Running head: MEDICATION-TAKING BEHAVIORS IN CKD

Medication-taking Behaviors in CKD with Multiple Chronic Conditions: A meta-ethnographic synthesis of qualitative studies

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Abstract

Aims and Objectives: This meta-ethnographic study identified behaviors associated with taking medications and medication adherence reported in qualitative studies of adults with chronic kidney disease (CKD) and co-existing multiple chronic conditions (MCCs).

Background: To inform medication adherence interventions, information is needed to clarify the nature of the relationships between behaviors that support medication-taking and medication adherence in MCCs.

Study Design: Meta-ethnographic review and synthesis

Methods: CINAHL Complete, MEDLINE and PsycINFO databases were searched. Five qualitative studies met the inclusion criteria. A meta-ethnographic approach was used for synthesis. Medication-taking behaviors were abstracted from study findings and synthesized according to the contexts in which they occur and interpreted within new developing framework named the Medication-taking Across the Care Continuum with adherence-related Outcomes (MACO).

Results: Twenty categories of medication-taking behaviors occurred in three main contexts: 1) patient-provider clinical encounters, 2) pharmacy encounters, and 3) day-to-day management. These behaviors are distinctly different, multi-level, and interrelated. Together they represent a process occurring across a continuum.

Conclusions: Future medication adherence research should consider using a multi-level ecological view of medication management. Clinical practice and policy development can benefit from further understanding socio-contextual behaviors that occur across the continuum. Nurses should have greater presence in chronic disease management and be positioned to support

the day-to-day home management of patients' medications.

Relevance to Clinical Practice: Healthcare professionals can partner with patients to elucidate how these behaviors are enacted across the care continuum and in day-to-day management to identify opportunities to intervene on specific behaviors and promote medication adherence.

Key words: medication management, medication adherence, comorbidity, chronic illness, behavior, compliance, self-management

What does this paper contribute to the wider global clinical community?'

Summary Box:

On the topic of medication management for Chronic Kidney Disease and Multiple Chronic conditions, this paper adds:

- Medication management is a process that occurs across three interrelated contexts.
- Healthcare team members should be aware that patients engage in complex medication-taking behaviors that span three interrelated contexts: clinical encounters, pharmacy encounters and day-to-day management.
- Recommendations for research, clinical application and policy implications with respect to contexts are identified to improve medication adherence, calling nurses to the forefront in chronic disease management.

Chronic Kidney Disease (CKD) is progressive and irreversible (Pyram *et al.* 2012), can be managed with medications, but not cured, and affects people worldwide. An estimated 10% of the global population is affected by CKD (World Kidney Day 2016) and in adults over the age of 65, approximately one quarter have CKD (NIDDK, n.d.; World Kidney Day, 2016; Zhang & Rothenbacher, 2008). Left unmanaged or poorly managed, CKD can lead to kidney failure, known as end-stage renal disease (ESRD). The leading causes of ESRD are diabetes mellitus and hypertension (US Renal Data System 2011), which are physiologically interrelated chronic diseases.

Self-management of CKD usually requires management of multiple chronic conditions. Slowing disease progression and managing underlying comorbidities are major goals of treatment in early CKD stages. Adherence to prescribed medications is critical to achieve goals of CKD management. In the early stages of CKD (Stages 1-3) treatment with an ACE inhibitor or angiotensin receptor blocker has been shown to reduce the risk for developing ESRD and slow disease progression, and use of statins reduces all-cause mortality by lowering the risk of myocardial infarction, stroke, and other cardiovascular events (Qaseem *et al.* 2013). In addition to these treatments, people with CKD and diabetes must also manage other prescribed medications to manage blood glucose levels and hypertension. Of those receiving treatment for ESRD, more than 80% are from well developed countries such as the US, Japan and China (Jha *et al.* 2013). For example, eighty-four percent of national health care spending in the US is for people who have one or more chronic diseases, and spending increases as the number of diseases multiplies (RWJ, 2010). Furthermore, for each Medicare patient who avoids dialysis progression, an estimated $250,000 can be saved (Diabetes Leadership Initiative 2012). In lower-income

countries, managing prevention of ESRD with multiple drug regimens is key to cost-effective care as dialysis and kidney transplant may not be readily available treatment options (White *et al.* 2008).

Background

Medication adherence as defined by the World Health Organization (2003), as "the extent to which a person's behavior [concerning] taking medication corresponds with agreed recommendations from a healthcare provider" (p. 17). Medication nonadherence widely varies but is estimated to occur in 17–74% (Karamanidou *et al.* 2008, Magacho *et al.* 2011) of people with CKD compared to 30-50% in other chronic diseases (Osterberg & Blaschke 2005, Schmitt *et al.* 2010, Shore *et al.* 2015). Many factors are associated with medication adherence including socio-economics, patient-provider relationships, healthcare conditions, medication treatment, and patient beliefs and capabilities (American Society on Aging and American Society of Consultant Pharmacists Foundation 2006, An & Nichol 2013). People managing CKD usually take from 5-14 medications per day (Rifkin *et al.* 2010). Because of the complex interplay of these factors, there is a need to explore the specific behaviors involved in medication management. These behaviors are more than just taking or not taking prescribed medication; they include all behaviors that lead to taking or not taking prescribed medication.

Understanding the full range of medication-taking behaviors from patients' perspectives is needed for intervention development. Appropriate behavior change techniques can be integrated in interventions targeting important behavioral components that lead to medication adherence in CKD. Thus, the study purpose was to identify medication-taking behaviors reported in qualitative studies of patients managing CKD with multiple chronic conditions.

Methods

Study Design

A synthesis of the qualitative literature was undertaken using a meta-ethnographic approach (Britten *et al.* 2002b, Noblit & Hare 1988). This type of synthesis is interpretive in nature, seeking to transfer concepts and findings from one study to another which distinguishes this method from other types of qualitative syntheses and in particular distinguishes it from an integrative review (Britten *et al.* 2002b). Our study was guided by the seven steps outlined by Noblit and Hare (1988) which include getting started; deciding what is relevant to the initial interest; reading the studies; determining how the studies are related; translating the studies into one another; synthesizing translations; and expressing the synthesis. Following the approach used by Britten and colleagues (Britten *et al.* 2002a), we chose to focus on concepts identified within study findings, rather than metaphors. Specifically, these concepts were identified medication-taking behaviors.

Getting Started and Determining What is Relevant. We have combined Noblit and Hare's (1988) first two steps in the section given the introduction of this paper provides the background that led to this synthesis and was the starting point for our review. The first step in the process was to clearly outline the objectives of our synthesis and develop search strategies, inclusion and exclusion criteria. The specific objectives were to 1.) identify medication-taking behaviors across studies that focused on CKD and multiple chronic conditions; and 2.) synthesize the behaviors across studies. We set our search strategies, inclusion and exclusion criteria based on achieving the stated objectives.

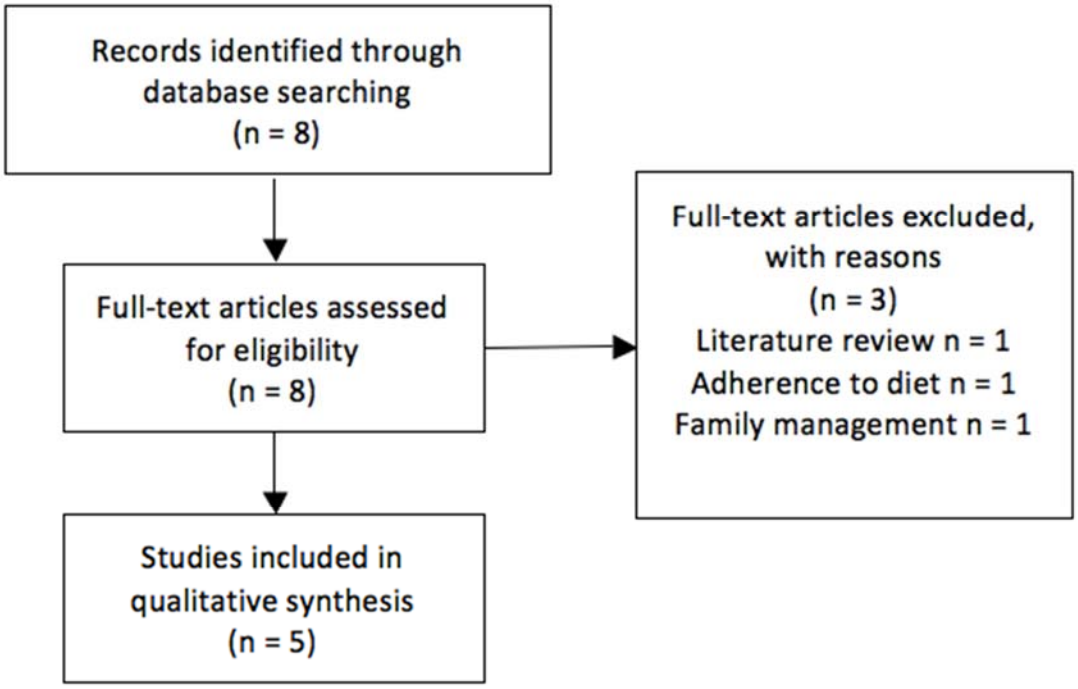
Search Strategy & Sources

With the assistance of a university librarian, we systematically searched Academic Search Premier (EBSCO), CINAHL Complete, MEDLINE, PubMED and PsycINFO databases using search terms: "medication adherence or medication compliance" AND "qualitative research" AND "kidney" AND "chronic disease." By including the key word "chronic disease" we were able to abstract studies of people with both CKD and multiple chronic conditions. We limited the search to scholarly (peer reviewed) journals published between 2004 and 2015.

Inclusion and Exclusion Criteria

To be included, studies had to be qualitative, conducted in adults who were 18 years of age or older diagnosed with CKD Stages 1-4 and co-existing multiple chronic conditions, and focused on medications. Studies with people in CKD Stage 5 and undergoing dialysis were excluded. This search yielded 8 qualitative studies, 3 of which did not meet inclusion criteria (see Figure 1).

Figure 1. PRISMA



Analytical Approach

Reading the Studies. The third step in this synthesis focused on reading the studies to gain an understanding of the articles. We independently read and reread the articles to gain a deeper understanding of the medication-taking behaviors described within each article. In this process, we began to identify medication-taking behaviors within the text. We began highlighting these key behavioral concepts as we read to gain a deeper understanding of the behaviors described. In this step we also independently assessed each article using Critical Appraisal Skills Programme (CASP) checklist questions for quality appraisal of qualitative research (CASP, 2014), following the adapted process used by Campbell et al. (2003). The 10-item CASP Qualitative Research Checklist was completed independently by each author, for each of the five studies identified from the literature search. The first 9 questions on the checklist

required check-marking a response of "yes", "no" or "unclear" for each of the quality criterion and the last question allowed for qualitative response about the value of the research. Authors independently tracked comments about each assessment to inform discussions about the appropriateness of including the studies in the review.

Determining How Studies Were Related. In this fourth step we began abstracting the key findings from each study in order to facilitate understanding of the findings across studies. We developed a table to track participants' characteristics and identify key themes among the findings. Additionally, consistent with the purpose and objectives of our review, we abstracted all behaviors, line by line, related to the way people reported that they managed their medications. We defined medication management behaviors as "any self-described patient actions related to accessing, managing, or actual taking (e.g., swallowing) of medication." In articles that included qualitative data from healthcare providers or system-related factors that may affect medication-taking behaviors, only behaviors described by patients were abstracted.

Translating studies into one another. First, we organized studies by date of publication to gain a historical understanding of the findings. We then reviewed the first study, participating in a constant comparison and "reciprocal translation" with the findings of the second study (Britten *et al.* 2002b, Pound *et al.* 2005). To accomplish reciprocal translation, we began with the list of behaviors abstracted from the first study and then added the behaviors abstracted from the second study, looking for similarities and differences. Adding the third paper to the review, we compared behaviorally focused findings to abstract and synthesize similarities and differences across studies (Britten *et al.* 2002b). This process was followed until all studies had been reviewed and findings compared with each other. We then synthesized these findings into a table

to allow us to examine which studies included the abstracted behaviors and used this to summarize our findings.

Synthesizing Translations. To synthesize the findings, we discussed the behaviors and the contexts in which they were reported to occur. This discussion included interpreting how the behaviors were related to one another and supported medication management. As we discussed the interrelationships, we began referring to a developing framework named the Medication-taking Across the Care Continuum and Adherence-related Outcomes (MACO) framework (Authors initials XXX) to describe the processes that lead to medication taking, the contexts in which they occur across the care continuum, and the medication adherence related outcomes specific to controlling disease with prescribed medications.

Expressing the Synthesis. The final step in the seven-step process of conducting a meta-ethnographic synthesis is discussing the implications of the findings. In our discussion section of this article, we discuss the implications of our findings for research and clinical application and consider policy implications.

Results

Study Characteristics

Five studies meeting study inclusion criteria were reviewed and appraised for quality (Table 1). Four publications included at least one of the same authors. Interrater agreement on study quality was adequate, with 100% agreement across all CASP criteria except one item on the checklist pertaining to whether the authors of the studies addressed how the relationships between the researcher and participants had been considered. In particular, two different articles reviewed were marked by one of us as unclear for this quality criterion. We discussed and

resolved the concern and included the article. Thus, our review included the five studies abstracted from the literature search.

Studies represented a diverse population of 108 patients from Australia, England, and the United States. Two studies involved the same group of patients (Williams *et al.* 2008, Williams *et al.* 2009). On average, patients were 60 years old (range 21-90 years) and taking an average of 8 medications. Patients across studies took 1-14 medications per day. In addition to CKD, diabetes and hypertension, other co-morbid chronic conditions included hyperlipidemia, bone disease, and depression.

Synthesis

Noblit and Hare (1988) describe the process of translating studies into one another involves comparing key metaphors or concepts with one another. Given our focus was on identifying behaviors among study findings, the central concepts identified across studies were the medication management behaviors. To gain an understanding of how the different behaviors were reported across studies, we developed a table with the behaviors in the left column and then marked an "X" for each study that reported that particular behavior (See Table 2). The result was 20 different categories of medication-taking behaviors that occurred in the three contexts in the MACO framework. We maintained the central concepts, in the case of our synthesis, the central behaviors, abstracted from each of the studies. These central behaviors, twenty in all, are identified in a table showing which studies they were abstracted from. The MACO framework served to help organize the behaviors within the contexts in which they occur, which include clinical encounters, pharmacy encounters and day-to-day management. The framework was not applied a priori to the synthesis, rather it emerged in our discussions about how the identified behavioral categories (i.e. the key concepts), from our review were related to one another.

Following the Noblit and Hare approach (1988), making comparisons across studies helps to uncover hidden meanings. In the case of our discussions, it was apparent that the central behaviors we identified across studies also occurred across a continuum of care.

Based on our review, central behaviors patients engage in include: (1) communicate with providers, (2) seek information, (3) keep current medication lists, (4) appraisal, (5) use personal or family past experience to make decisions, (6) make risk assessments, (7) denial as coping mechanism, (8) access resources, (9) get prescriptions filled, (10) manage side effects, (11) create or establish routines, (12) prioritize medications, (13) prepare correct doses of medications, (14) prepare and administer doses, (15) self-monitor, (16) use prompts as reminders, (17) respond to forgotten medications, (18) trial-and-error, (19) keep equipment needed to titrate doses in good working order, and (20) maintain prescriptions on hand. In synthesizing the literature, we have considered how these behaviors are related to one another and when they occur. The new meaning added by this synthesis is in understanding that these behaviors occur across a continuum of care and in different yet interrelated contexts (clinical encounters, pharmacy encounters and day-to-day management), which ultimately influences whether patients adhere to prescribed medications. These behaviors therefore are interrelated, but occur across the three contexts of the clinical encounter, pharmacy encounters and day-to-day home management.

Medication-taking behaviors were carried out in patients' daily lives and involved interactions with family members, healthcare providers, and the healthcare system. The most frequently mentioned behaviors occurred across three contexts including 1) communicating with providers during clinical encounters, 2) getting prescriptions filled/refilled at the pharmacy, and 3) day-to-day home management of medications, with emphasis on managing side effects and

prioritizing medication taking. We used the contexts from the MACO framework to organize the categories of behaviors across the continuum of care and used these contexts to further elaborate on the behaviors and relationships in the descriptions below.

Patient-Provider Encounters

Patients across the five reviewed studies described the importance of the patient-provider relationship. *Communicating with Providers* was identified as important to support open discussion about medications with healthcare providers (Williams, 2008) including consultants, nurses, and physicians (Walker *et al.* 2012). This encounter can occur in a hospital or provider clinic office setting or any setting in which there is a communication between a patient and a provider who has responsibilities for prescribing. Information shared during clinical encounters provides patients with information that may inform their primary decision about whether to take medications. These decisions may be based on beliefs about the medications, costs of medications, as well as patient values and preferences. The decisions are also based on how well this information is communicated to the patient in a way the patient clearly understands. For example, during clinical encounters, providers often set target physiological measures for disease control (e.g. blood pressure) influenced by medication taking. These physiological measures are the therapeutic targets of medications, and therefore not taking medications as prescribed or not taking them at all may lead to poor outcomes relative to disease control. Patients in one study considered these targets difficult and unrealistic to achieve (Williams & Manias 2013).

Patient behaviors associated with patient-provider communication included managing conflicting advice from providers (Walker *et al.* 2012), withholding information from physicians to avoid new prescriptions (Williams & Manias 2013), and questioning why they were taking certain medications (Walker *et al.* 2012). Distrust of providers was a concern and patients spent a

great deal of time searching for satisfactory health care resulting in frequent provider changes (Senteio & Veinot 2014).

Because patients across studies were managing multiple chronic conditions, it required them to manage several medications used to treat different conditions. This required patients to *keep and maintain a comprehensive current list of medications (Williams et al. 2008).* Communicating this list to providers was identified as a medication-taking behavior requiring skills in navigating the health system (Williams & Manias 2013) and communicating with healthcare providers. These factors likely then influenced pharmacy encounters.

Pharmacy Encounters

Acquiring medications required patients engage in behaviors associated with pharmacy encounters, the second context. Pharmacy encounters involve several patient behaviors, which we have categorized as a) appraisal, b) accessing resources, and c) getting prescriptions filled.

The decision to fill a prescription involves appraisal, that is, patients questioning the need for different medications (Walker *et al.* 2012) and making risk assessments regarding, for example, the long- term implications of medications (Williams *et al.* 2009) and the cumulative effect of their diseases (Williams *et al.* 2009). This requires patients to accept responsibility for their actions related to the disease and medications (Williams *et al.* 2009). Another behavior related to appraisal identified was that of denial, which was used as a coping mechanism. Some patients denied the fact that they needed medication for chronic disease management.

Appraisal, accessing resources and getting prescriptions filled leads to decision making about whether to take medications. Appraisal can be influenced by outside information the patient has received since the clinical encounter, including that from friends and family, the Internet, and other sources such as the media (Walker *et al.* 2012) (TV commercials, social

media, informational pamphlets)(Senteio & Veinot 2014, Williams & Manias 2013, Williams *et al.* 2008). Patients using information from family members (Walker *et al.* 2012) or other outside sources to inform medication taking were behaviors we categorized as *information seeking*. Diabetes and hypertension tended to be familial, and therefore knowledge came from family experience. Patients also learned from prior experiences in which medications had helped them feel better when they experienced symptoms or, in some cases, when medications had helped keep them alive (Williams & Manias 2013). Past healthcare experiences provided background knowledge and contributed to certain beliefs about their care (Senteio & Veinot 2014). When they did not understand information (Williams *et al.* 2008) patients sought explanations from reference books, the Internet, and doctors (Williams & Manias 2013). This information then helped patients make decisions about medication taking (Williams & Manias 2013). Behaviors related to information seeking included reading medication-related materials (Williams *et al.* 2008) and information on the Internet, as well as seeking verbal advice from practitioners (Williams & Manias 2013).

In addition to appraisal, patients spent time engaging in behaviors to secure medications that we categorized as *accessing resources*. *Accessing resources* encompasses behaviors that lead to obtaining actual medications such as ordering the medication, securing transportation (Walker *et al.* 2012), (Williams *et al.* 2008), and having the ability to pay for medications (Williams *et al.* 2008). Senteio and colleagues (2014) asserted that in order to secure medications, patients had to respond to changes in insurance coverage and medical care. Medical care was noted in another study when patients needed to follow up with an additional physician appointment when a prescription had run out (Williams *et al.* 2008).

G*etting prescriptions filled* or refilled was mentioned in four studies (Senteio & Veinot

2014, Walker *et al.* 2012, Williams & Manias 2013, Williams *et al.* 2008) and required planning and time management skills (Williams *et al.* 2008). It required patients to order medications when needed (Walker *et al.* 2012), and this was more difficult when they had to deal with refills for medications at different times (Williams *et al.* 2008). When medications were not in stock at pharmacies, patients resorted to other options such as using other family members' medications (Senteio & Veinot 2014).

Day-to-Day Home Management

Managing side effects. Management of side effects was discussed in four studies (Walker *et al.* 2012, Williams & Manias 2013, Williams *et al.* 2008, Williams *et al.* 2009). Effective management of side effects required knowledge of side effects and relating symptoms and side effects to medication (Williams *et al.* 2008). Medication-taking behaviors used to manage side effects included altering doses of medications, adjusting timing of the regimen, or deliberately missing medications (Walker *et al.* 2012). Patients were able to anticipate side effects (Williams *et al.* 2008), and in some cases patients recognized that they could avoid side effects if they stopped taking medications (Williams & Manias 2013, Williams *et al.* 2009). When side effects occurred, communication with the pharmacy and physician about current medication was an additional behavior associated with managing side effects (Williams *et al.* 2008).

Prioritizing Medications. Prioritization efforts were associated with decision-making about which medications to take while prioritizing competing demands associated with family obligations. Prioritization of medication included deciding which medicines were important (Williams *et al.* 2008) and deciding which ones to take or not take (Williams *et al.* 2008), which included prioritizing medical directives (Senteio & Veinot 2014). Patients independently decided which chronic conditions were more important and chose medications to take based upon this

assessment (Williams *et al.* 2009). They prioritized information that helped inform medication taking (Williams *et al.* 2009). They also took medications for conditions deemed to be more salient (Williams *et al.* 2009), and in some cases this meant choosing medications they thought to be absolutely necessary for health (Williams & Manias 2013). Some patients also prioritized medications based on cost (Senteio & Veinot 2014). Finally, prioritization included managing competing external demands that complicated medication taking (Williams *et al.* 2009). Patients often prioritized family needs ahead of taking medications (Williams *et al.* 2009). Effective medication taking required interrupting family activities if necessary to take medications as scheduled (Williams *et al.* 2009), as well as managing distractions and competing demands that complicated medication taking (Senteio & Veinot 2014, Williams & Manias 2013, Williams *et al.* 2009).

Preparing correct doses of medications. Preparing medications for medication administration was an important behavior. This included recognizing specific medication characteristics such as the color, size, and brand name differences in order to take the right medication at the right time (Williams *et al.* 2008). Sorting medications was important in preparing correct medications, and family members often supported this function (Walker *et al.* 2012). In order for patients to prepare and administer medication doses, they needed to have a clear head (Williams *et al.* 2008). One patient stated that a simple task such as cutting a pill in half was challenging due to age. They also needed to be able to swallow multiple pills, difficult for some (Williams *et al.* 2008). In some cases, patients required assistance with medication taking from friends, spouses, or other family members (Williams & Manias 2013). In other circumstances, such as blood glucose monitoring, patients had to keep their equipment in good working order to determine the medication dose needed. Maintaining properly working

equipment was mentioned in only one study (Williams & Manias 2013). In this population, the equipment might include glucose monitoring equipment or blood pressure monitors. Since some medication-taking behaviors involve self-monitoring, maintaining the equipment is important.

Self-monitoring and Independent Behaviors. Patients participated with varying degrees in their medication-related self-management. For example, Williams et al. (2009) reported that 43% of the patients interviewed did not know the results of their blood pressure readings and believed this knowledge was relevant to the physician, not necessarily to themselves, whereas some patients in Walker's study (Walker *et al.* 2012) checked their own blood pressures and maintained copies of relevant lab tests. Some patients reported that they believed nothing unexpected would happen if they kept an eye on the disease process (Walker *et al.* 2012).

Creating or establishing routines. Patients described establishing routines by aligning medication taking with daily routines such as mealtimes (Walker *et al.* 2012). This required diligence (Senteio & Veinot 2014), but patients also noted a "cyclical struggle," being diligent intermixed with periods of "laxity." Adjustments to eating schedules and sleeping later than normal disrupted medication-taking routines. When new medications were prescribed, patients had to disrupt their established routines and develop new ones (Williams *et al.* 2008).

Using prompts as reminders. Patients also reported the use of various prompts to help them remember to take medications, including pillboxes, calendars (Williams & Manias 2013, Williams *et al.* 2008), charts, diaries (Walker *et al.* 2012), and automatic reminders on a mobile phone (Williams & Manias 2013). These behaviors targeted remembering to take medications. Patients also used prompts to help them remember if they had taken their medications (Williams *et al.* 2008). For example, they counted used needles at the end of each day to be sure all insulin had been taken (Williams *et al.* 2008). No elaboration was provided about what they did when

there was a discrepancy.

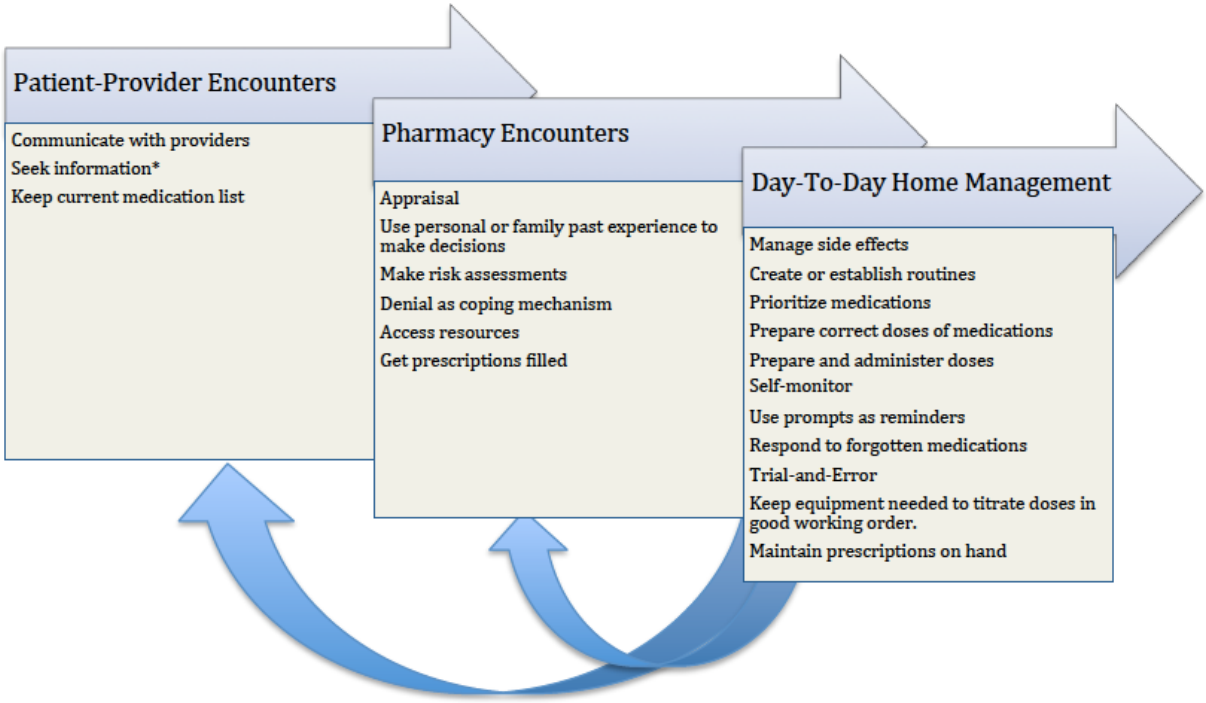
Responding to forgotten Medications. Remembering to take medication is a critical component of medication taking. Patients often forgot to take their medications, but when they remembered to take them, the medication may not have been available because they were outside their normal routines. Keeping duplicate supplies in other convenient locations was an additional behavior used (Williams, 2008).

In addition to the above-mentioned behaviors, patients also reported using trial-and-error medication-taking behaviors to manage symptoms and side effects of medications. In two studies (Williams & Manias 2013, Williams *et al.* 2008), patients described manipulating medications to achieve desired outcomes, meaning they added new medications such as supplements and complementary alternative medications (e.g. fish oils, vitamin D) (Williams & Manias 2013) or stopped taking medications to determine the effects of this on their symptoms. In some cases, patients would make these adjustments without their doctors' knowledge or advice; patients reported they would stop medications and monitor if symptoms disappeared before seeking medication advice (Williams *et al.* 2008). In some cases patients would adjust the timing of medication administration or avoid taking medications at all (Williams *et al.* 2008). Decision-making was a large component of these "trial-and-error" behaviors. Physical symptoms or lack thereof informed patients' decisions about medication effectiveness (Williams & Manias 2013). In some cases, people would engage in other self-management behaviors such as diet to avoid taking medications (Williams *et al.* 2009). Trial-and-error methods may be one way that people try to avoid changes in their lifestyle perceived as negatively affecting their quality of life (Williams *et al.* 2009).

Persistent medication taking involves getting medications refilled when they run out, which may require new prescriptions with the goal being to keep medications on hand (Senteio & Veinot 2014, Williams & Manias 2013, Williams *et al.* 2008). Previously identified behaviors contribute to refilling prescriptions, as well as patients' recent experiences taking their medications. These experiences are based on patient preferences and values. For example, if medications interfere with an activity that is important to them they may not want to refill the prescription. These decisions represent another decision time point that affects long-term medication taking and management behaviors and whether patients follow through with getting the prescription refilled. When patients had multiple different medications and refills occurred at different times, it was inconvenient to go back and forth to the pharmacy so often, and therefore patients often stretched their medications until the next time they needed to go to the pharmacy (Senteio & Veinot 2014). Additionally, prescriptions were often time limited or had expired, requiring patients to schedule and attend a physician appointment to obtain a new prescription (Williams & Manias 2013). Sometimes the unavailability of medications from the pharmacy and insurance interfered with patients being able to obtain their medications in a timely manner. Patients also mentioned that sometimes pharmacies did not have medications in stock (Williams *et al.* 2008). When multiple medications were prescribed, patients had to create systems to reorder and secure multiple prescribed medications (Walker *et al.* 2012). In some cases when patients ran out of medications, days or weeks would go by without them taking medications (Williams *et al.* 2008). To stretch medications, patients would skip them for days or weeks to make them last until the next prescriptions were available (Senteio & Veinot 2014). This required patients to keep track of medications and refill dates (Williams & Manias 2013) in order to maintain a supply of medication (Williams & Manias 2013).

To further illustrate the translation of findings and synthesize the results, we developed Figure 2. [insert Figure 2 here]

Figure 2. Categories of Medication-taking Behaviors Across Contexts



We organized the 20 categories of behaviors in the contexts in which they occurred. Behaviors that occur in patient-provider encounters affect behaviors that occur subsequently in pharmacy encounters and the day-to-day management of medications. Likewise, day-to-day home management behaviors affect subsequent behaviors of refilling prescriptions and clinical encounters. This reflects that medication management is cyclical and occurs across a continuum.

Discussion

In this review, we identified medication-taking behaviors used by people with CKD and multiple chronic conditions. These behaviors occur within three interrelated contexts to include patient-provider encounters, pharmacy encounters and the day-to-day home management of

medications. These contexts represent managing medications across a continuum, with specific behaviors occurring across each context, with the exception of information seeking which was a behavior noted in all three contexts. While we identified and described 20 categories of medication-taking behaviors embedded in these contexts, the most important finding from this synthesis is that, these behaviors are distinctly different yet interrelated and represent medication management as a process that occurs across a continuum.

Contexts in which different medication management behaviors occur are relevant to developing theoretical models. Commonly studied behavior change theories target individuals, but none reflect the socio-contextual behaviors that occur across the continuum, reflecting a multi-level ecological view of medication management. Although there is recognition that medication adherence is a multi-level problem, no interventions have approached medication adherence guided by ecological theories. In particular, a recent meta-analysis reported that most theory driven interventions are focused on cognitive factors such as knowledge, beliefs, and attitudes (Conn *et al.* 2016) that have had limited effect on medication adherence.

Adopting a multi-level ecological view of medication management requires research methods to better understand these behaviors in context. First we need to continue to empirically explore medication adherence across the three contexts. Several systematic reviews and meta-analyses have demonstrated limited effectiveness of interventions to improve medication adherence and improve clinical outcomes (Conn *et al.* 2015, Fletcher *et al.* 2015, Viswanathan *et al.* 2015). While the measurement of medication adherence is often implicated when interpreting findings (Thakkar *et al.* 2016, Vik *et al.* 2004, Voils *et al.* 2011), little attention has been paid to the interrelated contexts in which the interventions are delivered. Second, longitudinal research may help understand the cyclical nature of these behaviors across contexts and the continuum

that leads to long-term medication management. Future research that includes longitudinal designs with measures of specific medication-taking behaviors in people with CKD and multiple chronic conditions is recommended.

Clinical Application

Healthcare patient-provider interactions require effective communication behaviors so patients can partner with healthcare team members. Patients in one study (Senteio & Veinot 2014) reported physician communication as problematic and poor physician communication is linked with an almost 20% higher risk of medication nonadherence. Our review also highlighted patients deliberately chose to not communicate certain information such as their symptoms, side effects, or changes they had made in their medication regimen because they feared receiving new medication prescriptions which was viewed as disruptive in daily living. This patient population is particularly vulnerable to progressively worsening kidney disease, cardiac events and mortality and withholding information to prevent disruptions in daily living may ultimately lead to poorer outcomes. These findings call attention to the need for providers to seek to understand patients' day-to-day management of medications. Repeated dialogue with patients that includes education with behavior support can help bridge the gap between clinical encounters and daily experiences of managing multiple medications for multiple chronic conditions. Interventions that include education with behavior support provided with patient contact over a period of weeks or months have been found to be the most effective across multiple clinical conditions (Viswanathan *et al.* 2012).

Policy Implications

Adjustment of medication dosing was a medication-taking behavior mostly associated with patients desire to self-manage their conditions. In some cases it was difficult for patients to

prepare and administer their own medications, in other cases patients did not have access to needed medications. From a policy perspective, in order to support medication management, patients need access to medications. This includes ensuring medications are cost effective, available in sufficient quantities and drug development pays particular attention to patient reported outcomes. International efforts to address system level barriers such as the Australian National Medicines Policy are targeting increased access to medications including controlling costs, appropriateness of prescribing and working with pharmaceutical industry to support development of medicines to increase availability (2014). These efforts mainly affect the clinical and pharmacy encounter contexts and help improve access to needed medications. Policy efforts should also consider once access to needed medications is improved, how people can best be supported in their day-to-day medication management. Consideration should be given to nurses to help support patients in their day-to-day medication management as their autonomous scope of practice includes enhancing patients' functional capabilities and symptom management. Nurses may be able to help bridge care across the continuum; however the economics of this endeavor need further exploration.

Methodological Strengths and Limitations

This synthesis contributes a greater understanding of the complex behaviors associated with medication adherence. Meta-ethnography permits findings from multiple studies to be combined, leading to new interpretations of the combined data (Britten *et al.* 2002b) . In this way, the data abstracted from published reports becomes primary data and allows for greater insight across a body of literature. The literature included in this study was limited to five studies, therefore as new literature is identified, the synthesized findings herein should be either confirmed or refuted, which is a strength of the meta-ethnographic approach in synthesizing

literature. Our synthesis described a continuum of behaviors across three contexts; however the studies in this review were cross-sectional; further study is needed to empirically confirm which behaviors may occur at different time points, such as which behaviors are specific to patient-provider encounters, patient-pharmacy encounters, or patient day-to-day management, and how they may change over time. Reported findings also include both patient reported findings and authors' interpretations and therefore require further validation. Intervention design should consider the range of these medication-taking behaviors, the different skills needed at these different time points, which behaviors lead to positive or negative outcomes, and which should be targeted during intervention delivery.

Conclusion

There are multiple categories of distinctly different medication-taking behaviors that occur across a continuum of interrelated contexts. The majority of patient behaviors identified occur within the day-to-day context; however these behaviors are affected by the behaviors and contexts that precede day-to-day management. A multi-level ecological view of medication management should guide medication adherence research. An ecological understanding of medication management that includes the socio-contextual behaviors that occur across the continuum can be applied to clinical practice and policy development.

Relevance to Clinical Practice

This synthesis calls attention to the complexity of medication management that occurs across different contexts, yet demonstrates the interrelationships of contexts and subsequent decision-making and management of medications. The health care team, including nurses, physicians and pharmacists, has the opportunity to support patients with many of these medication-taking behaviors. In developing better relationships with patients, healthcare

providers should elucidate patients' experiences with managing their medications and help devise interventions that will support adherence and address patients' concerns about taking medications. Nurses are positioned to support patients' medication management by helping to identify barriers to enacting medication-taking behaviors.

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Table 1. Study Characteristics

1st Author / Year	Country	Purpose	Design	Sample / Data Collection
Williams 2008	Australia	Examine factors that affect medication adherence when prescribed for those with multiple chronic conditions.	Descriptive exploratory	23 patients with CKD and DM Mean age = 59.3 (SD = 15.5) 65% male Number of prescribed medications: median = 10 (range 4-14) Patients had a median of 5.5 additional chronic conditions including hyperlipidemia, bone disease, and depression. Structured interviews
Williams 2009	Australia	Examine irrational thought as a contributor to medication nonadherence.	Descriptive exploratory	23 patients with CKD and DM Mean Age = 59.3; SD = 15.5 65% male Individual interviews

1st Author / Year	Country	Purpose	Design	Sample / Data Collection
Walker 2012	England	Explore the experience of integrating lifestyle changes into daily living when progressing to CKD Stage 4.	Exploratory-descriptive	9 patients with CKD GFR < 25 mL/min (MDRD) Age range 63 – 93 years 44% male Semi-structured interviews
Williams 2013	Australia	Explore the motivation and confidence to take medications as prescribed during an intervention trial.	Secondary analysis of interview data from a randomized controlled trial	39 patients with CKD, DM, and HTN GFR > 15 ≤ 60 (MDRD) Mean age = 68 (SD = 8.3) 56% male Number of prescribed medications: Mean = 7.6 (SD = 2.6; range 1-10) Semi-structured motivational interviewing
Senteio 2014	United States	Examine adherence-related challenges of African Americans	Grounded theory	37 patients with at least two of the following conditions: CKD, DM, or HTN

1st Author / Year	Country	Purpose	Design	Sample / Data Collection
		living in high-poverty neighborhoods with more than one chronic condition.		Mean age 56.9 (range 21-90) 27% male Semi-structured interviews

Table 2. Categories of Behaviors Across Studies in Review

	(Williams, Manias, & Walker, 2008).	(Williams, Manias, & Walker, 2009)	(Walker et al., 2012)	(Williams & Manias, 2013)	(Senteio & Veinot, 2014)
Patient-Provider Clinical Encounters					
Communicate with providers	X		X	X	X
Seek information*	X			X	X
Keep current medication list	X			X	
Pharmacy Encounters					
Appraisal			X		

	(Williams, Manias, & Walker, 2008).	(Williams, Manias, & Walker, 2009)	(Walker et al., 2012)	(Williams & Manias, 2013)	(Senteio & Veinot, 2014)
Use personal or family past experience to make decisions			X	X	X
Make risk assessments		X			
Denial as coping mechanism		X			
Access resources	X		X		X
Get prescriptions filled	X		X	X	X
Day-to-Day Home Management					
Manage side effects	X	X	X	X	
Create or establish routines	X		X		X
Prioritize medications	X	X		X	X
Prepare correct doses of medications	X		X		
Prepare and administer doses	X			X	X
Self-monitor		X	X		
Use prompts as reminders	X		X	X	
Respond to forgotten medications	X				

	(Williams, Manias, & Walker, 2008).	(Williams, Manias, & Walker, 2009)	(Walker et al., 2012)	(Williams & Manias, 2013)	(Senteio & Veinot, 2014)
Trial-and-Error	X	X		X	
Keep equipment needed to titrate doses in good working order.				X	
Maintain prescriptions on hand	X			X	X

*occurs across contexts