2007), as is to be reflected by integrative reviews (Whitttemore & Knafl, 2005). Thus, all types of research were considered for this review in identifying interventions that reduce the causes and outcomes of problematic polypharmacy, and not solely intervention studies. Systematic reviews, randomised-controlled trials, non-randomized controlled studies, qualitative data, as well as guidelines developed through systematic review were considered for inclusion.

Research that addresses interventions to reduce the causes and outcomes of problematic polypharmacy, but do not include NPs as participants, met the inclusion criteria. This is considered due to the aforementioned role overlap allowing interventions to be transferrable across health professions, and also to assess how NPs can assure other care staff sustain their roles in reducing causes and outcomes of problematic polypharmacy.

Systematic reviews that are published within the given timeframe, though analyze some studies published prior to 2005, were included for review. Due to limited data within Canada, research conducted in the United States and overseas was included. Non-English studies were excluded. Research conducted outside the context of nursing homes was also excluded in order to inform the specific context and population. However, many strategies conducted outside of nursing homes may be useful as efforts to reduce problematic polypharmacy before older adults require transition to a nursing home environment may reduce the prevalence of the causes and outcomes of problematic polypharmacy within this context. It is recognized that efforts to reduce this issue in other practice settings are important for NPs to adhere to and advocate for.

Search Outcomes

Due to the extent of information on polypharmacy, the search strategy identified 1,227 results between all four databases. Duplicates between each database were removed leaving 1,108 results. After an analysis of titles, literature conducted outside the context of interest were excluded. For example, some contexts included hospitals, home care, and community. Titles that identified literature that solely focused on the prevalence, factors associated, and outcomes of problematic polypharmacy within various settings and populations were also excluded as they do not aid to inform how causes and outcomes of this issue may be reduced

After reviewing abstracts, of the remaining 452 papers, studies found to be in the trial phase were excluded. Other reasons for excluding articles included those conducted outside the context of nursing homes, or focused on other factors, such as outcomes and the prevalence of polypharmacy among certain disease states, rather than interventions to reduce the causes and outcomes of this issue.

In the phase of full-text review, 18 articles were examined. Many studies were found to be in the trial phase and excluded. One study simply had staff rate interventions that reduce causes and outcomes of problematic polypharmacy according to their personal perception of importance. This study was excluded, as it did not provide evidence-based information surrounding the efficacy of interventions within nursing homes. One article was excluded as it was not guided by a particular method of data collection, and appeared to be a synopsis of a systematic review.

Two systematic reviews were found, and the first of these is inclusive of most studies retrieved from this search process. However, the first review focused on those with severe

dementia. Though dementia is a common diagnosis within nursing homes, the second and older review was kept to assure effective interventions are not missed.

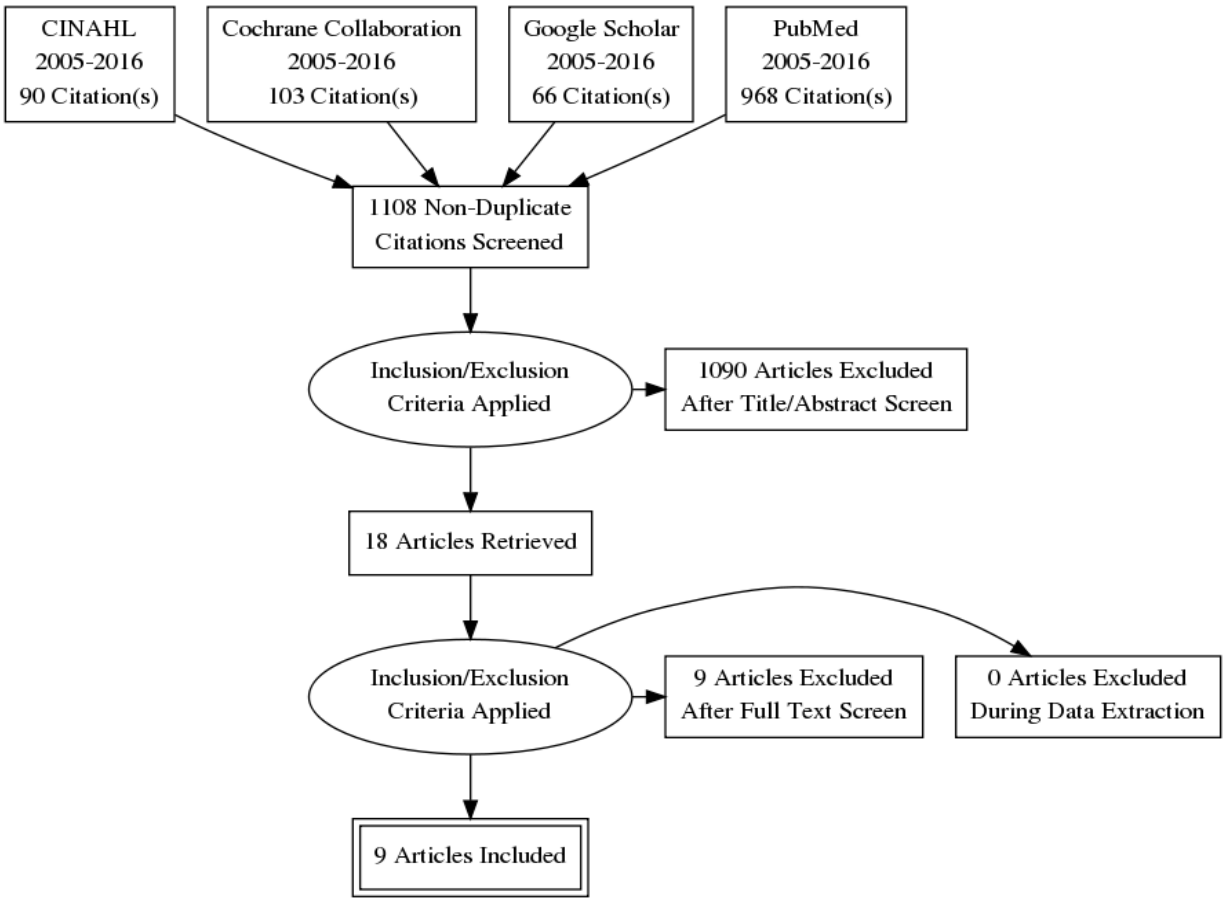
One article retrieved examined the role of an NP caring for nursing home residents, with one outcome measure, among other broader outcome measures, that explores reductions in the causes and outcomes of problematic polypharmacy. This article, including two retrieved from its references, were included for review. The two articles identified within the references also review the role of NPs in the context of nursing homes with some discussion surrounding how causes and outcomes of problematic polypharmacy can be reduced. An analysis of these three studies within the integrative review may allow for specific insight surrounding how NPs can impact the issue at hand within nursing homes. Also one guideline formulated in 2012 targeting NPs was included for review.

The critical appraisal process is guided by tools and checklists created by the Critical Appraisal Skills Programme (CASP, 2013). These tools are easily accessible online and include straight forward checklists for a variety of different types of research. The CASP tools do not include a tool to assess the quality of guidelines and non-randomized studies. To address this gap, a tool created by Downs and Black (1998) that has held up in terms of rigour and usefulness, making it one of the most commonly used tools (Quigley, Thompson, Halfpenny, & Scott, 2014), is used to analyze non-randomized studies included in this review. To ensure robust critical appraisal of the guideline included in this review, the Appraisal of Guidelines for Research and Evaluation (AGREE 2) tool is used, as it is current, commonly used, and comparable to other tools (Eikermann, Holzmann, Siering, and Ruther, 2014). It additionally requires an external review process which enhances the quality assessment (Eikermann et al.,

2014). A total of 9 studies are kept for inclusion in this integrative review. A search flow chart outlining the process described above is found below.

Figure 1

Search Flow Chart



Studies conducted within the specific context of nursing homes are sparse. However an array of interventions are found within studies, reviews, and the guideline, which are undertaken by different health care professionals. The two systematic reviews provide a comprehensive understanding of interventions. The three studies specific to NPs provide additional insight surrounding how NPs can undertake a reduction in the causes and outcomes of problematic polypharmacy. The next chapter is an overview of the 9 articles included for review, including critical appraisal, and an analyses and critique of the results.

CHAPTER 4

Findings

Nine studies are selected to address the research question of how NPs can best promote a reduction in the causes and outcomes of problematic polypharmacy among residents in BC nursing homes. The findings are discussed based on individual article in order to provide clear analysis and critique. Analyses of each article touches on the aim, method of data collection, sample, and setting for critical appraisal and strength of evidence. There are many guides for evaluating the strength of evidence throughout the literature. A modified compilation put forth by Mazurek and Fineout-Overhold (2011) is used to rate studies as it is more inclusive of various types of studies. Results are also synthesized individually per article with critical analyses for clarity in answering the research question.

This integrative review begins with exploring the sole practice guideline found within the literature search. An analysis and critique of two systematic reviews follows, and subsequently research published after these systematic reviews. The goal is to reveal implications for practice inclusive of evidence-based interventions that reduce the causes and outcomes of problematic polypharmacy in a way that considers the complexity of resident care needs, and barriers faced by staff within nursing homes, as well as implications for policy, education, and research.

Bergman-Evans & Schoenfelder (2012). *Evidence-based practice guideline: Improving medication management for older adult clients residing in long-term care facilities.* University of Iowa, School of Nursing, Center for Gerontological Excellence.

Guideline Aim

The purpose of this guideline was to improve medication management practices for older adults who reside in nursing homes (Bergman-Evans & Schoenfelder, 2012). This was

undertaken by putting forth interventions that demonstrate effectiveness within this context, along with specific outcome measures that can be used to reflect a reduction in problematic polypharmacy (Bergman-Evans & Schoenfelder, 2012). The guideline targets a reduction in polypharmacy, described in the way of number of medications, as well as reductions in inappropriate prescribing. These are two causes of problematic polypharmacy and collectively inform this review. This guideline is directed to NP practice, though other members of the interdisciplinary team including nurses, pharmacists, physicians, and physician assistants may also benefit from incorporating the recommendations (Bergman-Evans & Schoenfelder, 2012).

Method of Data Collection, Sample, & Setting

The overall quality of this guideline is strong (Brouwers et al., 2010). The researchers use a sound and comprehensive method of data collection through systematic review. However, it is difficult to assess the rigour of the 118 individual studies used for formulating this guideline, as the researchers do not provide study specific information, including methodological features, such as methods of data collection (Brouwers et al., 2010). Researchers do explicitly link their findings with supporting evidence (Brouwers et al., 2010), and support their recommendations while using a grading schema that refers to the types of studies that were used. Furthermore, inclusive studies are relevant to the research question as they were each conducted in the context of nursing homes, which considers the specific complexity of resident care needs towards reducing the causes and outcomes of problematic polypharmacy.

To improve the validity of this guideline, the researchers include an external review (Brouwers et al., 2010) conducted by two experts knowledgeable about research on improving medication management for those residing in nursing homes (Bergman-Evans & Schoenfelder, 2012). They suggest additional evidence and changes to the guideline to enhance the clinical

usefulness (Bergman-Evans & Schoenfelder, 2012). These recommendations are clearly identified and rated as level D, referring to expert opinion (Bergman-Evans & Schoenfelder, 2012). Other levels of evidence include level B1 (high quality evidence-based practice guideline), and C1 (observational studies with consistent results, including correlational and descriptive studies), overall making this guideline a well-researched and informed systematic review of the literature, with level one evidence per Mazurek and Fineout-Overhold (2011).

Results

Four different outcome measures were presented in this guideline in regard to assuring the causes and outcomes of problematic polypharmacy were limited. Outcome measures that target causes of problematic polypharmacy include minimizing inappropriate prescribing and polypharmacy (Bergman-Evans & Schoenfelder, 2012). Measures that target the outcomes of problematic polypharmacy include assessing functional status and avoiding adverse drug reactions among nursing home residents (Bergman-Evans & Schoenfelder, 2012). The outcome measure of reducing inappropriate medications was supported by interventions with the strongest evidence per the grading schema, representing level B1 (Bergman-Evans & Schoenfelder, 2012). However, all interventions are limited, as it is difficult to determine the statistical significance of each intervention, as these values are not provided.

Reducing inappropriate medications focused on utilizing existing accessible criteria, such as the Beers Criteria, as well as consulting pharmacists for their clinical expertise (level B1), to inform the appropriateness of medication prescriptions (Bergman-Evans & Schoenfelder, 2012). Reducing polypharmacy was another strategy identified, which is described as the number of medications. This acknowledges an increased likelihood of interactions with increasing medications among nursing home residents, who undergo varying degrees of physiological

change that effects drug metabolism (Bergman-Evans & Schoenfelder, 2012). The researchers also acknowledged time constraints faced by nursing staff who must prepare and administer medications, as well as monitor numerous residents, while confounded with interruptions, which increased the risk for medication errors (Bergman-Evans & Schoenfelder, 2012). Thus emphasis was applied on reducing medication regimens to decrease the likelihood of interactions among residents, and the burden on staff.

To reduce the burden on staff and the likelihood of interactions among residents, researchers advised prescribers to conduct medication reviews at each mandated periodic visit, and to record the total number of scheduled and as needed medications (Bergman-Evans & Schoenfelder, 2012). The goal was to prevent an increase in medications, with no more than nine medications, which are scheduled no more than three times daily for ease of administration (level C1) (Bergman-Evans & Schoenfelder, 2012). Capping regimens at nine medications is a numerical threshold that reinforces the variability of polypharmacy definitions within the literature. Many residents may require more medications given increasing comorbidity. Additionally, while medication administration times isolated to three times daily is beneficial for nurses, many medications have interactions necessitating ample spacing, require administration on an empty stomach, half-hour before meals, and other variables that may make this recommendation difficult to implement.

Researchers also advised an assessment of creatinine clearance, while using the Cockcroft Gault Score (level D) on admission, upon changes in condition, and at least annually (level C1) to prevent adverse resident outcomes due to physiological changes (Bergman-Evans & Schoenfelder, 2012). This is an excellent recommendation for providers, including NPs. It prompts preventative assessments, considers changes in pharmacokinetics and

pharmacodynamics that come with aging, and reduces the risk for inducing causes and outcomes of problematic polypharmacy. To facilitate this recommendation, it may be timed with other investigations residents may need throughout the year.

Reducing polypharmacy was also supported by having nursing staff implement nonpharmacological approaches to manage behavioural symptoms (Bergman-Evans & Schoenfelder, 2013). However, reduced nursing staff, holding nurses in supervisory roles as opposed to being more involved with direct-resident care, and lack of knowledge in effectively implementing these approaches may make this intervention difficult.

Maintaining functional status as an intervention is unique within the literature obtained for this project. Decline in functional status was identified as a poor outcome for residents and could result in increased workload for staff (Bergman-Evans & Schoenfelder, 2013). The researchers suggested it is important to detect and discuss these changes within interdisciplinary meetings (Bergman-Evans & Schoenfelder, 2013). An assessment of functional status was effectively conducted while using the MDS-ADL scale designed to be administered within 14 days of admission, quarterly, and during status changes (level C1) (Bergman-Evans & Schoenfelder, 2013). This interval is reasonable as a baseline is obtained, routine screening assures changes are not missed, and acute incidents are well-assessed. The MDS-ADL scale assesses the resident's bed mobility, transfer, walk in room and corridor, locomotion on and off unit, dressing, eating, toilet use, and personal hygiene (Bergman-Evans & Schoenfelder, 2013). The scale is limited in that these assessments are subjective and dependent on individual skill. The elements of the scale may be best informed by staff who spend the most time with residents during these processes, such as HCAs who conduct most personal care. However, as HCAs are provided with less educational preparedness in detecting medication-related decline, assessments

are also warranted by other care staff, such as nurses, and NPs, especially upon acute status changes.

The last outcome measure that assured a safe medication regimen among residents, and minimized outcomes of problematic polypharmacy, was to avoid adverse drug reactions (Bergman-Evans & Schoenfelder, 2012). If medications were identified as causing an adverse drug reaction, emergency transfers, or hospitalizations, they were to be discontinued, though only after establishing a mutually agreed-on plan with care staff (level C1) (Bergman-Evans & Schoenfelder, 2012). A mutually agreed-on plan encompassed monitoring residents for symptoms of reoccurrence and/or withdrawal reactions (Bergman-Evans & Schoenfelder, 2012). This is important evidence, as it provides physicians support in deprescribing when staff support in monitoring residents is guaranteed; however, limited staffing that contributes to limited availability from nurses and HCAs, may make this plan increasingly difficult to assure.

Shortfalls in knowledge surrounding adverse drug reactions and medication management is shown among nursing staff (Lim et al., 2010). This may be particularly problematic for HCAs who receive less education and training compared to nurses. Improving knowledge with an educational intervention is not put forth as a specific outcome measure to reduce causes and outcomes of problematic polypharmacy and to improve medication management in this guideline. An analysis of an educational intervention is warranted to determine its efficacy and strength of evidence.

This guideline recommends four outcome measures that address the causes and outcomes of problematic polypharmacy. Conducting medications reviews while utilizing the Beers Criteria are informative interventions for NPs to implement. Nurse practitioners also benefit from pharmacist expertise, thus can work with these professionals to inform medications prescribed.

The effective interval of these reviews is yet to be determined. Monitoring for functional decline and physiological changes are excellent ways to assure the causes and outcomes of problematic polypharmacy are limited. The optimum interval in discussing functional assessments also needs consideration. Though each outcome may not target NPs specifically, multiple health care professionals are involved with implementing interventions, and NPs can help ensure nurses and HCAs sustain their roles, which may involve advocating for practice and policy changes to promote staffing improvements and time for direct resident care.

Kroger et al. (2015). Medication use among nursing home residents with severe dementia: Identifying categories of appropriateness and elements of a successful intervention. ***Journal of the American Medical Directors Association, 16*****(7), 1-17.**

Study Aim

This review had three specific aims. The first aim was to determine how to identify inappropriate medications among nursing home residents with severe dementia. Secondly, they aimed to identify interventions likely to succeed in improving medication use among residents that considered reducing the causes and outcomes of problematic polypharmacy. Lastly, researchers aimed to adapt findings to the context of Quebec, Canada (Kroger et al., 2015). Though the review focused on those with severe dementia, which is not identified as a focus for this project, it is a common diagnosis among nursing home residents, and commonly associated with problematic polypharmacy.

Method of Data Collection, Sample, & Setting

The overall quality of this systematic review is strong (CASP, 2013), with level 1 evidence per Mazurek & Fineout-Overhold (2011). The internal validity is enhanced as a quality assessment of inclusive studies were rated moderate to strong (Kroger et al., 2015). These studies

have a strong method of data collection, and represent primarily level two and three evidence per Mazurek & Fineout-Overhold (2011), and quantitative data. Interventions will be identified with their corresponding level of evidence throughout this review.

Inclusive studies focused on the causes of problematic polypharmacy, including inappropriate medications, specific studies pertaining to inappropriate antipsychotic use, and three studies that generally addressed polypharmacy (Kroger et al., 2015). Studies also focused on outcomes of problematic polypharmacy, such as drug-related problems. This review is a good representation of the literature, as the 35 studies included represent worldwide research, non-English studies, and those published from 1987 to December 2013 (Kroger et al., 2015). Although this review aimed to examine interventions effective among nursing home residents with severe dementia, most studies inform general nursing home demographic, assuring interventions are generalizable across nursing home residents.

This review is limited in that most inclusive studies were conducted outside of Canada, with the exception of three from Quebec, and one from Ontario. A 15-member Delphi panel was formulated to evaluate the applicability of the findings of this review to nursing homes in Quebec, Canada (Kroger et al., 2015). To assure no limitations, the Delphi panel was inclusive of a multidisciplinary team, including geriatricians, physicians, nurses, pharmacists, social workers, and an ethicist (Kroger et al., 2015). The Delphi panel assessments determined that interventions are generally applicable to Quebec, though some may be affected by understaffed facilities. This is a generalizable statement to the BC context given current barriers within some facilities. It is important to note that per Mazurek & Fineout-Overhold (2011), the strength of evidence using the Delphi process is least evidence-based (level seven); however, expert opinion is beneficial in gaining a view surrounding the clinical significance and feasibility of findings.

Results

Upon analyzing interventions that come through within studies to reduce the causes and outcomes of problematic polypharmacy, each intervention demonstrated reductions in their specified outcome measure. However, the findings are limited as statistical analyses, such as probability values, are not provided.

In addressing the causes of problematic polypharmacy, researchers advised the use of screening criteria to identify inappropriate medications (Kroger et al., 2015). They referred to the Beers Criteria and the Screening Tool of Older People's Potentially Inappropriate Prescriptions-Screening Tool to Alert Doctors to Right Treatments (STOPP-START) as effective criteria (Kroger et al., 2015).

Sixteen of 35 studies in this review included education or training as an intervention for staff, including physicians and nurses. Each of the 16 studies demonstrated an improvement in the appropriateness of medications, thus causes of problematic polypharmacy, determined by reductions in antipsychotics, hypnotics, benzodiazepines, and NSAIDs (Kroger et al., 2015). Each of the 16 studies also represent strong evidence, rated as level two or three per Mazurek & Fineout-Overhold (2011). It is specifically noted that active involvement of pharmacists in education or training of other health care professionals improved pharmacotherapy for older adults by reducing the causes and outcomes of problematic polypharmacy (Kroger et al., 2015). Nurse practitioners could benefit from pharmacist-led education in improving their prescribing practices, such as participating in PAD services. In analyzing forms of education, interactive educational approaches with direct feedback appeared to be the most effective (Kroger et al., 2015).

It is difficult to determine the long-term efficacy of educational interventions as most studies do not indicate a follow-up period. Studies that do indicate a follow-up period at 9, 12, and 18 months, each remained effective in reducing inappropriate medications, although to a lesser extent (Kroger et al., 2015). There is no determined interval of reintroducing and implementing education interventions. Specific elements of education are put forth for an assessment of generalizability to the Quebec context by the Delphi panel. These included education surrounding nonpharmacological approaches, and considering the resident's life expectancy upon prescribing, in which all were considered applicable to the Quebec context (Kroger et al., 2015), and are likely applicable to nursing homes across Canada, including BC.

Twenty-one studies included medication reviews which were led by pharmacists, physicians, or a multidisciplinary team (Kroger et al., 2015). Each of these studies were effective in reducing causes of problematic polypharmacy including polypharmacy, and inappropriate medication, such as antipsychotics and benzodiazepines (Kroger et al., 2015). Medication reviews also demonstrated reductions in outcomes of problematic polypharmacy, including reduced falls and hospital transfers (Kroger et al., 2015). These studies all represent strong evidence, and are rated as level two or three evidence (Mazurek & Fineout-Overhold, 2011).

Medication reviews led by pharmacists was particularly promising in improving medication use among older adults (Kroger et al., 2015), which may stem from their pharmaceutical expertise. However, the implementation of pharmacist recommendations were often suboptimal among studies. This highlights ongoing collaborative challenges within nursing home settings. These findings also indicate that enhancement of interdisciplinary education among health professions surrounding the roles, knowledge, and expertise of team members is

timely in order to facilitate better uptake of recommendations by various professionals, including pharmacists.

Regular follow-up meetings were also suggested to discuss the resident's medication regimen. This suggestion is quite vague, as the interval and makeup of health care professionals warranted at these meetings are not established. The multidisciplinary Delphi panel acknowledged how these meetings may not be feasible in Quebec facilities that are understaffed (Kroger et al., 2015), which is also applicable to BC. The appropriate interval for regular medication reviews has not been determined. Currently in BC pharmacists are mandated to conduct medication reviews every six months (CPBC, 2014), which requires reconsideration for shorter intervals, or more meaningful reviews, given persisting causes and outcomes of problematic polypharmacy.

Interdisciplinary approaches were among 15 of 35 studies (Kroger et al., 2015). These approaches included team meetings and group discussions where medications were discussed in general, and/or case conferences where medications were reviewed in the context of individual resident (Kroger et al., 2015). All of these approaches demonstrated effectiveness in reducing causes of problematic polypharmacy, such as inappropriate medications, including antipsychotics, benzodiazepines, and NSAIDs (Kroger et al., 2015). Team meetings also specifically demonstrated detecting untreated conditions, which reduced potential adverse resident outcomes (Kroger et al., 20150. This is likely feasible as the team is provided an opportunity to share findings and benefit from each other's expertise. All 15 studies represent level three and four evidence (Mazurek & Fineout-Overhold (2011).

Specific elements of this interdisciplinary intervention that assured its success were to relay that participation from nursing home staff was expected, and to encourage staff

involvement in care (Kroger et al., 2015). The multidisciplinary Delphi panel again raised issues of understaffing within Quebec nursing homes that would hinder the feasibility of these elements (Kroger et al., 2015), which is also applicable to the BC context. Nonetheless, it is noteworthy that interdisciplinary team meetings and case conferences continue to be presented as effective means of reducing causes and outcomes of problematic polypharmacy, and implications for staffing and policy changes are warranted for an effective follow-through.

Although interventions are overall successful, and studies that involve a follow-up period remain to demonstrate reductions in the causes and outcomes of problematic polypharmacy, follow-up results are not as effective and rather demonstrated a trend towards effects fading over time (Kroger et al., 2015). It is not mentioned if this is the case despite interventions consistently in place, or if this is demonstrated over time after the cessation of interventions. Thus determining the appropriate and feasible interval of implementing effective interventions is important.

It is important to note that NPs and HCAs are not particularly targeted within this review. However taking part in interdisciplinary case conferences and team meetings are transferable to the participation of these two members. Nurse practitioners can benefit from interdisciplinary case conferences where they can be updated with resident assessments that may otherwise be overlooked. Nurses and HCAs play an important role within these meetings, which is not always feasible due to time constraints, thus the collective team, including NPs, have a role in advocating for practice and policy changes to improve staffing levels. Conducting medication reviews is well within the scope of NP practice, though it is particularly regarded to collaborate and benefit from pharmacist-expertise with medication reviews, as well as receiving pharmacist-led education. Thus, NPs may elect to involve pharmacists in medication reviews at alternating

intervals in order to delegate functions allowing for a more feasible workload. Nurse practitioners can also encourage pharmacists' participation among interdisciplinary team meetings where educational opportunities can be undertaken, and prescribing practices can be improved. A common aspect of effectively implementing most interventions is the requirement or benefit of involving multiple health care professionals.

The focus of this systematic review was to determine interventions specifically effective among residents with severe dementia. However, very few studies inform this population, and most inform the general nursing home demographic (Kroger et al., 2015), thus results are generalizable. To assure effective interventions are not missed, the next review is inclusive within this integrative review, as it aimed to examine interventions that broadly address nursing home residents.

Loganathan, Singh, Franklin, Bottle, & Majeed. (2011). Interventions to optimise prescribing in care homes: Systematic review. ***Age and Ageing, 40*****(2), 150-162.**

Study Aim

The aim of this review was to examine the effects of interventions that are implemented to optimize prescribing specifically in nursing homes (Loganathan et al., 2011). Thus, this review brings forth interventions that reduce the causes of problematic polypharmacy, such as inappropriate prescribing.

Method of Data Collection, Sample, & Setting

The overall quality of this systematic review is strong (CASP, 2013), with level one evidence per Mazurek & Fineout-Overhold (2011). The majority of the 16 studies inclusive for review represented high quality studies with mean scores of 20/27 and above (Loganathan et al., 2011). Two studies had much lower scores, potentially due to selection bias and confounding

(Loganathan et al., 2011). Each study helps in answering the research question, as studies were conducted within the context of nursing homes, represented a mean age above the age of 65 years, and evaluated the effects of an intervention on prescribing, and improving appropriate prescribing (Loganathan et al., 2011). An advantage of this review over the previous two, is that an assessment of statistical significance is feasible, as statistical analyses is provided, such as probability values. This review includes strictly level two and three evidence per Mazurek & Fineout-Overhold (2011). Though this review is comprehensive in that it includes studies from 1990 to April 2010, non-English studies were excluded, thus potentially missing relevant studies (CASP, 2013). Also all but two studies were conducted outside the context of Canada, thus an assessment surrounding the generalizability of interventions is conducted.

Results

The interventions that came forth in this review are organized into four categories. Categories include staff education for prescribers and/or care home staff (n=8), pharmacist-led medication reviews (n=3), multidisciplinary team meetings that were usually chaired by the prescribing physician (n=3), and computerized clinical decision support systems (CCDSS, n=2) (Loganathan et al., 2011). However, the categorization of studies was not straight forward and brings forth limitations for an accurate assessment of interventions, as some studies took a combination of approaches (Loganathan et al., 2011). This in turn demonstrates that problematic polypharmacy is a multifaceted topic that may require multiple interventions to successfully reduce its causes and outcomes.

Of the studies that examine the impact of educational interventions, six of eight demonstrated reductions in causes of problematic polypharmacy, such as inappropriate prescribing, with the longest follow-up at 13 months ($p<0.05$). Of these studies, an “interactive”

component was present (Loganathan et al., 2011). Interactive components also demonstrated effectiveness among Kroger et al.'s (2015) review. For example, academic detailing was particularly effective in reducing inappropriate prescribing, and used interactive components (Loganathan et al., 2011). Academic detailing is described as when a trained health care professional meets with a prescriber in their practice setting to provide evidence-based information (Jin et al., 2012), such as PAD services. Within the studies in this review, academic detailing used interactive components with face-to-face interaction between a group of experts and the prescribing physician. Groups of experts within studies included psychiatrists, geri-psychiatrists, and pharmacists (Loganathan et al., 2011). Academic detailing using pharmacist expertise was particularly effective in reducing antipsychotic use (Loganathan et al., 2011). These are opportunities for prescribers, including NPs, to draw on specialist expertise.

Education provided to multiple members of the team, rather than just the prescriber, was shown to be more effective in reducing inappropriate prescriptions (Loganathan et al., 2012). For example, education with interactive components that were found to be effective, also involved nurses and families as their audience through workshops (Loganathan et al., 2011). This highlights the importance of a team understanding surrounding the causes of problematic polypharmacy, as multiple staff are involved in the care of residents. For example, nurses and HCAs can detect adverse health changes, and communicate these to the team, or manage behavioural symptoms with proper techniques, and without the use of inappropriate prescriptions. Thus, enhanced psychosocial care training with focus on behaviour management through the use of nonpharmacological approaches that were taught through role play demonstrated reductions in inappropriate neuroleptic use (Loganathan et al., 2011).

One study extended to examine the effects of educational intervention on reducing inappropriate prescribing after five years. Although this study demonstrated a reduction in the use of hypnotics before nine p.m. ($p<0.01$), there was an overall increase in the proportion of residents that were receiving hypnotics (Loganathan et al., 2011). This may represent an increase in the complexity of nursing home residents over the five years who are living longer with more comorbidy. It may also represent growing staff constraints that promote the use of these medications, or a lack of continual educational intervention within the five years.

Studies that were comparatively less successful with an educational intervention found poor attendance by participating physicians (Loganathan et al., 2011). Physicians are an important target for educational intervention that are aimed at improving prescribing practices, as they have prescriptive authority. This also applies to NPs who have comparative roles in reducing causes of problematic polypharmacy. The lack of success within these studies highlights the importance of prescriber attendance. Thus, the researchers formulated implications for policy and practice and suggested implementing educational interventions that employ several complementary techniques, and are directed at all healthcare professionals, as well as family members (Loganathan et al., 2011). However, the appropriate interval of interventions has not been determined, and the method of delivery through which the educational intervention would be implemented needs consideration, as staff may not find it feasible to attend formal information sessions.

Upon reviewing studies that implemented pharmacist-led medication reviews, only one of three demonstrated statistically significant changes ($p<0.0001$) in optimizing prescribing within nursing homes with follow-up at six months (Loganathan et al., 2011). However, the other two studies used a reduction in medications as an outcome measure, rather than appropriateness

of medications, which may not have reflected the effectiveness of the intervention appropriately (Loganathan et al., 2011). Also it was not indicated whether the intervention was not effective because of a lack of uptake of pharmacists' suggestions, as found in Kroger et al. (2015), or an ineffective medication review. Thus despite mandated regular medications reviews in BC, this review highlights the importance of meaningful medications reviews. For instance, the successful medication review involved consultation with residents and their carer, such as a family member (Loganathan et al., 2011). This approach makes medication reviews more meaningful, as the resident is the cornerstone to decisions being made. Ongoing exploration is needed to establish the factors contributing to a meaningful medication review and their efficacy.

Two of three studies examined the effects of multidisciplinary team meetings and demonstrated statistically significant changes in medication-related outcomes (Loganathan et al., 2011). It is noteworthy that one successful study was pharmacist-led, and the other involved experts from other disciplines, such as geriatricians. This again emphasizes the effectiveness of pharmacist expertise, and also suggests involving specialty fields in tackling the issue of problematic polypharmacy among this complex population. A general multidisciplinary team meeting that was used by the study without demonstrable outcomes may be just as effective, as it was noted that this study may have been subject to selection bias (Loganathan et al., 2011). These meetings are also informed by direct-care staff that share resident status updates. The timing of multidisciplinary team meetings must be considered in order to be mindful of staffing shortages.

Of the two studies focused on CCDSS, one study evaluated the appropriateness of drug orders, based on maximum daily dose, frequency of administration, medications to be avoided, and kidney function. With a follow-up at 12 months, this study demonstrated improvements in

prescribing (CI 95%). The other study evaluated the systems effects on preventing drug-to-drug interactions, though the results were statistically insignificant (Loganathan et al., 2011). The effectiveness of CCDSS needs further investigation to establish its efficacy in reducing aspects that contribute to problematic polypharmacy.

Overall, Loganathan et al. (2011) suggested that a combination of interventions are likely to be required to improve prescribing among nursing homes residents (Loganathan et al., 2011). Upon assessing the generalizability of interventions to the BC context, although the two CCDSS studies were conducted in Canada, this intervention is only applicable to nursing homes who have computerized systems in place, such as EMR and EHR. There are no technical constraints surrounding educational interventions, medication-reviews, and multidisciplinary approaches, and they are generalizable to the BC context.

In light of NP practice, enhancing prescribing practices is beneficial through education informed by pharmacist-expertise. These opportunities are also beneficial for other health care professionals, such as nurses, for whom NPs can promote ongoing participation. Determining the appropriate interval and methods of delivery, such as formal versus informal, needs consideration. Medication reviews are a necessity as they provide an overview of resident medications. Nurse practitioners can assure these are updated and more meaningful by double checking with PharmaNet, and consulting with residents and their families. Inappropriate medications can be identified by utilizing screening criteria, such as the Beers Criteria. The appropriateness of medications can also be gathered by drawing on specialist expertise, and gaining assessment information from nurses and HCAs within multidisciplinary team meetings. As multiple health care professionals are required in the care of residents and reducing the causes

and outcomes of problematic polypharmacy, NPs can advocate for practice and policy changes to assure staffing ratios are improved and time for direct resident care is enhanced.

Ilic, Bukumiric, & Jankovic, (2015). Impact of educational intervention on prescribing inappropriate medication to elderly nursing home residents. ***Journal of the Serbian Medical Society, 134*****(3-4), 174-179.**

Study Aim

Loganathan et al.'s (2011) review, suggests an educational intervention to facilitate a reduction in causes of problematic polypharmacy in the context of nursing homes, such as inappropriate prescribing. Though interactive approaches are highlighted, the method of delivery is vague, such as formal versus informal. The aim of this study was to evaluate the effectiveness of a specific form of staff education and its ability to increase appropriate prescribing in a cluster of nursing homes (Ilic et al., 2015).

This study was conducted in three phases, including a three-month phase of recording prescribing practices, one-month phase of educational intervention, and a three-month phase of recording and analyzing prescribing practices at a six-month follow-up (Ilic et al., 2015). The intervention was two-faceted targeting physicians and residents. For physicians, one-hour lectures were provided by a medical doctor who had a Master of Science in pharmacology about the pharmacokinetics and pharmacodynamics of drugs in the elderly, the Beers, START, and STOPP criteria, and screening tools to alert physicians to the right treatment (Ilic et al., 2015). One-hour lectures were also provided to nursing home residents about adherence, adverse drug reactions, and drug-to-drug interactions. Separate brochures were provided to physicians and residents with the identical content that they were each provided in lectures (Ilic et al., 2015).

Method of Data Collection, Sample, & Setting

This study is a nonrandomized controlled before-and-after trial of educational intervention (Ilic et al., 2015). The quality of this study is strong (Downs & Black, 1998), with level three evidence per Mazurek & Fineout-Overhold (2011). However, the external validity of this study is compromised as residents with major psychiatric diseases and dementia were excluded. These residents were excluded to promote full participation (Ilic et al., 2015). Those excluded represent a large portion of nursing home residents, thus the findings must be generalized with caution. A total of 104 residents met the inclusion criteria that included those 65 years of age and older, and residents that have at least two chronic health disorders (Ilic et al., 2015). This study was conducted during 2012 and 2013 among 20 nursing homes located in Belgrade, Serbia, and included 27 physicians who provided resident care (Ilic et al., 2015). The organization of nursing homes was not indicated, i.e. not-for-profit versus for-profit. The findings are assessed for generalizability to the BC context. The Beers, START, and STOPP criteria were used to assess medication appropriateness before and after the intervention (Ilic et al., 2015).

Results

During phase one of this study, residents were found to be taking 10.2 +/- 2.3 prescribed medications and 3.2 +/- 1.5 over-the-counter medications (Ilic et al., 2015). After the educational intervention, inappropriate medications were found to reduce from 349 to 37 medications according to the Beers Criteria, and from 70 to 20 medications according to the STOPP criteria (Ilic et al., 2015). The START criteria omitted 143 appropriate medications before the intervention which reduced to only 67 appropriate medications after the intervention (Ilic et al., 2015). All findings were with statistical significance ($p<0.001$) (Ilic et al., 2015). Beyond the

overall educational intervention, the findings highlight the effectiveness of screening tools. The Beers Criteria is specifically effective, as it continues to identify significantly more inappropriate medications.

The educational intervention demonstrated long-term efficacy of providing physicians and residents education in lecture form, as a reduction in inappropriate medications remained reduced at six-month follow-up. However, a limitation to this study is that it is not clear whether residents had an impact on deciding the appropriateness of medications. It cannot be for certain that an agreeable plan was formulated between this team to improve prescribing, or if results were solely facilitated by physicians. The longevity of this intervention is also compromised within nursing homes, as residents may no longer be able to participate upon facing a degree of functional decline and memory impairment. Also, this intervention does not indicate whether there is an interactive component that was highlighted in Kroger et al. (2015), and Loganathan et al.'s (2011) reviews. Different forms of education that can be provided throughout the year may be optimal to solidify and utilize knowledge.

This study is limited for generalizability across nursing homes, as the resident sample is not a strong representation of nursing home demographics. Many nursing home residents suffer a degree of memory impairment, and cannot participate in this intervention. The likelihood of implementing this intervention in its entirety is compromised.

This intervention could be used with NPs who are also primary care providers that make medication-related decisions. For more meaningful decisions and if appropriate, NPs can encourage family involvement within the intervention to represent residents who suffer a degree of cognitive impairment. The information provided within these seminars are also important teaching points for other care staff, such as HCAs and nurses. Nurse practitioners can encourage

nurses and HCAs to attend seminars. As there are time constraints that subject direct care staff to competing priorities, NPs can promote educational preparedness by encouraging staff to refer to brochures.

da Costa et al. (2016). Drug-related problems identified in a sample of Portuguese institutionalised elderly patients and pharmacists' interventions to improve safety and effectiveness of medicines. *Real World Outcomes, 3*(1), 89-97.

Study Aim

This study provides current analysis surrounding pharmacist-led intervention, which was statistically insignificant within two of three studies presented by Loganathan et al. (2011). The objective of this study was to determine the prevalence and nature of drug-related problems (DRPs) among older adults residing in nursing homes who are subject to polypharmacy, and to test the acceptability of a pharmacist's intervention (da Costa et al., 2016).

This integrative review focuses on the intervention aspect of the study, and not the prevalence and nature of DRPs. The intervention consisted of a prioritisation of DRPs by pharmacists, and then a subsequent report of these after establishing what were identified as clinically relevant by prescribers and nurses (da Costa et al., 2016). After determining what was clinically relevant, pharmacists provided recommendations surrounding these medications, which were mailed to physicians (da Costa et al., 2016).

Method of Data Collection, Sample, & Setting

This study is a randomised-controlled trial, and the quality of this study is strong (CASP, 2013), with level two evidence per Mazurek & Fineout-Overhold, (2011). This study was carried out between August and September 2014 among four Portuguese nursing homes (da Costa et al., 2016). Residents meeting the inclusion criteria were those 65 years of age and older, and subject

to polypharmacy, described as taking five or more medications (da Costa et al., 2016). Solely assessing for DRPs among those who received five or medications may have subjected researchers to missing DRPs among those who received fewer medications. This does not affect an assessment of the pharmacist's intervention. The intervention and control groups consisted of 63 residents each (da Costa et al., 2016). The results of the intervention were evaluated one month later in October 2014 (da Costa et al., 2016).

Results

Pharmacists identified 1002 DRPs, while 697 were found to be clinically relevant by physicians and nurses (da Costa et al., 2016). Pharmacists made 63 recommendations for nurses, which were mainly based on changing administration times (da Costa et al., 2016). It is noteworthy to mention that in Bergman-Evans & Schoenfelder's (2012) guideline, they identified that a delay in and/or missed medications contributed to adverse drug reactions. As a result, and as mentioned by Loganathan et al. (2011), a combination of interventions may be necessary, where education surrounding adverse effects and timing of medications is provided for all professionals involved in caring for nursing home residents. Given current barriers surrounding staffing shortages and subsequent time constrains in some BC nursing homes, administrating medications at the recommended time may be difficult. As improper timing of medications may subject residents to adverse effects, advocating for staffing and policy changes is important.

Pharmacists made 539 recommendations to physicians, including dosage changes, suspension or addition of medications, and request of additional complementary exams to evaluate the necessity of medications (da Costa et al., 2016). However, physicians only responded to 172 recommendations, and only 15 recommendations were accepted (8.7%) (da

Costa et al., 2016). The researchers attributed the response rate to possible technical communication problems, or lack of cooperation between different healthcare providers. A lack of cooperation was favoured, as most non-response cases were from a nursing home where a culture that facilitated cooperation was lacking (da Costa et al., 2016). The organization of this nursing home, i.e. for-profit, was not identified. On the other hand, the response rate of 172 recommendations with an acceptance of only 15 recommendations may indicate that there were many insignificant recommendations. Also it may be difficult to address a large volume of recommendations in one given time. Physicians may have also rejected many recommendations due to a lack of front-line support for monitoring residents and/or a lack of clear deprescribing guidelines.

The findings in this study are also applicable to NP practice. Similar to physicians and other health care professionals, NPs also have competing priorities where a large sum of recommendations may be difficult to address. Feeling overwhelmed may significantly impact implementing interventions to reduce causes and outcomes of problematic polypharmacy, and important recommendations could be overlooked. Thus an examination of the exact recommendations is warranted to determine how recommendations could be improved for clinical usefulness. Nonetheless, pharmacist-led recommendations are highly valuable due to their expertise in pharmacotherapy, thus they are essential members of the healthcare team in reducing causes and outcomes of problematic polypharmacy.

Given recommendations may not be implemented due to a lack of front-line support, it is important for NPs to address these concerns, as opposed to allowing residents subject to inappropriate medications. Nurse practitioners can utilize deprescribing guidelines put forth by the TI and OPRC. A mutually agreed upon assessment plan with HCAs and nursing staff, as put

forth by Bergman-Evans & Schoenfelder (2012) guideline, is necessary to assure residents are properly monitored and adverse effects are limited during deprescribing. Advocating for practice and policy changes is warranted as this approach may be impeded by understaffing and staffing choices surrounding nurses and HCAs.

Marasinghe. (2015). Computerised clinical decision support systems to improve medication safety in long-term care homes: A systematic review. ***British Medical Journal, 5*****(5), 1-8.**

Review Aim

This review focused on providing current analysis surrounding the use, benefits, and effectiveness of CCDSS within nursing homes (Marasinghe, 2015). In reviewing CCDSS, the aim of this review was to reduce causes of problematic polypharmacy by enhancing medication safety and quality of care in nursing homes. Furthermore, the aim was to also reduce outcomes of problematic polypharmacy by limiting the added burden of medication-related issues on the healthcare system, such as hospitalizations, as well as improve healthcare system efficiency (Marasinghe, 2015).

Method of Data Collection, Sample, & Setting

This is the first systematic review to explore the role of CCDSS in improving medication safety in nursing homes (Marasinghe, 2015). The quality of this review is strong (CASP, 2013), with level one evidence per Mazurek & Fineout-Overhold (2011). This review was comprehensive, as there were no limitations to the year of publication of inclusive studies until February 2014; however, non-English studies were excluded (Marasinghe, 2015). A quality assessment of the seven articles that met the inclusion criteria were generally good and fair, with average scores of 19 out of 26 (Marasinghe, 2015); however, a limitation to this review is that there was only one reviewer, and statistics analyses, such as probability values, were not

provided for most studies. Inclusive studies are mostly randomized-controlled trials and non-randomized controlled studies, and are relevant to the research question as they are each conducted in the context of nursing homes, and evaluate the effectiveness of CCDSS to improve medication safety (Marasinghe, 2015).

Results

Five of seven studies demonstrated improvements in medication safety by identifying causes and pending outcomes of problematic polypharmacy (Marasinghe, 2015). Messages included recommendations for dosing corrections, frequency corrections, missing information, adverse drug reaction detections, side effect detections, and alerts related to laboratory warnings (Marasinghe, 2015). The system was able to identify these warnings simultaneously in a short period of time, which is not feasible by prescribers (Marasinghe, 2015). As a result the proportion of final drugs orders were improved (Marasinghe, 2015). Furthermore, when resident specific risk estimates were allotted into the system, i.e. falls risk, CCDSS provided an effective method to reduce risk of injury by identifying medications that increased risks (Marasinghe, 2015). These instances demonstrated improvements in medication safety for residents, and also reduced the burden on the healthcare system, such as preventable falls, fractures, hospitalizations, and added cost (Marasinghe, 2015).

One study demonstrated positive results in the amount of warning messages triggered; however, there was a negative response from prescribers to alerts, which requires further investigation surrounding prescribers' perception of alerts (Marasinghe, 2015). Researchers stated that a high volume of alerts, which were considered irrelevant, may have affected physician confidence in CCDSS, or may have caused alert burden, which warranted further modifications to the systems (Marasinghe, 2015).

In some studies CCDSS was added to pre-existing computerized systems, such as EMR. These systems, including EHR, have many advantages in collecting resident data. Combining these systems will allow greater informed decisions surrounding medications prescribed. However, despite the advantages of computerized systems, the accuracy of programs will depend on consistent data entry that requires effort from multiple health care professionals. Furthermore, studies examining health professionals' perceptions of CCDSS report the usability of these systems, including technical and practical constraints, and the local practice culture, including a facilities openness to these systems, as barriers to implementation (Moja et al., 2014).

With modifications to prevent alert burden, NPs can encourage a shift in culture by creating awareness surrounding the advantages of computerized systems. They can also facilitate an uptake of these systems by promoting in-services for ease of use.

Klaasen, Lamont, & Krishnan. (2009). Setting a new standard of care in nursing homes. ***Canadian Nurse, 105*****(9), 24-30.**

Study Aim

The aim of this study was to evaluate overall resident services after implementing a full-time NP, who worked in collaboration with the medical director (Klaasen et al., 2009). Discussions also included how the NP facilitated a reduction in the causes and outcomes of problematic polypharmacy. Physicians working for the nursing home resigned for unknown reasons (Klaasen et al., 2009). The NP's willingness to expand her resident roster as physicians trended out of their positions, demonstrates the NP's ability to provide care in times of need.

Method of Data Collection, Sample, & Setting

The quality of this historically-controlled trial is fair (Downs & Black, 1998), with level three evidence per Mazurek & Fineout-Overhold (2011). Both qualitative and quantitative data

was collected to evaluate the full-time NP's overall effectiveness in improving resident care between the time period of September 2007 to August 2008 (Klaasen et al., 2009). The NP worked within an interdisciplinary team in a 116-bed Winnipeg, Manitoba non-profit nursing home (Klaasen et al., 2009). All residents were inclusive and represented nursing home demographics well, thus inform the research question.

Among unstructured interviews, a variety of staff from different disciplinary backgrounds were interviewed (n=15), pertaining to their perception of the NP (Klaasen et al., 2009); however, a theoretical framework for this arm of the study is not provided, and it is unknown how staff were selected, subjecting this arm of the study to selection bias. Family satisfaction was determined through pre. and post-intervention surveys, though it is unknown how many family members were included. The quantitative data collection pertaining to drug cost, polypharmacy, inappropriate antipsychotic use, and emergency transfers is strong, as pre and post-intervention data is accessible through the same data sources; however, statistical analyses such as probability values are not provided.

Results

Within the quantitative data analysis, there was a 17% reduction in drug cost, 55% reduction in the rate of polypharmacy that was described as nine or more medications, and a 63% reduction in the use of inappropriate antipsychotic medications for the management of behavioural and psychological symptoms associated with dementia. Furthermore, there was a 20% reduction in emergency transfers, and a 24% increase in family satisfaction (Klaasen et al., 2009).

Through NP interviews, it was determined that comprehensive literature reviews, experience, and consultation with clinical experts, contributed to supporting the NP in

developing a specific list of strategies to reduce the causes and outcomes of problematic polypharmacy (Klaasen et al., 2009). One strategy included a medication review, in which the NP asked an array of questions that took a resident-focused approach. For example, if the resident would live long enough to benefit from the medication at hand (Klaasen et al., 2009). Strategies also included considering nonpharmacological interventions first, weighing the pharmacological intervention against quality of life, reducing/discontinuing the medication to assess whether it was truly needed, involving the resident and family in the decision-making process, and educating staff/residents/family about monitoring parameters after discontinuing the medication, among others (Klaasen et al., 2009). The last approach upholds an important factor put forth by Bergman-Evans & Schoenfelder's (2013) guideline in improving medication use in nursing homes. A safe environment for deprescribing is created, when staff, residents, and family are aware of adverse signs. Involving residents and family members, if appropriate, also provides nurses and HCAs the support in identifying these instances in understaffed facilities.

Through staff interviews, the NP was found to increase access for staff and residents and was available throughout weekdays to work with the interdisciplinary team (Klaasen et al., 2009). Increased availability allowed for regular participation in interdisciplinary care planning, family conferences, quarterly reviews of the residents' medications, and thus care plans were comprehensively formulated and updated (Klaasen et al., 2009).

Within interviews, it was also found that nursing staff were pleased with the timely clinical education that they received from the NP, and referred to the NP as a role model (Klaasen et al., 2009). Staff also particularly regarded the reduction of antipsychotic medications, which may have been due to the NPs ongoing dialogue and follow-up with residents, families, and staff (Klaasen et al., 2009).

Overall, NPs were encouraged to lead medications reviews and consult clinical experts for their expertise. However, NPs experienced barriers for collaboration from some physicians (Klaasen et al., 2009). This is specifically problematic when concerns are raised about medications prescribed by different providers, in which consultation with these specialists is highly valuable and required. Furthermore, NPs are encouraged to provide NP-led education for staff and to continue follow-up with staff and residents with dialogue surrounding medications prescribed. These instances may be impeded with role confusion. For instance the NP was often consulted for tasks within the RN or LPN scope of practice (Klaasen et al., 2009), possibly taking away from the NP's optimal use of time for implementing interventions. Implications for education warrant interdisciplinary education to assure optimum consultation and effective collaboration.

The NP's abilities to demonstrate a reduction in causes and outcomes of problematic polypharmacy may have been achievable in this study due to the benefits of working within a full-time practice model. This requires consideration prior to generalizing the efficacy of the NP and interventions across practice models.

Peri, Boyd, Foster, & Stillwell. (2013). ***Evaluation of the nurse practitioner in aged care.*** **Auckland, NZ: University of Auckland.**

Study Aim

The aim of this study was to evaluate the impact of resident care provided by a collaborative model involving an NP and physician against a non-collaborative model (Peri et a., 2013). Broader outcome measures that may be a result of problematic polypharmacy were the focus of this study, such as emergency transfers, hospital admissions, and preventable transfers, with brief discussions on problematic polypharmacy. Intervention to reduce all outcome

measures are reviewed, as they may be potentially linked. Other outcome measures that were not specifically the focus of this study, analyse staff and family perceptions surrounding their relationship with the NP, and their perceptions of the NP role (Peri et al., 2013). A description of NP activities during resident consultations are also sought (Peri et al., 2013). These descriptions highlight what was done to best minimize outcome measures.

Method of Data Collection, Sample, & Setting

This study uses a quasi-experimental method of data collection (Peri et al., 2013). The quality of this study is fair (Downs & Black, 1998), with level three evidence per Mazurek & Fineout-Overhold (2011). Chart audits were used to collect quantitative data, and informant interviews, and focus groups comprised of various staff and a family member, were used to collect qualitative data (Peri et al., 2013). The qualitative data is limited as no residents and only one family member is included within interviews. Also there is no theoretical framework for this arm of the study. Researchers are not blinded to the intervention and comparative arms, which may affect the rigor of evaluation. Three nursing homes (n=177) received collaborative care involving the NP, and three nursing homes (n=165) were among the control arm, all within Levin, New Zealand (Peri et al., 2013). Interventions to reduce the causes and outcomes of problematic polypharmacy are assessed for generalizability to the BC context.

Results

Through interviews and focus groups staff recognized a reduction in polypharmacy, which was also demonstrated via randomized chart audits (Peri et al., 2013). However, the definition of polypharmacy is not provided, as well as objective data pertaining to polypharmacy reduction, which would strengthen these results. Staff state that the NP's presence increased access to the provider for themselves and for residents (Peri et al., 2013). This subsequently

reduced stress experienced by staff, as NPs were available for questions/concerns (Peri et al., 2013). Through increased availability and access, NPs were able to conduct timely assessments, which allowed for the discontinuation of medications that were no longer needed (Peri et al., 2013). Staff, and the family member, appreciated the holistic and resident-centered care provided by the NP (Peri et al., 2013). Increased access, timely assessments, and resident-centered approaches were also promoted by NPs found by Klaasen et al. (2009). Staff also appreciated the NP's high degree of collaborative practice and the competence targeted education they provided (Peri et al., 2013). An educational role delivered by NPs was also found by Klaasen et al., while also demonstrating an effect on reducing factors related to problematic polypharmacy, as the study at hand.

Chart audits demonstrated a reduction in emergency transfers by 28%, compared to a 21% increase in the control arm ($p=0.001$) (Peri et al., 2013). There was a 22% reduction in hospital admissions, compared to a 21% increase among the control ($p=0.027$) (Peri et al., 2013). There was a 26% reduction in preventable transfers, compared to an 18% increase among the control, though this was not statistically significant ($p=0.07$) (Peri et al., 2013). It was not mentioned what preventable transfers were attributed to. They could very well include preventing adverse resident outcomes related to problematic polypharmacy, as reductions in polypharmacy were demonstrated among interviews and chart audits.

Physicians found that the NP decreased their workload, and from this experience they recognized the benefits of collaboration, and building trusting relationships for better resident-care (Peri et al., 2013). Physicians were also more inclined to work within these nursing homes, as they could foresee a less stressful workload, due to the NP's presence, and a subsequent strong

nursing structure (Peri et al., 2013). These factors may make physicians more inclined to deprescribe, as they have stronger nursing support, and clinician support from NPs.

Overall, the cornerstone of interventions that come through in this study were the NP's ability to increase time spent on resident care, which was made feasible through the practice model. Nurse practitioners are encouraged to provide staff with education to allow for safe deprescribing, as front-line support is established for monitoring residents. It is interesting to find that co-location and the NP-to-resident ratio is not a barrier for the NP in improving resident care. Though the NP strictly works among three nursing homes, and does not have priorities within a personal practice. Nurse practitioners work among multiple nursing homes in the BC context, thus the results of this study are generalizable.

Peri et al. (2013) found a lack of knowledge surrounding the NP role from staff and the public as barriers for effectively implementing interventions, as found by Klaasen et al. (2009). There were also some collaborative challenges with physicians (Peri et al., 2013). These barriers reveal ongoing implications for education and efforts to improve collaboration between all professions' roles to facilitate significant reductions in the causes and outcomes of problematic polypharmacy.

Stolee, Hillier, Esbaugh, Griffiths, & Borrie. (2006). Examining the Nurse Practitioner role in long-term care. *Journal of Gerontological Nursing, 32*(10), 28-36.

Study Aim

The aim of this study was to retrospectively examine the effect of one NP, who provided health care services when consulted, among three different nursing homes (Stolee et al., 2006). Outcome measure that were the focus of this review related to reducing both causes and outcomes of problematic polypharmacy and included interventions proven effective in prior

studies. For example this study examined the NP's effect on care planning and conducting pre-admission assessments, treatment recommendations for complex biopsychosocial problems, and facilitating communication and multidisciplinary approaches to care (Stolee et al., 2006).

Brief discussions pertained to the NP's impact on improving staffings' ability to conduct assessment and skills related to medication usage, and also the NP's ability to complete medication reviews. Researchers also aimed to identify factors that facilitated or impeded the implementation of the NP role (Stolee et al., 2006), and thus their subsequent impact on reducing causes and outcomes of problematic polypharmacy.

Method of Data Collection, Sample, & Setting

This study is a retrospective cohort study and the quality of this study is strong (Downs & Black, 1998), with level 4 evidence per Mazurek & Fineout-Overhold (2011). Surveys were used to gather information from facility staff (Stolee et al., 2006). The response rate was 41% (nurses: n=32; HCAs: n=45; allied health care professionals: n=11; physicians: n=3; administration and directors: n=10) (Stolee et al., 2006). Surveys are strengthened by including questions that are not part of the NP role, to ensure validity of responses. However, the response rate was low, which may reflect time constraints within nursing homes (Stolee et al., 2006). Furthermore, only three of six physicians responded to the survey, thus there was a limited understanding of nonparticipating physician perceptions on the NP role (Stolee et al., 2006). In-depth interviews were also conducted with the NP (Stolee et al., 2006).

This study was implemented among three nursing homes in Ontario, Canada, including two not-for-profit (A: n=63, B: n=141), and one for-profit (C: n=170) (Stolee et al., 2006). This organizational distinction helps to inform barriers between the two models in implementing interventions to reduce causes and outcomes of problematic polypharmacy.

Results

Only 11.6% of respondents indicated that the NP had a positive impact on preadmission assessments (Stolee et al., 2006). Among interviews, NPs stated that time constraints between facilities posed a barrier for comprehensive admission assessments, and unfamiliarity with residents, given NP-to-resident ratios, posed a barrier for medication reviews (Stolee et al., 2006). Improved outcomes are expected with more practical NP to facility/resident ratios and practice models. For example, as demonstrated by Klaasen et al. (2009), where the NP practiced full-time, Monday to Friday, and within Peri et al. (2013), where the NP practiced among three nursing homes, though within a regularly implemented collaborative approach, versus a consultative model.

Most respondents found that the NP had a positive impact on continuity of care and timely access to care (Stolee et al., 2006). This was also demonstrated in Klaasen et al.'s (2009) study, in which ongoing dialogue and follow-up with residents, families, and staff was promoted. The majority of staff also found that the NP had a positive impact on communication with residents and families (56.5%), between nursing staff and physicians (54%), and within the facility (53%), though only 19.2% felt that communication among the three nursing homes was enhanced (Stolee et al., 2006).

The NP stated challenges in assuming non-direct initiatives among the team, such as educational initiatives, due to a high clinical workload and time constraints posed between three different facilities (Stolee et al., 2006). Nonetheless, the majority (68%) of nursing staff found that with education provided by the NP, their assessment skills, including factors related to medication usage, were enhanced (Stolee et al., 2006). Forty-eight percent of nursing staff found that the NP had a positive impact on their skill level particularly through informal education

(Stolee et al., 2006). Interactive educational approaches also demonstrated effectiveness in reducing the prevalence of problematic polypharmacy within Loganathan et al. (2011) and Kroger et al.'s (2015) reviews.

Surveys indicated that not-for-profit (A & B) nursing homes were double satisfied with the NP's effectiveness, compared to the for-profit (C) nursing home (Stolee et al., 2006). Surveys also indicated that only a few (2.9%) of respondents interacted with the NP on a daily basis, while 40.4% of respondents interacted once or more times a week, and 36.5% hardly ever or never interacted with the NP, while varying across all nursing homes (Stolee et al., 2006). Staff who interacted with the NP more often, versus staff who hardly interacted, found the NP to be more effective and were significantly more satisfied with care (Stolee et al., 2006). These staff members were not differentiated surrounding the organizational model that they worked within. The differences in satisfaction with the NP role and NP effectiveness ratings between staff who did consult the NP and staff who did not, demonstrates the variance in outcomes when consulting NPs is up to staff, versus an NP practice model that facilitates NP leadership and initiative.

The NP found that her role was implemented fully and more accepted among not-for-profit facilities (A & B), where there was also a culture of staff accompanying NPs/physicians during assessments (Stolee et al., 2006). For-profit facilities (C) were found to have more physician support and they conducted assessments independently (Stolee et al., 2006). Staff accompanying NPs during assessments also allowed for informal teaching opportunities. This culture within not-for-profit facilities is more likely to facilitate multidisciplinary approaches that have been found to demonstrate reductions in causes and outcomes of problematic polypharmacy (Bergman-Evans & Schoenfelder, 2012; Klaasen et al., 2009; Kroger et al., 2015; Loganathan et al., 2011; Peri et al., 2013).

The NP recognized that a negative work environment was created by overworked, undervalued, and underpaid staff, which led to challenges for collaboration, as there was little incentive for staff to improve their knowledge and skills (Stolee et al., 2006). It is uncertain whether these findings are more prevalent in not-for-profit, versus for-profit nursing homes. Nonetheless, these findings reveal implications to work towards improving the work environment for nursing staff and HCAs, in order to allow effective team processes in reducing causes and outcomes of problematic polypharmacy.

Overall, NPs are encouraged to provide informal and interactive education for staff to assure they are able to identify causes and outcomes of problematic polypharmacy, and to allow for safe deprescribing processes. However, the consultative model hinders these opportunities, as well as the ability to conduct medication reviews, and subjects NPs to unmanageable resident-to-NP ratios. Suboptimal NP time on site and support for direct care staff adds to the negative work environment faced by staff. These instances reveal implications for practice and policy changes for more available practice models and to improve HCA and nursing staff ratios.

Similar to barriers found within Klaasen et al. (2009) and Peri et al. (2013), barriers within this study also surrounded resistance from some physicians in establishing collaborative working relationships (Stolee et al., 2006). There was also a lack of administrative support that was required to introduce the NP role and to encourage its utilization due to a high degree of administration and nursing staff turn-over (Stolee et al., 2006). These factors not only emphasize implications for education surrounding the NP role for staff, residents, and families, but also highlight extreme downfalls with policy and practice that subject nursing homes to increasing turn-over rates.

CHAPTER 5

Discussion

The literature revealed 9 sources of evidence that informs the research question that asks how NPs can best promote a reduction in the causes and outcomes of problematic polypharmacy among BC nursing homes residents. The findings are strengthened as three sources are systematic reviews, with level one evidence per Mazurek & Fineout-Overhold (2011).

The specific goal of this integrative review is to reveal evidence-based implications for NP practice to reduce the causes and outcomes of problematic polypharmacy in a way that considers the complexity of resident care needs, and barriers faced by staff, as well as implications for policy, education, and research. Nurse practitioner practice models, as well as nursing and HCA staffing patterns, are important to consider, as these determine the time team members are able to spend on resident care, and their subsequent ability and frequency for implementing effective interventions to reduce the causes and outcomes of problematic polypharmacy.

The identified practice implications are most often subject to implications for policy, education, and/or research given barriers faced by staff. Barriers faced by individual staff are important determinants for all health care professionals working within nursing homes. This is determined as most interventions require a shared approach with active participation and communication between multiple health care professionals for an effective reduction in causes and outcomes of problematic polypharmacy. Thus, constraints experienced by one health care professional, inevitably affects others involved. Next, an overview of implications for practice are revealed with their subsequent implications for policy, education, and/or research, as well as limitations of this integrative review.

Medication Reviews & Screening Criteria

Practice Implications. An important preliminary intervention for NPs to implement into their practice in order to gather a comprehensive understanding of the resident's medication regimen, and to reduce potential causes of problematic polypharmacy, includes a medication review. The findings are not clear surrounding how frequently medication reviews are to be completed. An interval following the Residential Care Initiative is sound, consisting of on admission, every six months, after transfer back from acute care, and during resident status changes. As pharmacists are mandated to conduct medication reviews for nursing home residents every six months, sharing the implementation of this intervention with pharmacists will ease strain of this function being performed only be NPs. Nurse practitioners may consider conducting medication reviews on admission to gather a baseline understanding of the resident's medication regimen, after transfer back from acute care to assure the medication regimen is updated, and during resident status changes to assure adverse-drug-effects are considered among differential diagnoses. Pharmacists can conduct medication reviews every six months after admission, at which time their recommendations can also be considered. For a more meaningful medication review, the accuracy of regimens can be assessed using PharmaNet and EHR, and by also consulting residents and their family (Klaasen et al., 2009; Loganathan et al., 2011).

In deciding the appropriateness of medications during medications reviews, NPs can access effective screening criteria online, such as the Beers Criteria (Ilic et al., 2015; Oliveira et al., 2015). The MedStopper Application can also be accessed online to identify medications for potential discontinuation (MedStopper Beta, 2015), as well as OPRC guidelines that go further to guide the deprescribing process (OPRC, 2015). Medication reviews can also be accompanied by assessments of creatinine clearance by using the Cockcroft Gault Score (Bergman-Evans &

Schoenfelder, 2012) to assure current medications are safe for continuation and inappropriate medications with subsequent adverse resident outcomes are minimized.

To prevent the likelihood of missing critical information, NPs can encourage the implementation of CCDSS (Marasinghe et al., 2015), and EMR/EHR if they are not currently in place. Nurse practitioners can provide their opinion of alerts to assure modifications to systems are made and the clinical usefulness of CCDSS is enhanced.

Policy Implications. To assure pharmacist medication recommendations are not overlooked, and rather appropriately examined and considered, NPs can facilitate policy that schedules mandatory meetings to review and discuss recommendations. For practicality, meetings can be set at six month intervals during mandated pharmacist-led medication reviews.

To promote the implementation of CCDSS into nursing homes, Nurse practitioners can facilitate policy for mandatory in-services. In-services can be facilitated over two days to prevent information overload and retention of knowledge. Nurse practitioners can also advocate for remuneration for attendance at in-services outside working hours.

Nurse practitioners can advocate for policy to include medication reviews conducted at the aforementioned intervals. Implementing policy for these intervals are to assure medication reviews are completed by primary care providers, including NPs, in order to set a standard of care.

Research Implications. To determine the efficacy of scheduled medication reviews and utilizing screening tools, NPs can collect pre. and post. intervention data pertaining to emergency transfers and hospitalizations caused by adverse-drug-reactions. Data can be collected via chart audits.

Functional Status Assessments

Practice Implications. To identify residents at increased risk for adverse outcomes due to functional limitations, and to identify acute functional changes potentially related to inappropriate medications, NPs can use the MDS-ADL scale for an assessment of functional status (Bergman-Evans & Schoenfelder, 2012). These scales can be implemented at the same intervals as medications reviews to allow for a baseline assessment, routine screening, and monitoring. Nurse practitioners can complete these scales as part of their initial resident assessment to gather a baseline understanding of the resident's function, as well as during resident status changes and transfer back from acute care in order to promptly discontinue or hold unsafe medications. To ease strain of this function being only performed by NPs, they can encourage RNs and LPNs to complete these scales thereafter, as these team members also spend more time with direct resident care. Health care assistants can also communicate functional status changes with nurses and NPs. For practicality, forms can be kept among clipboards outside resident rooms. Forms can be reviewed during multidisciplinary team meetings, unless changes indicate prompt communication.

Policy Implications. NPs can facilitate a culture that upholds a high standard of care by implementing biannual mandatory chart audits. The intention of chart audits is to encourage staff in appropriately completing MDS-ADL forms and to determine if appropriate contact with the NP is made upon functional status changes.

Educational Intervention

Practice Implications. A combination of educational techniques are helpful for improving prescribing practices and can be facilitated year round to solidify and utilize knowledge. Nurse practitioners can arrange for educational opportunities that include a variety of

techniques, such as interactive, informal, face-to-face methods (Kroger et al., 2015; Loganathan et al., 2011; Stolee et al., 2006), in lecture form (Ilic et al., 2015), as well as web-based.

To improve prescribing practices, NPs may benefit from specialist expertise that can be facilitated by arranging on-site pharmacist-led academic detailing (Kroger et al., 2015; Loganathan et al., 2011). Intervals for educational intervention are not established, though it is reasonable for NPs to arrange PAD services biannually with education focused on efficacy of treatments and length of therapy among older adults with projections for deprescribing, safe dosing considerations among older adults, side effects, and interactions.

Nurse practitioners can also attend conferences offered by TI aimed at improving medication management and guidelines for deprescribing when they are offered. Podcasts and web-resources are also an option if NPs are unable to attend conferences. This information will help NPs stay current with best practices and knowledge can be disseminated among other health care professionals within multidisciplinary team meetings.

Informed resident assessments are extremely important in identifying and preventing adverse resident outcomes related to problematic polypharmacy. As nurses and HCAs spend most direct care time with residents, NPs can facilitate biannual seminars including pharmacist-led education for these staff members with focus on timing of medications (da Costa et al., 2016), interactions, and identifying side effects and adverse signs.

Nurses and HCAs will also benefit from interactive and informal NP-led education during direct resident care (Klaasen et al., 2009; Peri et al., 2013; Stolee et al., 2006). Nurse practitioners can focus on providing education surrounding signs of adverse effects and nonpharmacological approaches to manage psychosocial care (Bergman-Evans & Schoenfelder, 2012; Klaasen et al., 2009; Kroger et al., 2015; Loganathan et al., 2011) in order to reduce the

use of inappropriate medications, such as antipsychotics. Nurse practitioners can enhance the frequency of these opportunities by creating a culture that facilitates staff accompanying NPs during resident assessments (Stolee et al., 2006), such that educational opportunities can be taken on a continuum.

Policy Implications. Nurse practitioners can work towards creating policy for mandatory continuing education among nurses and HCAs through the web-based course catalogue registration system (Vancouver Coastal Health Authority, 2008). Yearly competency checklists can be formulated and can be encouraged to complete by the first quarter of the year. Remuneration for completing checklists can be formulated based on standard time required to complete courses.

Research Implications. To determine and demonstrate the efficacy of enhancing prescribing practices among NPs, data can be collected pre. and post. intervention. Data collection can include the number of medications residents receive, the classification of medications, and use of as needed medications before and after the intervention.

Multidisciplinary Meetings/Case Conferences

Practice Implications. For enhanced communication, NPs can facilitate regular team meetings and case conferences. Team meetings can be arranged monthly to facilitate ongoing support and collegiality, and case conferences can be arranged biannually with encouragement for resident and family attendance, if appropriate, to facilitate resident-centered care.

An understanding of different disciplinary backgrounds and role overlap are important for staff to acknowledge and understand in order to decipher how different team members contribute to reducing causes and outcomes of problematic polypharmacy as part of the team. Nurse practitioners can incorporate interdisciplinary education within team meetings to assure

staff effectively communicate and collaborate with appropriate staff. This can be undertaken by arranging professional speakers to share their background and expertise, and where their roles overlap with other professionals. Nurse practitioners can also encourage staff participation by allowing different team members to lead meetings by providing a summary of their role and their viewpoints.

Within team meetings, NPs can encourage discussions surrounding nonpharmacological approaches in order to gain staff experiences, to provide support, and to tease out and address barriers and limitations to these approaches. In these instances, NPs can help to arrange for specialists in behaviour management who can provide educational content while using interactive approaches, such as role play (Loganathan et al., 2011).

Team meetings are also an excellent opportunity to disseminate educational content learned through PAD services and TI in an interactive manner. Nurse practitioners can lead or promote the benefits of these meetings and can also arrange for PAD specialists to participate.

Each case conference should encourage residents and their family to share their thoughts and/or concerns. Nurse practitioners may use case conferences as a time to initiate and update care plans (Bergman-Evans & Schoenfelder, 2012; Klaasen et al., 2009; Kroger et al, 2015; Loganathan et al., 2011) while informed by nurses, HCAs, physicians, pharmacists, residents, and their family. These include updating safety concerns to prevent adverse resident outcomes by reviewing trends in functional status provided by MDS-ADL scales. Advanced-care planning can be established upon resident admission into the nursing homes to gather resident desires with medication therapy. Nurse practitioners can continue to inform residents and their family with evidence surrounding the efficacy of medications with aging to determine deprescribing within case conferences. If deprescribing is established, a mutually agreed upon plan with nursing staff

and HCAs is necessary in order to assure a safe taper, where residents are monitored for symptom recurrence and withdrawal (Bergman-Evans & Schoenfelder, 2012). Family members and residents, if feasible, can also be informed of this process and red flags/adverse effects (Klaasen et al., 2009) for safety, and to provide nursing staff and HCAs with support in detecting changes at the front-line.

Policy Implications. Nurse practitioners can promote policy that supports one hour monthly multidisciplinary team meetings at an optimal time, such as between meals and after medication administration, that may be best between two and three pm. These meetings can alternate staff participation to assure residents have continued access to care. The content of meetings related to problematic polypharmacy can be decided and arranged on a monthly basis that includes contacting appropriate specialists. Deciding the content of meetings on a monthly basis enhances the usefulness of meetings when dependent upon identified learning needs that can be shared anonymously.

An important policy consideration is to assure case conferences are held biannually to allow resident-centered care. Half an hour can be allotted per case and steered by the NP and in collaboration with the most responsible nurse.

Research Implications. In continuing to monitor the effects of intervention to reduce the causes and outcomes of problematic polypharmacy, NPs can establish the efficacy of multidisciplinary team meetings and case conferences by collecting pre. and post. intervention surveys. Surveys can include staff perceptions surrounding ease of implementing nonpharmacological approaches for behaviour management, their knowledge base in identifying adverse resident outcomes, and their perceptions of MDS-ADL scales and variability in

subjective assessments, as well as family and resident satisfaction surrounding care related to medication use.

Limitations and Implications at the Organizational or System Level

Practice Implications. In order to uphold all NP roles in reducing the causes and outcomes of problematic polypharmacy, including implementing interventions, supporting direct care staff, and conducting research, NPs will require dedicating adequate time to each aspect of their role. To facilitate adequate time for these roles, NPs can take an important approach using leadership. By taking leadership, NPs can facilitate a strong team dynamic within nursing homes by supporting staff in order to gain collaborative working relationships, and in order to facilitate a culture that shares the workload towards reducing the causes and outcomes of problematic polypharmacy. Creating this environment and collegiality can allow NPs to also form strong collaborative working relationships with physicians who may be more inclined to lead multidisciplinary team meetings, case conferences, and medication reviews when a stronger support structure is formulated (Peri et al., 2013). Administrative staff can support in collecting pre. and post. intervention data. Creating this environment can allow NPs to allot ample time for deprescribing while being informed and supported by the team.

Based on the evidence, in order to effectively reduce the prevalence of causes and outcomes of problematic polypharmacy, it is necessary for NPs to implement interventions across practice settings. For instance, within the hospital setting NPs can use interventions to assure the outcomes of problematic polypharmacy, such as adverse effects, are linked to inappropriate medications and adjustments are appropriately made. Furthermore, NPs can use interventions to routinely screen older adults within community practice settings to limit the chances of problematic polypharmacy transpiring among vulnerable older adults who transfer to

nursing homes for ongoing support. Nurse practitioners have a responsibility of obtaining access to PharmaNet and to be familiar with interventions discussed in identifying and reducing instances of problematic polypharmacy.

Policy Implications. Nurse practitioners can encourage nursing staff and HCAs to share their front-line experiences surrounding time constraints and suboptimal staffing patterns to promote bottom-up advocacy. These experiences can be shared with BCNU and HEU who can collectively lobby for policy changes to improve working conditions and direct resident care hours in order to allow for improved assessments and identifying causes and outcomes of problematic polypharmacy.

Nurse Practitioners can also advocate for more NP positions within nursing homes and practice model changes in order to allow adequate time for direct resident care, including the implementation of problematic polypharmacy reduction interventions, supporting staff, and conducting research. They may work alongside policy makers, the British Columbia Nurse Practitioner Association (BCNPA), the voice for BC NPs (BCNPA, 2016), and the Office of Seniors Advocate to lobby for changes to assure BC nursing homes are meeting baseline guidelines for resident care hours. Advocating for practice models may include full-time models (Klaasen et al., 2009), and collaborative models between nursing homes (Peri et al., 2013). Consultative practice models (Stolee et al., 2006), and working between nursing homes and personal/community practices may subject NPs to competing priorities and subsequently less time for implementing recommendations put forth within this discussion.

Education Implications. Nurse practitioner educational curriculums may benefit from including opportunities for students to work with older adults within nursing homes among clinical rotations, especially as it is a growing subset of the population with likely projections for

ongoing employment opportunities. The curriculum may also benefit from ensuring problematic polypharmacy discussions are embedded in course content alongside content related to older adults, such as identifying inappropriate medications among this population by utilizing interventions discussed.

Research Implications. Most research within this integrative review is conducted outside the Canadian context, and specifically BC. This integrative review is strengthened in that only studies conducted in the context of nursing homes are included, and nursing home residents share similar demographics internationally. However, it is difficult to compare international organizational characteristics to assure interventions are effective in the BC context. Thus the applicability of interventions to the BC context are most often subject to practice and policy changes that promote optimal resident-to-provider ratios to assure interventions are not competing with other practice priorities.

Research also rarely explicitly states the organizational model of nursing homes, such as for-profit and not-for-profit, upon examining the effects of intervention on reducing the causes and outcomes of problematic polypharmacy. Research that focuses on the organization of nursing homes is needed to provide stronger projections surrounding the feasibility of interventions in BC nursing homes. Research is also needed to compare provider practice models and nursing/HCA staffing levels in implementing interventions and facilitating a reduction in the causes and outcomes of problematic polypharmacy. The findings from these studies may provide stronger incentive to create change.

Conclusion

In conclusion, problematic polypharmacy is a profound issue with serious consequences for nursing home residents. My experience as an emergency nurse, and through providing care

for many nursing home residents who transfer to the emergency department due to adverse-drug-effects, led me to research the issue of problematic polypharmacy. The background uncovered that nursing home residents have complex care needs, including increasing comorbidity that subjects them to problematic polypharmacy. Providing optimal care is hindered due to barriers faced by health care professionals who provide resident care. Thus the goal of this integrative review was to reveal evidence-based implications for NP practice that considers the complexity of resident care needs, and barriers faced by staff, as well as implications for policy, education, and research.

After conducting an integrative review of the literature, specific interventions demonstrate promise in reducing the causes and outcomes of problematic polypharmacy for residents within the context of nursing homes. Most interventions are embedded with a need for multidisciplinary and interdisciplinary approaches, highlighting the importance of a strong collaborative relationship among nursing home teams. However, the literature that addresses this issue in the context of nursing homes is mostly conducted in countries outside of Canada, and specifically BC. Organizational characteristics and staff barriers are rarely addressed. Due to known barriers faced by staff within some BC nursing homes, to allow the ongoing use of effective interventions among complex nursing homes residents, the implications put forth for policy, education, and research are warranted to reduce problematic polypharmacy among this population.

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Appendix A: Search Term Combinations

Database	Term Combination	Inclusion Criteria	Results
CINAHL Database	Polypharmacy + nursing home	2005-2016; peer reviewed	7
	Polypharmacy + long term care	2005-2016; peer reviewed	4
	Inappropriate medication + nursing home	2005-2016; peer reviewed	0
	Inappropriate medication + long term care	2005-2016; peer reviewed	0
	Inappropriate medication + nurse practitioner	2005-2016; peer reviewed	0
	Inappropriate prescribing + nursing home	2005-2016; peer reviewed	0
	Inappropriate prescribing + long term care	2005-2016; peer reviewed	0
	Inappropriate prescribing + nurse practitioner	2005-2016; peer reviewed	0
	Medication + nursing home	2005-2016; peer reviewed	7
	Medication + long term care	2005-2016; peer reviewed	0
	Nurse practitioner + nursing home	2005-2016; peer reviewed	0
	Nurse Practitioner	2005-2016; peer reviewed; randomised controlled trial	72
Cochrane	Polypharmacy + nursing home	2005-2016	25
	Polypharmacy + long term care	2005-2016	15
	Polypharmacy + nurse practitioner	2005-2016	0
	Inappropriate medication + nursing home	2005-2016	13
	Inappropriate medication + long term care	2005-2016	9
	Inappropriate prescribing + nursing home	2005-2016	23

	Inappropriate prescribing + long term care	2005-2016	12
	Nurse Practitioner + nursing home	2005-2016	13
	Nurse Practitioner + long term care	2005-2016	8
Google Scholar	Polypharmacy + nursing home	2005-2016; terms in title	20
	Polypharmacy + long term care	2005-2016; terms in title	8
	Polypharmacy + nurse practitioner	2005-2016; terms in title	0
	Inappropriate medication + nursing home	2005-2016; terms in the title	10
	Inappropriate medication + long term care	2005-2016; terms in the title	4
	Inappropriate prescribing + nursing home	2005-2016; terms in title	7
	Inappropriate prescribing + long term care	2005-2016; term in title	5
	Nurse practitioner + nursing home	2005-2016; terms in title	3
	Nurse practitioner + long term care	2005-2016; terms in title	9
PubMed Database	Polypharmacy + nursing home	2005-2016	270
	Polypharmacy + long term care	2005-2016	213
	Polypharmacy + nurse practitioner	2005-2016	29
	Inappropriate medication + nursing home	2005-2016	183
	Inappropriate prescriptions + nursing home	2005-2016; clinical trials	15
	Medication + nursing home	2005-2016; clinical trials	196
	Nurse Practitioner + nursing home	2004-2016; clinical trials	33
	Nurse Practitioner + long term care	2005-2016; clinical trials	26