Decreasing Chronic Kidney Disease Complications through Improved Early Identification and Nursing Interventions

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ABSTRACT

Data reported in the United States Renal Data System's (USRDS) 2015 Annual Report indicates the overall prevalence of chronic kidney disease (CKD) was 14.8 % (United States Renal Data System [USRDS], 2015). While progression to ESRD may not be completely preventable, studies have suggested the timing of renal specialty care may impact patient outcomes. Educating bedside nurses (RN) and primary care nurse practitioners (APRN) to identify and manage early stage CKD and related risk factors is crucial to optimize patient outcomes (Paige & Nagami, 2009). Implementation of evidence based practice guidelines that facilitate early identification of CKD may delay the progression to ESRD. A nephrology-specific educational course and guideline tool provided RNs & APRNs with the requisite knowledge, skills, and attitudes (KSA) on evidence-based care for patients in early stage CKD. KSA levels of RNs and APRNs, referral, and return to acute care facility rates (RTACF) were measured pre and post-intervention. A significant increase in knowledge levels was found for both RNs and APRNs following the educational sessions. This enhanced knowledge translated into demonstrable increases in both nephrology referral and RTACF rates for patients with renal-related diagnoses. The use of organizational leadership tenets, nursing theory, change theory, and advanced nursing practice has resulted in the implementation and evaluation of a quality improvement project demonstrating enhanced nursing KSA and care of the nephrology patient. This project demonstrates the importance of the non-nephrology nurse's practice in playing an essential role in the identification, evaluation, and management of CKD. Through the dissemination of evidence-based practice guidelines in a facility-based continuing education model, improvements in the delivery of patient care and outcomes can be recognized.

Keywords: chronic kidney disease, end stage renal disease, early referral, and progression

Decreasing Chronic Kidney Disease Complications through Improved Early Identification and Nursing Interventions

Data reported in the United States Renal Data System's (USRDS) 2015 Annual Report indicates the overall prevalence of chronic kidney disease (CKD) was 14.8 % with 32 to 40 % also having diabetes or hypertension (United States Renal Data System [USRDS], 2015). The prevalence of CKD stage three has climbed from 5.4 to 6.6 % from 1999 to 2014. The prevalence of end-stage renal disease (ESRD) continues to climb by approximately 21,000 cases per year across all ethnic groups (USRDS, 2015). Rehospitalization rates for older Americans with CKD or ESRD remain higher than individuals without renal disease, 22.3, 34.8 and 15.8 %, respectively (USRDS, 2015). Advance practice registered nurses (APRN) practicing as primary care providers (PCP) as well as bedside staff nurses can have a positive impact on outcome measures such as compliance of therapeutic regimen, patient knowledge of disease process, patient satisfaction, and quality of life (Keleher, Parker, Abdulwadud & Francis 2009). The delivery of disease-specific education regarding identification, evaluation, and evidence-based management to these providers and development of an evidence-based protocol may have a positive impact on patient outcomes.

Background

In the role of a nephrology nurse practitioner, it is not uncommon to receive requests from primary care nurse practitioners and long-term rehabilitation centers for renal consultation care. A recurring theme is the advanced stage of renal dysfunction and the lack of knowledge experienced by these patients as well as the nurses providing care to this patient population. The staging of CKD has been established based on glomerular filtration rate (GFR) and the level of albuminuria. There are currently six stages based on GFR: G1 >90 ml/min/1.73 m^2, G2 60-89

ml/min/1.73 m^2, G3a 45-59 ml/min/1.73 m^2, G3b 30-44 ml/min/1.73 m^2, G4 15-29 ml/min/1.73 m^2, and G5 < 15 ml/min/1.73 m^2 (National Kidney Foundation [NKF], 2012). With respect to level of albuminuria or albumin excretion rate (AER), there are three stages: A1 30 mg/24 hours, A2 30-300 mg/24/hours, and A3 > 300 mg/24 hours (NKF, 2012). A decrease in GFR and/or AER is indicative of disease progression. The progression of early stage CKD to ESRD can be measured on a scale of months depending on the presence or absence of co-morbid factors (Vigil, Condés, Camacho, Cobo, Gallar, Oliet, Rodriguez, Ortega, Mon, Ortiz & Herrero, 2015). A lack of provider knowledge of the disease process, more specifically progression, can lead to a negative impact on the patient's health outcomes. Understanding the crucial concepts of CKD and related co-morbid conditions is necessary to improve the progression rates of CKD to ESRD (Paige & Nagami, 2009). In addition, the USRDS (2015) indicates only 2.7-2.8 % of patients with CKD self-reported the presence of kidney disease. Unfortunately, in our society, providers do not spend enough time educating the patient about their disease process, signs and symptoms, or complications possibly due to primary care providers lacking the requisite knowledge, skills and attitudes related to the care and management of this unique patient population.

While progression to ESRD may not be completely preventable, studies have suggested the timing of renal specialty care may impact patient outcomes. A systematic review of research studies evaluating the outcomes in patients diagnosed with CKD indicate a reduction in mortality at three-months, six-months, twelve-months and five-years associated with early nephrology referrals (Smart & Titus, 2011). Other quality measures associated with earlier specialist referral included higher hemoglobin levels, decreased erythropoietin use, and lower creatinine levels (Smart & Titus, 2011). In addition, early referral was linked to shorter duration of hospitalizations. An analysis of ESRD treatment modality outcomes suggests improved quality

of life, patient satisfaction, and patient education is also associated with early nephrology care (Smart & Titus, 2011).

The USRDS (2015) reports the presence of diabetes or hypertension in approximately 40 and 32 % of patients with CKD respectively. Although management of diabetes and hypertension are well within the expertise of providers with a primary care or internal medicine education; in the context of early stage CKD, the ideal treatment protocols may not be implemented. For example, therapies targeting inhibition of the renin-angiotensin system have been shown to delay the progression of CKD (Hirsch, 2006). In addition, identification of markers for CKD may be overlooked in some cases. The diagnosis of CKD should follow the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines which include both a decrease in glomerular filtration rate (GFR) and evidence of kidney damage such as proteinuria, electrolyte imbalances or abnormal renal histology (NKF, 2012).

Educating primary care nurse practitioners to identify and manage early stage CKD and related risk factors is crucial to optimize patient outcomes (Paige & Nagami, 2009). The primary care provider is at the forefront of the United States (U.S.) healthcare system and can serve as the entry point into required healthcare services. Numerous studies support the role of the primary care provider in providing general health services access, facilitating quality of general and specialty care, promoting preventative interventions, and managing disease conditions in earlier stages (Starfield, Leiyu & Macinko, 2005).

This project proposes to provide APRNs and bedside nurses nephrology-specific educational sessions and a treatment protocol guideline for care of the CKD patient in a long-term acute care facility. The request rates for nephrology consultation will be measured prior to and following the educational sessions.

Problem Statement

The prevalence and incidence of CKD and ESRD continues to present a significant healthcare issue in the U.S. Early identification of CKD can delay the progression to ESRD and improve patient outcomes such as mortality, quality of life, and patient satisfaction as well as decrease the need for late nephrologist intervention through increasing the knowledge, skills, and attitudes of the PCP in the acute renal injury stages. Primary care and non-nephrology providers remain unaware of the issues surrounding early versus late renal-specific interventions or referrals (Huisman, 2004). Although the medical profession has begun efforts to address this issue, the literature to support this practice in the nursing profession is lacking.

Purpose Statement

The overarching aim of this project is to delay the progression of ESRD in patients diagnosed with CKD Stage 1-3. The reduction in ESRD rates of progression may be achieved by developing protocols for nurses to recognize, evaluate, and treat upon admission to their service. A nephrology-specific educational course and guideline tool will provide bedside nurses with the requisite knowledge, skills, and attitudes to provide appropriate, evidence-based care for patients in early stage CKD. In addition, this project will improve their ability to recognize, evaluate and report co-morbid disease processes such as hypertension or diabetes that are common risk factors for the incidence and prevalence of CKD and/or ESRD.

Project Questions

Will primary care APRNs and bedside nurses successfully identify, evaluate and report hypertension, hyperglycemia and dehydration in patients with CKD using a pre-post comparative measurement over a three-month period if given appropriate nephrology specialty training? The outcome measurement for this question will be a comparison of knowledge levels for both

APRNs and bedside nurses pre and post nephrology-specific educational sessions along with a pre and post chart audit.

Does providing nephrology-specific education and treatment protocols to APRNs and bedside nurses reduce the renal-related return to acute care facilities (RTACF) as measured by correlating pre and post comparison of appropriate, early nephrology consultation requests with RTACF rates? The outcome measurement for this question will be a comparison of the diagnosis of renal disease through an audit of the facility's ICD-10 codes and the amount of nephrology consultation requests, pre and post nephrology-specific educational sessions.

Objectives

Objective 1

Evaluate levels of knowledge, skills, and attitudes of APRNs and bedside nurses in providing nephrology-specific nursing care for patients admitted to a rehabilitation facility pre and post nephrology-specific, patient-care education.

Objective 2

Provide nephrology-specific, patient-care education for APRNs and bedside nurses to address knowledge, skills, and attitudes for identifying and reporting co-morbid conditions associated with early stage CKD (Appendix A).

Objective 3

Develop protocol guidelines that APRNs and bedside nurses can refer to when identifying signs and symptoms of hypertension, hyperglycemia, and dehydration in the early stage CKD patient (Appendix B).

Objective 4

Increase the early referral rates to nephrologist specialty care providers over a three-month period.

Literature Search

A thorough review of current literature was performed using the Cumulative Index of Nursing and Allied Health Literature (CINAHL) Plus with Full Text, Academic Search Complete and PubMed databases. Search terms included keywords: chronic kidney disease, end stage renal disease, early referral, late referral, treatment initiation, prevention, progression, progression delay, nursing, nurse-driven, nurse-led, health promotion, mortality, hospitalization and complications. Studies were not limited by geography or type but were limited by the most recent 15 years, English language, and peer-reviewed. The Boolean phrases were used in various combinations with the keywords listed above in multiple search cycles to produce approximately thirty-five articles. The fourteen articles used for this literature review were selected based on the strength of the study demonstrating the impact of the timing of nephrology-specific interventions and evidence supporting improved patient outcomes through nurse-driven models of care.

Review of Literature

Early Nephrology-Specific Intervention

The notion of delaying or preventing the progression of CKD to ESRD is based on evidence supporting the initiation of nephrology-specific care interventions in the early phases of the disease process. A retrospective study of 726 patients diagnosed with moderate to late-stage CKD examined the impact of nephrology-specific care on slowing the progression of CKD and patient mortality or survival (Jones, Roderick, Harris, & Rogerson, 2006). The authors demonstrated a significant decline in CKD progression, as measured by a slowing in the rate of

GFR. This reduction was associated with nephrologist referral and strongly correlated with average lower systolic blood pressures (Jones, et. al., 2006). The post-referral decline in GFR rates were also associated with a significant decrease in the risk of mortality (Jones, et. al., 2006). The timing of specialist interventions and the relation to patient prognosis must also be considered. A meta-analysis of 20 research reports was performed measuring the mortality and hospitalization rates in patients diagnosed with CKD associated with the timing of nephrology-specialist referral. Late referral was defined as nephrology intervention within three months of initiation of dialysis therapy for mortality and within four months for duration of hospitalization. With respect to mortality, the authors identified a higher risk of death as associated with late nephrology referrals (Chan, Dall, Fletcher, Lu & Trivedi, 2007). The authors also report a significant decrease in the length of hospital stays was associated with earlier nephrology interventions (Chan, et. al., 2007). Some of these improvements in patient outcomes may be related to enhanced blood pressure control due to the utilization of renoprotective agents for hypertension which would be a nephrology-specific consideration geared towards delaying the progression of CKD (Hirsch, 2006; Martínez-Ramírez, Jalomo-Martínez, Cortés-Sanabria, Rojas-Campos, Barragán, Alfaro & Cueto-Manzano, 2006). Smart and Titus (2011) performed a systemic review of 27 studies to identify the association between early or late nephrology referral on outcome measures such as mortality or length of initial hospitalization with the definition of late referral ranging between one and six months prior to the initiation of dialysis therapy. The analysis indicated a decrease in the odds ratio for mortality rates at multiple time points associated with earlier nephrology referral (Smart & Titus, 2011). The decreased mortality was calculated to be 49 percent at three months, 41 percent at six months, 45 percent at twelve months and 55 percent at five years (Smart & Titus, 2011). Similarly, the duration of

hospitalization is correlated with referral timing. Those patients receiving early nephrology-specific care spent an average of 8.8 fewer days at initial hospitalization (Smart & Titus, 2011). In a prospective study conducted by Kim, et. al., (2013), 1,028 patients were categorized as early referral if nephrology-specific referral occurred more than one year prior to initiation of dialysis. The early referral patients experienced a significantly longer dialysis-free period compared to the late referral group, 62.3 months versus 2.9 months, respectively (Kim, et. al., 2013). The authors reported the mortality rate in the late referral patients to be 2.4 times higher than in the early referral group, which included deaths related to cardiovascular events (Kim, et. al., 2013). The majority of early versus late referral studies are examining the phenomenon from the perspective of the physician primary care provider. Little is known regarding the knowledge, skills, and attitudes of the APRN with respect to nephrology-specific care in the setting of early CKD. Thompson-Martin, McCullough and Agrawal (2015) describe the effectiveness of an educational course for nephrology-specific, assessment, evaluation and management of the patient at risk for or diagnosed with CKD. Using knowledge on evidence-based treatment guidelines as the outcome measure, the study reported an increase in core knowledge following participation in the educational meeting (Thompson-Martin, et. al., 2015). The significant differences between the pre and post-education knowledge scores suggest the academic preparation of the primary care APN are not sufficient to maintain knowledge of best practices related to CKD and CKD progression, similar to other reports examining internal medicine or primary care physician knowledge (Thompson-Martin, et. al., 2015).

Nurse-Driven Health Promotion

Nurse-driven patient care programs have been described throughout the literature to result in improved patient outcomes, enhance effectiveness of healthcare delivery, and increase

identification and treatment of disease conditions. Tracey, Cossich, Bennett, Wright, & Ockerby (2013) described a model of care developed to enrich the delivery of local and regional renal care. The program was designed to be managed by a nephrology nurse expert in collaboration a multidisciplinary team of healthcare providers including a nephrologist, nurse educator, community or clinic nurses, healthcare specialists, and administrative support personnel. Upon implementation, the program proved successful in early identification of patients with CKD allowing for greater access to education regarding behavioral modifications and treatment options suggesting a potential for a reduction in CKD to ESRD progression (Tracey, et. al., 2013). Other benefits included an increase in health promotion activities such as screening for hypertension resulting in timely initiation of treatment (Tracey, et. al., 2013). Predialysis nursing care is a critical component in the delivery of quality care for the CKD patient population. Appropriate predialysis education has been correlated with extending the time to the initiation of dialysis and had a positive impact on patient survival rates in patients with CKD (Devins, Mendelssohn, Barré, & Binik, 2003; Devins, Mendelssohn, Barré, Taub & Binik, 2005). The key aspects for the role of the predialysis nurse include patient education, patient engagement, collaborating with multidisciplinary team members, and preventing complications (Walker, Abel, & Meyer, 2010). With respect to minimizing complications of early-stage CKD, the predialysis nurse can play role in monitoring blood pressure trends, glycemic control, and monitoring of key laboratory results (Walker, Abel, & Meyer, 2010). Knowledge of and addressing barriers to the effective practice of predialysis nursing should be addressed to maximize their contribution to improve patient outcomes (Walker, et. al., 2012). An effective, collaborative relationship with the provider has been identified as one essential component for the practice of the predialysis nurse and can impact the quality of care the nurse is able to

provide (Walker, et. al., 2012). Nurses in these roles have suggested an efficacious rapport facilitates an environment of trust and increases the nurse's autonomy in providing care for the CKD patient, which in turn improves the quality of nursing care with respect to identifying or evaluating patient conditions and recommending appropriate interventions (Walker, et. al., 2012). Nurses practicing in a clinical specialist or advanced role have developed programs facilitating a linkage between general and specialist providers and care teams (Nikolajenko, 2013). One of the project's aims was to increase the detection of early-stage CKD through the development and implementation of assessment tools for use in the primary care setting (Nikolajenko, 2013). Increasing awareness of the prevalence of CKD in the practices also led to the discovery of knowledge gaps in the appropriate care and management of this patient population including, blood pressure management and other renal-specific interventions (Nikolajenko, 2013).

In summary, the literature review suggests improvements in patient outcomes for patients with CKD are achievable when the planned care includes nephology-specific treatment protocols. Outcomes measured include decreased rates of mortality and hospitalizations as well as delayed initiation of dialysis treatment suggesting a slowing of the progression of CKD to ESRD. Nurse's play a fundamental role in the identification, evaluation, and management of chronic diseases such as CKD. The collaborative nature of the nurse's practice is critical to improving overall patient outcomes.

Theoretical Framework

The theoretical framework in a research study provides a foundation by imparting a structured vision and organized flow throughout the project. This framework also serves as an essential element for the project's inquiry and provides organization on the chosen methodology

for the research. An aim of this research project is to improve the APRN's and bedside nurse's ability to recognize, evaluate, and report co-morbid disease processes such as hypertension or diabetes that are common risk factors for the incidence and prevalence of CKD and/or ESRD. In a survey of relevant theories to provide a framework, the particular theory that best resembles this author's project is that of Patricia Benner's novice to expert. This theory provides comprehensive context to the project as it measures learning and critical thinking skills as practitioner's transition from beginner to advanced nurse.

In the context of history, Stuart Dreyfus and Hubert Dreyfus originally posited that students develop expertise by passing through five stages of proficiency which reflect changes or improvements of individual skilled performance (as cited in Benner, 1984). Dreyfus and Dreyfus described the transition as initially relying on abstract principles while progressing to reliance on concrete familiarities as models (as cited in Benner, 1984). Influenced by both Stuart and Hubert Dreyfus as well as Virginia Henderson, Benner adapted the novice to expert theory to clinical nursing practice (Masters, 2015; Gobet & Chassy, 2008). Benner's work originally included seven domains and 31 competencies relating to clinical situations. Later, Benner extended her work to include nine domains of learning specific to the critical care nurse.

Benner describes five levels of nursing experience which include, in order: 1) Novice, 2) Advanced beginner, 3) Competent, 4) Proficient, and 5) Expert. The novice is considered a beginner with no experience and is governed by rules. The advanced beginner recognizes meaningful components of patient care due to prior experiences. The competent nurse usually has two to three years of experience in the same area of patient care. The proficient nurse has a more holistic understanding that improves his or her decision-making skills. Finally, the expert nurse has a great deal of experience, an intuitive grasp of clinical situations, and performs fluidly

(Benner, Kyriakidis, & Stannard 2011 & Masters, 2015). Masters (2015) further describes the expert nurse as one who is able to smoothly and unconsciously perform. Masters (2015) and Benner, et. al., (2011) described nine domains of critical care nursing practice that when broken down into the simplest of terms, means, the expert critical care nurse is easily able to practice reasoning while prioritizing patient and family needs by utilizing intelligent performance methods.

Benner (1984) suggests, nurses in the expert level of understanding, are able to distinguish minute physiological alterations in a patient's status thereby allowing for the opportunity to deliver interventions that prevent further deterioration. The ability to recognize, evaluate, and document subtle changes are crucial for implementation of successful modifications and treatment options that may promote a reduction in CKD progression. These abilities are likely to be developed through professional nursing experiences that are crucial to the development of clinical competence (Maynard, 1996). However, clinical experiences alone may have little impact on the development of one's clinical reasoning skills when devoid of a situated learning environment (Field, 2004).

Benner (1984) identified the diagnostic and patient monitoring function as one of the seven domains in nursing practice. This domain is comprised of the following competencies: "1) detecting and documenting significant changes in a patient's condition, 2) anticipating breakdown and deterioration prior to explicit confirming diagnostic signs, 3) anticipating problems, 4) understanding particular demands and experiences of an illness, and 5) assessing the patient's potential for wellness and for responding to various treatment strategies" (Benner, 1984, p.97). It is within the context of this domain and related competencies, this project is derived. Through directed educational sessions to enhance the nurse's knowledge, skills, and

attitudes in providing care to the nephrology patient, APRNs and bedside nurses will more likely integrate this newly acquired information into clinical practice (Bell, Chelf, & Geerdes, 2000).

Project Design

The following DNP project is a quality improvement (QI) project. The focus of this QI project is to implement evidence based practice guidelines that facilitate early identification of CKD to delay the progression to ESRD. The improvement in the knowledge, skills, and attitudes of the bedside nurses and APRN primary care providers regarding the issues surrounding early versus late renal-specific interventions and referral can decrease the prevalence and incidence of CKD progression to ESRD. A description of the project design, target population, sampling and recruitment technique, implementation procedure, statistical analysis, and human subjects' protection follows.

The following project will employ a non-experimental, quality improvement approach utilizing the plan, do, study, and act (PDSA) method. This design is appropriate for the study of interventions developed to improve clinical outcomes (Moran, Burson, & Conrad, 2014). The project proposal includes development and implementation of a protocol guideline to serve as a reference tool for identifying signs and symptoms of hypertension, hyperglycemia and dehydration in the early stage CKD patient**.** The dependent variable in the proposed project is the rate of readmission to the acute care setting. This variable will be examined pre and post-nephrology-specific educational classes.

Setting

The setting for the project will be a 120-bed, sub-acute rehabilitation facility. The facility delivers intensive, skilled medical and nursing care to adult patients with short term rehabilitation and long-term restorative needs following acute care hospitalization or various

surgical procedures. The average length of stay is two to four weeks depending on the complexity of the health condition. The healthcare services offered at the setting provides patients with the transitional care necessary to return to their home environment. Permission to implement the quality improvement project has been obtained by the authorized facility representative.

Target Population and Stakeholders

Target Population

The proposed project participants consist of bedside nurses providing direct patient care at the facility. In addition, APRNs providing primary care services in the diagnosis, treatment, and management of the patient population admitted to the facility will be included. Individuals willing to participate in the project will be required to complete a web-based, pre-educational session survey and attend one of the sessions.

Stakeholders

Key stakeholders in the project include the facility: administration, nurse educators, risk managers, bedside nurses, associate medical providers, and the patient population at risk for or diagnosed with CKD at the facility. From a patient-centered perspective, the interests of improving the quality of nursing care delivered to the population has the potential to enhance quality of life and satisfaction. The interests of the healthcare facility are addressed through increasing the efficacy of the services provided by the organization as demonstrated by improving measurable quality outcomes. Those practicing in the nursing profession are dedicated to promoting health, preventing illness, alleviate suffering, and advocating for quality healthcare for their patients. Quality improvement measures such as proposed in this project serve to fulfill this dedication.

Recruitment Methods

The overarching aim of the project is the change the practice of registered nurses (RNs) and APRNs providing care at the facility to improve patient outcomes surrounding CKD and/or ESRD through educational sessions designed to increase the knowledge, skills, and attitudes for identifying, reporting, and managing co-morbid conditions associated with early stage CKD and development of an evidence-based guideline tool.

Registered Nurses

Approximately 100 bedside nurses at the facility will be offered the opportunity to participate in educational sessions. Educational sessions for the bedside nurses will be mandated with the support of the facility administration. Multiple sessions will be provided to accommodate various work schedules. The target sample number for data analysis is 30 bedside nurses.

APRNs

Approximately 10 primary care APRNs caring for patients at the facility are independent practitioners having established privileges to provide medical services; attendance at the educational sessions will be voluntary. APRNs practicing at other similar facilities will be invited as well. Prior to attendance at the sessions, participants will be presented with a complete description of the project proposal and offered the opportunity to participate in completion of the pre-educational session survey.

Methods that serve to facilitate internal motivation among the participants may be more effective that external drivers (Kubsch, Henniges, Lorenzoni, Eckardt, & Oleniczak, 2003). Continuing education units will be offered to participants through a Nevada State Board of Nursing continuing education provider. Other approaches to increase participant attendance

include providing the educational sessions convenient to work schedules, at the facility location, and with organizational support to address potential barriers to involvement (Katsikitis, et al., 2013). Examples of organization support may include facilitating the coordination of work schedules, providing extra staffing, or offering monetary compensation to promote nurses' attendance at continuing education sessions within the facility.

Tools and Instrumentation

A reference tool of protocol guidelines will be developed for participants to utilize when providing care to patients diagnosed with acute kidney injury (AKI), renal insufficiency, and CKD. The visually-enhanced reference tool will include identifying signs and symptoms of hypertension, hyperglycemia and dehydration in the early stage CKD patient (Appendix B). Measured data for the project includes: evaluation of the current level of knowledge, skills, and attitudes of APRNs and bedside nurses in providing nephrology-specific nursing care, referral rates to nephrology specialty care providers, and rates of the readmissions to an acute care facility with a nephrology-related primary or secondary diagnosis, such as severe acute kidney injury or severe electrolyte imbalance, or CKD. An analysis of the primary diagnosis utilized as rationale for the readmission will be performed to reject cases where the cause of readmission is unrelated to renal complications. A web-based questionnaire will be developed to assess the nephrology-specific knowledge, skills, and attitudes appropriate for both the bedside nurse and the APRN (Appendix C). The content presented in the questionnaire will be based on published guidelines and standards of care (National Clinical Guideline Centre, 2014; American Nephrology Nurses Association, 2017; NKF, 2012). A content validity index was calculated for all KSA survey items. Seven doctorally-prepared content experts reviewed the items pertaining to the RN KSAs and four nephrology APRN content experts reviewed the items relevant to the

APRN KSAs. The results showed a CVI (1) for all items in both surveys. The mean total of all the means was 3.71 for the RN items and 3.74 for the APRN items. This finding indicates the items were evaluated as moderately relevant to highly relevant (Appendix D). A custom report generated from the facility's existing electronic health record (EHR) system will be utilized to capture referral and readmission rates.

Data Collection

Knowledge Levels

The web-based questionnaire to assess current nephrology-specific knowledge, skills, and attitudes will be administered via Survey Monkey. The questionnaire will consist of eight knowledge-based items, four to five skills-based items, and four attitudes-based items. Confidentiality during data collection will be maintained throughout the project. The survey will not contain any personal identifying data other than demographic information to differentiate the responses of the bedside nurses from the APRNs. A web link to the survey will be provided to all participants in the project. Completion of the web-based survey will be performed prior to attendance at the educational session at a location of the participants choosing. Participants will receive a random number code to enter prior to completing each survey to match pre and post survey responses.

Nephrology Referrals and RTACF

A chart audit tool will be developed to identify the presence of indicators suggestive of a diagnosis of chronic kidney disease and determine the extent of appropriate nephrology referrals (Appendix E). Prior to delivery of the nephrology-specific educational sessions, a retrospective audit of 30 patient charts will be performed to establish a baseline for the identification of the indicators of CKD and appropriate early-nephrology referral. A post-educational session audit

of 30 charts will be performed to determine the impact on the recognition and improvements in early treatment and referrals and rate of return to acute care facility (RTACF) rates (Appendix E).

This project proposal will utilize a repeated measures design; that is, a variable will be recorded at two separate time points. The variable, knowledge levels of RNs and APRNs, referral rates, and RTACF will be measured prior to and after deliver of the educational intervention utilizing the survey, chart audit tool, and the facility's EHR report. The non-parametric statistical analyses are appropriate for smaller sample size and do not have stringent requirements with respect to a normal distribution of the variable of measurement (Grove, Burns, & Gray, 2013; Pallant, 2013). Descriptive statistics will be obtained regarding participant's licensure status (RN or APRN) and years of experience in the designated role.

Project Timeline

An action plan for this project is presented in Appendix F. The plan involves approaches in four general areas of strategy, people organization, process, and technology (Moran, Burson, & Conrad, 2014). The time span is September 2017 through January 2018. Strategy methods include utilizing a tool to assess knowledge, skills, and attitudes of bedside nurses and APRNs to provide appropriate, evidence-based care for patients in early stage CKD. In addition, identification of the rates of nephrology consultations and the appropriateness of referrals will be performed prior to and following the nephrology-specific educational sessions. Approaches that promote involvement of individuals in the project include utilizing visual flyers distributed digitally and physically in the facility to improve recruitment of participants at the educational sessions. Process approaches entails CKD guideline tool development and dissemination to improve adherence to the patient care, quality improvement aspects of the project as well as a

statistical analysis of the outcome measures associated with nephrology referrals and rates of return to the acute care setting due to complications associated with CKD. Finally, technology approaches include provision of nephrology-specific educational classes and auditing medical records pre and post intervention.

Human Subject Protection

This project proposal does not involve direct patient care activities and will not be using human subjects. Therefore, an Institutional Review Board (IRB) submission will not be required. Attendance at the educational sessions or completion of the KSA questionnaire will not be a condition of employment. No monetary compensation will be provided to the participants. Participant confidentiality will be maintained, as the web-based questionnaire contains no identifying data. Responses cannot be tracked to an individual. No patient identifying information will be collected throughout the project.

Evaluation Plan

The quality improvement project addresses two main questions. The identification, evaluation and reporting hypertension, hyperglycemia and dehydration in patients with CKD by bedside nurses and APRNs will be analyzed using a pre-post comparative measurement over a three-month period. The outcome measurement for this question will critiqued using two measures: a comparison of knowledge levels for both APRNs and bedside nurses pre and post nephrology-specific educational sessions and a comparison of pre-post educational session chart audits identifying the appropriateness of and nephrology referrals.

The second question addresses slowing the progression of ESRD in patients diagnosed with early CKD as measured by pre and post comparison of early nephrology consultation requests. This item will be evaluated by a comparison of the diagnosis of renal disease through

an audit of the facility's ICD-10 codes, the amount of nephrology consultation requests as determined by chart audits, and the rates of return to the acute care facilities due to complications associated with a diagnosis of CKD, pre and post nephrology-specific educational sessions.

Significance

This quality improvement project is aimed at optimizing patient outcomes in delaying the progression of CKD to ESRD through interventions appropriate to the scope of nursing practice. The notion of delaying the progression to ESRD through early versus late renal-specific interventions or referrals remains to be adequately addressed in the nursing profession. Implementing quality improvement measures to facilitate the ability of bedside nurses and APRNs to identify and manage early stage CKD and related risk factors is crucial to optimize patient outcomes. The expertise of the nursing profession, both at the bedside and advanced practice role, must be validated through evidence-based designs that reflect nursing contributions that support improved patient outcomes (Smolowitz, Speakman, Wojnar, Whelan, Ulrich, Hayes, & Wood, 2015). The potential positive outcomes demonstrated from this project proposal may contribute to this validation.

Analysis of Results

KSA Scores

Following completion of the nephrology-specific educational courses and all survey data, the KSA scores for both APRNs and bedside nurses pre and post nephrology-specific educational sessions were analyzed using the SPSS software. All individual responses for the pre and post-intervention surveys were extracted into to an excel spreadsheet. Each individual response was reviewed and reassigned to a one or two based on the answer to the item using the codebook formulation. A score of two indicated the ideal or correct response. The responses to

each item for the bedside nurses & APRNs were summated by subgroup (knowledge, skills, and attitudes). This summated data was exported into SPSS along with the respondents' years of experience. Errors for each file were validated by running a descriptive statistics analysis for the minimum and maximum value, of which none were found. The summated data were analyzed by subgroup at the two distinct time points. The data was analyzed for normality indicating a non-normal distribution as evidenced by Skewness and Kurtosis value greater than or less than zero. In addition, the Kolmogorov-Smirnov test of normality correlated with a violation of the assumption of normality. Therefore, the statistical significance between the time points was generated using the non-parametric, Wilcoxon Signed Rank Test. The effect size was calculated by hand dividing the reported Z value by the square root of the N for the participant group. The maximum value for each subgroup was calculated to determine if the respondent achieved the optimal knowledge, skills, or attitudes based on the survey design. This was completed for 44 RN respondents and 15 APRN respondents. Respondents were matched for the pre and post-intervention responses based on their unique identifying code supplied prior to the nephrology-specific classes. Any missing values were identified and the items were coded as a zero (0). A demographic frequency analysis was performed to evaluate the distribution of study participants based on years of experience at their current level of nursing practice (Appendix G).

RN

The RN participants indicated less than one year and one to three years (15.9% each), three to five years (11.4%), five to ten years (27.3% each), and more than ten years (29.5%). A Wilcoxon Signed Rank Test demonstrated a statistically significant increase only in knowledge, in the care and management of the CKD patient population following participation in the nephrology-specific educational sessions, knowledge - $z = -2.141$, $p < 0.05$, with a moderate

effect size (r = 0.32). The median score on the knowledge subgroup increased from pre-intervention (Md = 11) to post-intervention (Md = 13). The skills and attitude scores did not reach statistical significance, skills - z = -0.775, p = 0.438, and attitudes - z = -0.177, p = 0.86. The median score on the skills subgroup was unchanged from pre-intervention (Md = 8) to post-intervention (Md = 8). The median score on the attitudes subgroup increased from pre-intervention (Md = 7) to post-intervention (Md = 8). Partial correlation was used to explore the relationship between pre-intervention and post-intervention knowledge scores while controlling for years of experience. There was a non-significant, weak, negative, partial correlation between pre-intervention and post-intervention knowledge scores controlling for years of experience, r = -0.287, n = 44, p - 0.062. An inspection of the zero-order correlation (r = -0.327) suggested that controlling for years of experience had very little effect on the strength of the relationship between pre and post-intervention knowledge scores. Scores (Appendix H).

APRN

The majority of the APRN participants indicated less than one year (40%), followed by three to five years (26.7%), one to three years and five to ten years (13.3% each), and more than ten years (6.7%). A Wilcoxon Signed Rank Test demonstrated a statistically significant increase in knowledge, skills, and attitudes in the care and management of the CKD patient population following participation in the nephrology-specific educational sessions, knowledge - z = -3.096, $p < 0.05$, with a large effect size (r = 0.80), skills - z = -2.382, $p < 0.05$, with a large effect size (r = 0.62), and attitudes - z = -2.332, $p < 0.05$, with a large effect size (r = 0.60). The median score on the knowledge subgroup increased from pre-intervention (Md = 13) to post-intervention (Md = 15). The median score on the skills subgroup increased from pre-intervention (Md = 9) to post-intervention (Md = 10). The median score on the attitudes subgroup increased from pre-

intervention (Md = 5) to post-intervention (Md = 8). Partial correlation was used to explore the relationship between pre-intervention and post-intervention scores while controlling for years of experience. There was a non-significant, weak, positive, partial correlation between pre-intervention and post-intervention knowledge scores controlling for years of experience, $r = 0.165$, $n = 15$, $p > 0.05$. An inspection of the zero-order correlation ($r = 0.170$) suggested that controlling for years of experience had very little effect on the strength of the relationship between pre and post-intervention knowledge scores. There was a non-significant, weak, negative, partial correlation between pre-intervention and post-intervention skills scores controlling for years of experience, $r = -0.264$, $n = 15$, $p > 0.05$. An inspection of the zero-order correlation ($r = -0.229$) suggested that controlling for years of experience had very little effect on the strength of the relationship between pre and post-intervention skills scores. There was a non-significant, moderate, positive, partial correlation between pre-intervention and post-intervention attitudes scores controlling for years of experience, $r = 0.386$, $n = 15$, $p > 0.05$. An inspection of the zero-order correlation ($r = 0.105$) suggested that controlling for years of experience had a moderate effect on the strength of the relationship between pre and post-intervention attitudes scores (Appendix H).

Chart Audit

Randomly selected electronic medical records were reviewed to identify the presence of indicators suggestive of a diagnosis of CKD and to determine the extent of appropriate nephrology referrals utilizing a chart audit tool. Prior to delivery of the nephrology-specific educational sessions, a retrospective audit of 30 patient charts was completed for comparison with an additional 30 patient chart to determine the impact of the nephrology-specific educational sessions on the recognition and improvements in early treatment and referrals

(Appendix I). Pre-intervention, 26 out of 30 charts reviewed were deemed appropriate for nephrology referral. However, only 14 of the 26 eligible cases reviewed were referred to a nephrology specialist. This represents a consultation rate of approximately 53.8%. In the post-intervention chart audit, 27 out of 30 cases were deemed appropriate for nephrology referral. In this group, 20 of the 27 eligible cases reviewed were referred to a nephrology specialist. This represents a consultation rate of approximately 74.1%. A chi-square goodness-of-fit test indicated there was a significant difference in the proportion of nephrology referrals identified in the post-intervention chart audit (74.1%) as compared with the value of 53.8% that was obtained in the pre-intervention chart audit, χ^2 (1, n=27) = 4.465, p = 0.035.

RTACF

Reports were generated from the facilities electronic medical record system using ICD-10 codes to evaluate the rates of renal-related RTACF pre and post-intervention. Data obtained for a 3-month period prior to delivery of the nephrology-specific educational course indicated a total of 58 RTACF cases with 20 having a renal-related diagnosis associated with the readmission reason. This represents a rate of approximately 34.5%. Data obtained for a 1-month period following the delivery of the nephrology-specific educational course indicated a total of 23 RTACF cases with 4 having a renal-related diagnosis associated with the readmission reason. This represents a rate of approximately 17.4% (Appendix J). A chi-square goodness-of-fit test indicated there was no significant difference in the proportion of RTACF identified in the post-intervention sample (17.4%) as compared with the value of 34.5% that was obtained in the pre-intervention sample, χ^2 (1, n=23) = 2.875, p = 0.09.

Discussion

The prevalence and incidence of CKD and ESRD continues to present a significant healthcare issue in the US. While the complex factors that may lead to the prevention of CKD have not been fully elucidated, there is significant evidence for measures that may reduce the progression of CKD to ESRD. For example, early identification of CKD and evidence-based management of related co-morbidities, such as hypertension and diabetes, can delay the progression to ESRD (Paige & Nagami, 2009). Increasing the knowledge, skills, and attitudes of the primary care APRN and bedside staff nurses caring for patients in the early stages of renal injury can have a positive impact on outcome measures. In contrast to the medical profession, there is a lack of literature demonstrating the efforts toward improving the practice of the nursing professionals in the care of patients at risk for or diagnosed with CKD. The diagnosis and management of CKD should follow the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines (NKF, 2012).

The purpose of this project is to delay the progression of ESRD through early diagnosis of CKD, improved management of CKD or co-morbid disease processes, and timely referral to nephrology specialists. Through the development and dissemination of an evidence-based, nephrology-specific educational course and guideline tool, two questions were addressed.

1. Will primary care APRNs and bedside nurses successfully identify, evaluate and report hypertension, hyperglycemia and dehydration in patients with CKD using a pre-post comparative measurement over a three-month period if given appropriate nephrology specialty training?
2. Does providing nephrology-specific education and treatment protocols to APRNs and bedside nurses reduce the renal-related return to acute care facilities (RTACF) as

measured by correlating pre and post comparison of appropriate, early nephrology consultation requests with RTACF rates?

This non-experimental, quality improvement project employed a repeated measures design. The outcome measurements included a pre and post intervention comparison of knowledge, skill, and attitude levels for both APRNs and bedside nurses, the diagnosis of renal disease, the amount of nephrology consultation requests, and the rates of return to the acute care facilities due to complications associated with a diagnosis of CKD.

KSA Scores

Knowledge levels increased significantly for both the APRN and bedside nurse following participation in the nephrology-specific educational sessions. This finding suggests the need for continuing education regarding the care and management of the nephrology patient existed in the facility. Supporting and facilitating specialty care expertise in a general medical-surgical care environment can positively impact nursing practice in the delivery of care to that unique patient population (Greene, et al., 2002). Similar to the findings reported by Thompson-Martin, et al. (2015), exposure to evidence-based patient care guidelines improves nurse's knowledge in the identification, management, and evaluation of patients at risk for or diagnosed with renal disease. Non-nephrology advanced practice and bedside nursing providers are a vital link to improving the clinical outcomes for this patient population. Interestingly, controlling for years of experience practicing in the current role had little effect on participant's knowledge scores for both groups. As over half of the bedside nurse participants indicated greater than five years of experience, this finding is not unexpected. However, the majority of APRN participants indicated less than one year of experience. The lack of impact related to years of experience in

the advanced practice role may be due, in part, the participants' combined experience as both RN and APRN.

Skills and attitudes increased significantly in the APRN population post-intervention but not with the bedside nurses. In addition, attitudes in the care and management of the nephrology patient were moderately affected by the APRN years of experience. As noted, the majority of APRN participants had only been practicing less than one year in the advanced role. This finding correlates with Benner's notion that a sense of confidence and mastery of performance increases as the nurse transitions from novice to expert (Thomas & Kellgren, 2017).

Chart Audit and RTACF

A significant increase in nephrology referrals were noted following the educational sessions. Late referral to nephrology specialists by non-nephrology providers has been associated with a lack of awareness and knowledge regarding evidence-based guidelines in the care and management of CKD patient population (Fox, Brooks, Zayas, McClellan, & Murray, 2006). While most studies examine the practices of the physician primary care provider, a recent publication demonstrated the implementation of educational sessions for medical and nursing providers, in conjunction with guideline reference tools at the point of care, was associated with a significant increase in accurate CKD diagnosis and early nephrology referrals (Regan, 2017). This quality improvement project focused exclusively on the practice of the nursing profession in this regard. The results are consistent with other reports demonstrating the increase in early nephrology referral being associated with educational and reference tool interventions. In addition to receiving the guideline tool during the education sessions, participants also have ready access to this evidence-based tool at the facility. In the study reported by Regan (2017), the reference tool was integrated into the electronic medical record system. Further

improvements in early-referral rates may be realized through increasing ease of accessibility for such guideline recommendations.

The renal-related RTACF rates decreased from 34.5 to 17.4 % following the educational intervention. However, this finding was not found to be statistically significant. The translation of the impact of nursing practice to measureable patient outcomes, such as RTACF, may require more time. Despite this fact, the absolute decrease in RTACF rates is encouraging. This may be due to the improvements of the bedside nurse's ability to identify or evaluate signs and symptoms of CKD-related co-morbidity complications and engage in appropriate interventions as well as improvements in the APRNs ability to diagnose, treat, and evaluate CKD using evidence-based practice. Additionally, the increase in early nephrology referral rates may also be an important factor resulting in the decreased RTACF rates. This finding is consistent with studies demonstrating a correlation between early nephrology referral and decreased hospitalization (Chan, et. al., 2007; Smart & Titus, 2011).

Project Questions and Objectives

The results reported in this quality improvement project suggest a positive outcome for both project questions. A significant increase in knowledge levels was found for both bedside nurses and APRNs following the nephrology-specific educational sessions. This enhanced knowledge translated into demonstrable increases in both nephrology referral and RTACF rates for patients with renal-related diagnoses.

The project aimed to address four objectives. The first three objectives were related to the project interventions. A measurement tool for both APRN and bedside nurses was developed, validated, and administered to the target population. This tool enabled the project's ability to evaluate, analyze, and report the impact of an educational intervention on the

participant's KSA. Nephrology specific educational sessions were successfully delivered to the bedside nursing staff at the facility as well as to a significant number of non-physician providers furnishing primary care services in the diagnosis, treatment, and management of the patient population admitted to the facility. A visually-enhanced reference tool that included identifying signs and symptoms of hypertension, hyperglycemia and dehydration in the early stage CKD patient along with evidence-based CKD guidelines was developed and disseminated to the study participants and the facility.

The final project objective was related to a patient-care quality improvement outcome, nephrology specialist referral rates. The interventions proposed and implemented during the project resulted in a significant increase in referral rates.

Implications for Nursing

This project demonstrates the importance of the nursing profession's contributions on quality care and patient outcomes. Nurses in the non-nephrology setting play an essential role in the identification, evaluation, and management of CKD. Through the dissemination of evidence-based practice guidelines in a facility-based continuing education model, improvements in the delivery of patient care and outcomes can be recognized. The utilization of clinical guideline tools may also play a vital role in the successful implementation of improvements in nursing practice. This factor should not be overlooked. Healthcare organizations must also consider methods that facilitate the sustained use of evidence-based practice. The identification of barriers to evidence-based utilization can guide stakeholders in the development and implementation of evidence-based quality improvement (Abdel-Kader, Greer, Boulware, & Unruh, 2014). Overcoming ease-of-use and time limitations is one barrier to be addressed when implementing evidence-based guideline protocols (Abdel-Kader, Greer, Boulware, & Unruh,

2014). Incorporating current guideline recommendations into the electronic medical record can be an effective approach to ensure quality care is provided to the CKD patient population (Regan, 2017).

Limitations

Population Sample

Interpretation of the results are limited by the study's sampling technique and size. This study utilized a convenience sample of bedside nurses employed at the project facility. While this methodology provided expedient access to participants, this may have the impact of limiting the generalizability of the intervention across the healthcare system. The bedside nurse participants were employed at a single facility. The results of this quality improvement process may be influenced by other unknown operational factors implemented at this location not examined or controlled for in the project. The ability to extrapolate the impact of this specific intervention to other facilities is unknown.

The APRNs included in the study were independent contractors for the facility. The number of participants was significantly less than the bedside nurses. Recruitment of the APRN participants required utilization of external motivating factors such as the offering of continuing education units and delivery in a social setting. It is possible all APRNs providing services at the facility were not captured during the recruitment phase.

While the bedside nurse can have an influence on the early recognition and evaluation of the patient at risk for renal disease, it lies within the scope of practice of the APRN to suspect the potential CKD patient and implement evidence-based diagnostic evaluation approaches. It is not clear as to how many of the patient charts audited during the data collection phases included the care and treatment plans provided by APRN participants.

The APRN participant population are not the only providers delivering care to the nephrology patients at the facility. While some physician providers did attend the nephrology-specific educational sessions, they did not participate in the KSA survey and were not specifically targeted for the promotion of evidence-based care in this patient population. This project did not identify or control for the care provided by physician versus APRN in the chart audit or RTACF data collection.

Participant Bias

The project participants self-identified knowledge, skills, and attitudes pre and post-educational intervention. This data collection technique can negatively impact the internal validity of the results through sensitization (Polit & Beck, 2016). The process of completing the pre-intervention survey tool may influence their post-intervention responses.

As noted, the bedside nurses were employed at the project site. While the principal investigator did not hold supervisory authority over the participants, the facility administration and education department were collaborators in the project. This factor can lead to the subject bias of social desirability (Polit & Beck, 2016). With social desirability, the participant may select responses or change behavior to reflect positively towards the researcher or, in this case, their employer. The participant may change their behavior to that which is expected during the study phase of the project and then slowly revert to prior practice over time.

RTACF and Chart Audit

The rates of renal-related complications may be presumably due to a complex set of factors, some of which may be unavoidable despite appropriate, evidence-based nursing practice. For example, the unpredictable course of co-morbid disease processes and pathophysiology may impact the validity of correlating this measurement to the changes in nursing interventions. In

addition, due to the limitations in the project timeline, the true impacts of improved nursing care for the nephrology patient may require a longer post-intervention data collection period. While significant improvements in nephrology diagnosis and early consultation were noted, this did not translate to a statistically significant improvement in RTACF despite the decrease in the absolute incidence of renal-related readmissions noted.

For this project, the primary investigator completed the chart audits pre and post-educational intervention. While the author has confidence that objective fidelity was maintained during all aspects of this project, a certain level of experimenter bias may still exist due to an unconscious prejudice ((Polit & Beck, 2016). An independent review of chart audits was not feasible within the timeframe constraints of this project.

Dissemination

Despite the limitations discussed, this project demonstrated statistically significant improvements in nursing knowledge, skills, and attitudes for the care of the nephrology patient. In addition, the data suggests a noted improvement in the appropriate identification, management, and nephrology referral for the CKD patient. Dissemination of these findings to stakeholders and other individuals or entities, with a vested interest in the improvement of evidence-based nursing practice for the care of the nephrology patient, is critical to support the overall aim of this project to delay the progression of ESRD in patients diagnosed with CKD Stage 1-3.

Informal dissemination of preliminary data analysis was provided to the nursing educator at the project site as well as to several bedside nurses. During these sessions, continued coaching and support for practice was also employed. This may serve to facilitate the sustained improvement in nursing practice at the facility as the individuals received positive reinforcement

in their ability to improve measurable patient outcomes. This type of internal motivation can nurture continued adherence to evidence-based practice (Ervin, 2005).

Formal dissemination is planned at the project site to include all bedside nurses and other facility stakeholders such as administration, nurse educators, risk managers, and associate medical providers. Through this collaborative discussion, continued support of practice change can be elucidated for the facility stakeholders. The inclusion of the bedside nurses along with organization leaders in proposing or implementing potential policy or process changes will be instrumental in sustaining the improvements noted in this project.

All aspects of this project will be disseminated virtually at the sponsoring academic institution supporting this quality improvement proposal. Further dissemination includes creation of a poster presentation to be displayed at the academic institution and submitted for consideration at the annual American Nephrology Nurses Association conference the following year.

Dissemination to the APRN participants, as well as nephrology physician providers, will occur over time based on the ability to coordinate scheduling with these individuals and the project author. The utilization of web-based technology will be employed to facilitate this process.

Conclusion

This project sought to improve the outcomes of individuals at risk for or diagnosed with CKD through principled actions to change the practice of nursing care at both the bedside and the advanced provider role in concordance with evidence-based guidelines. The use of organizational leadership tenets, systems thinking, nursing theory, change theory, and advanced nursing practice has resulted in the development, implementation, and evaluation of a quality

improvement project demonstrating improvements in nursing KSA and management of the nephrology patient. In addition, the reduction in RTACF rates identified in this project suggest improvement in a measurable patient outcome. As early nephrology referral and management of the CKD patient is associated with a reduction in the progression of ESRD, it is feasible to presume these noted changes in nursing practice may contribute to the overarching aim of the project.

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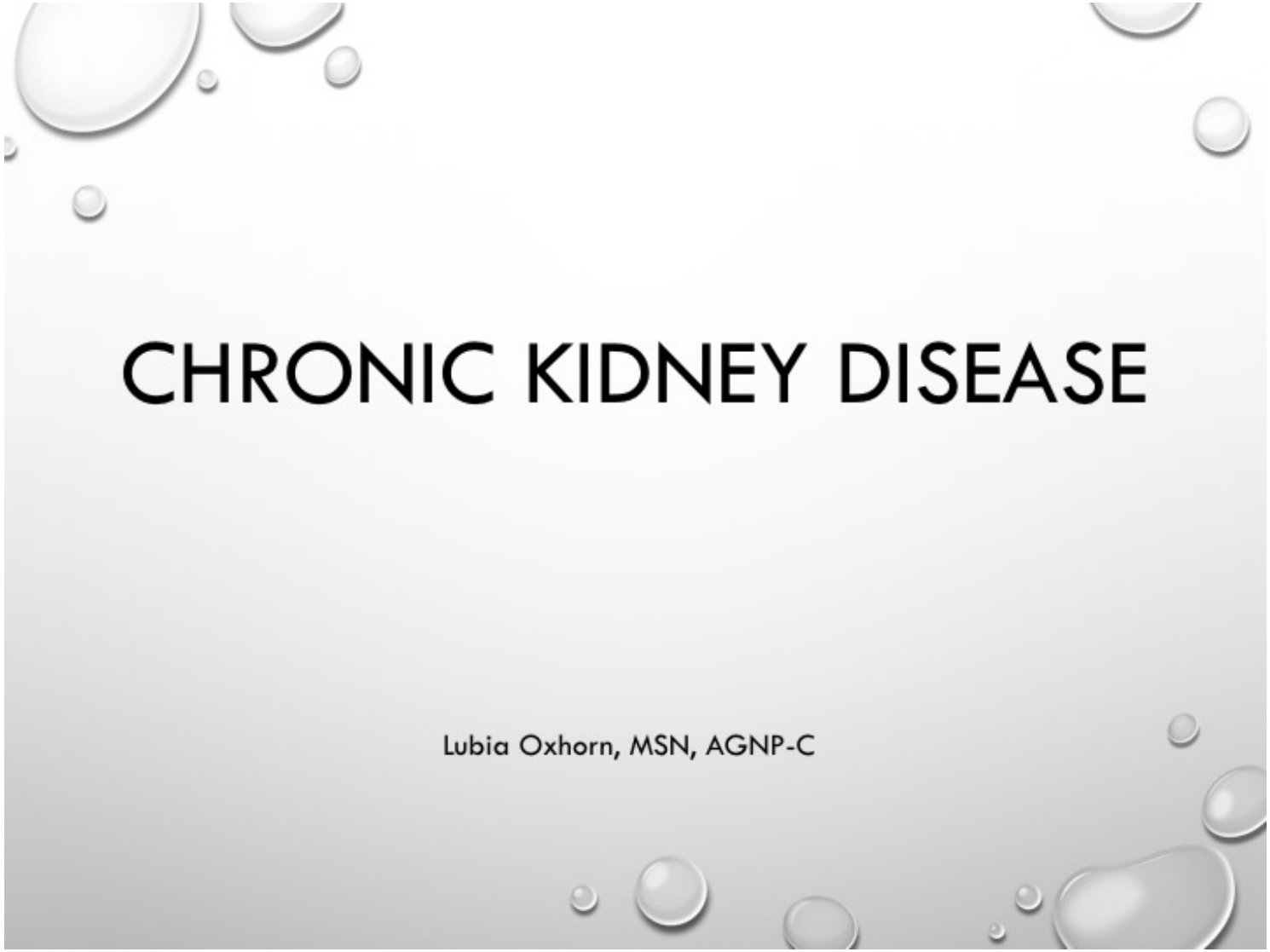
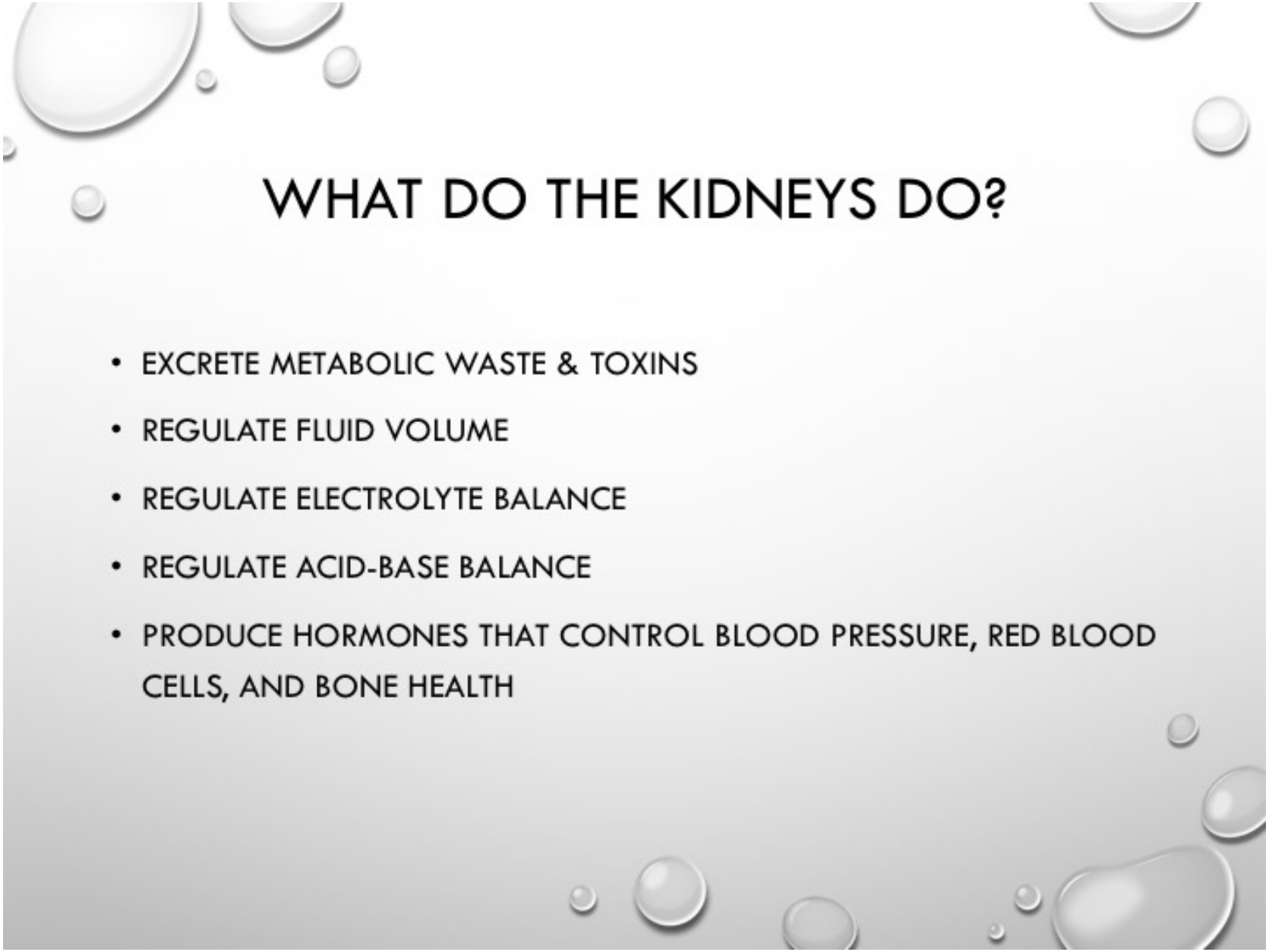
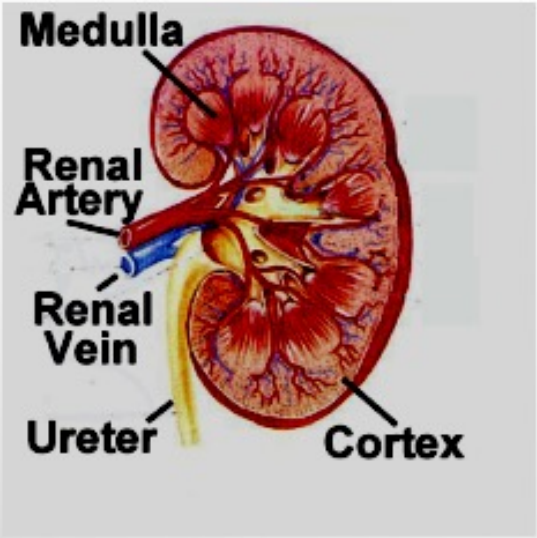
Appendix A

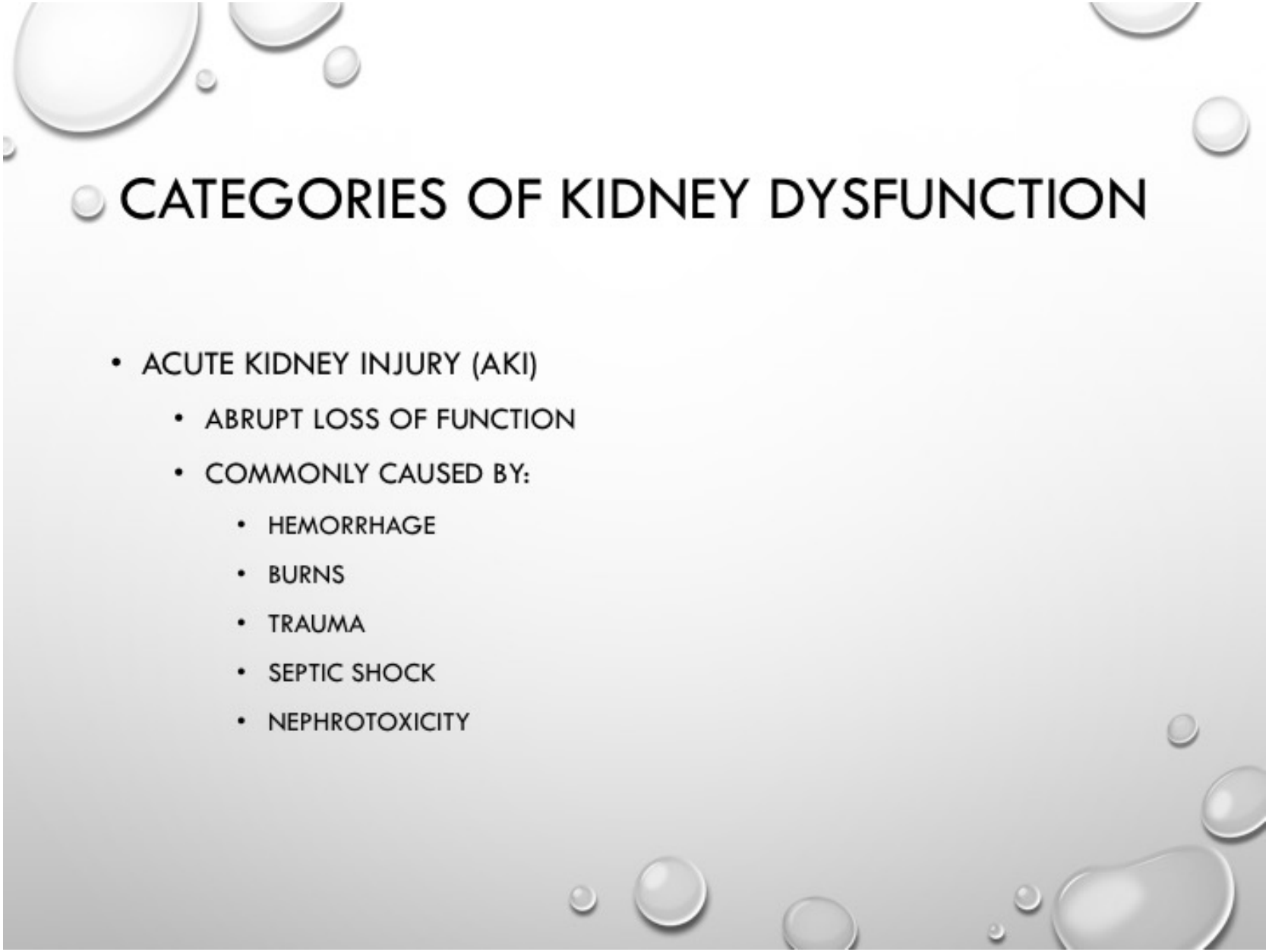


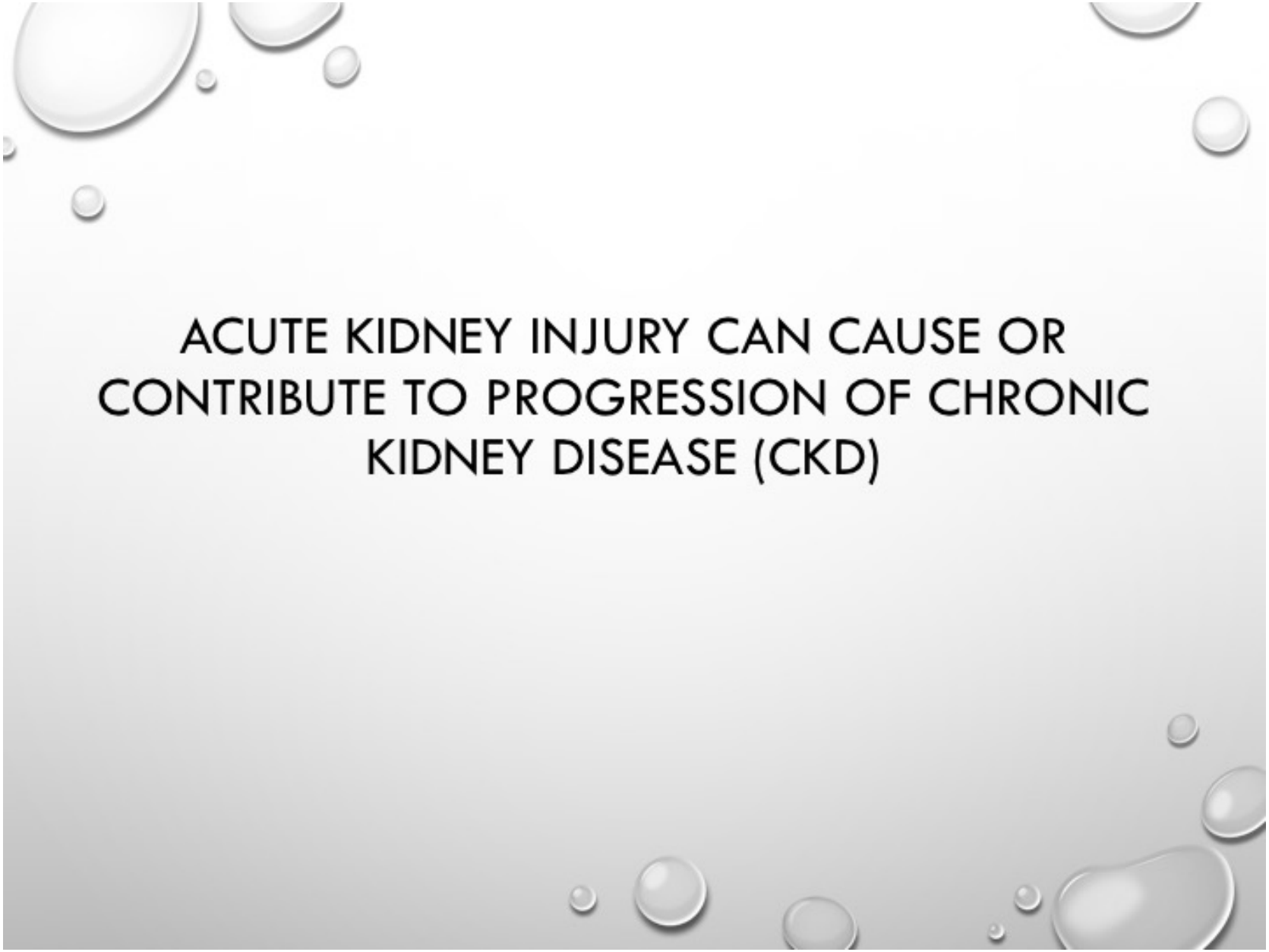

WHAT DO THE KIDNEYS DO?
• EXCRETE METABOLIC WASTE & TOXINS
• REGULATE FLUID VOLUME
• REGULATE ELECTROLYTE BALANCE
• REGULATE ACID-BASE BALANCE
• PRODUCE HORMONES THAT CONTROL BLOOD PRESSURE, RED BLOOD CELLS, AND BONE HEALTH

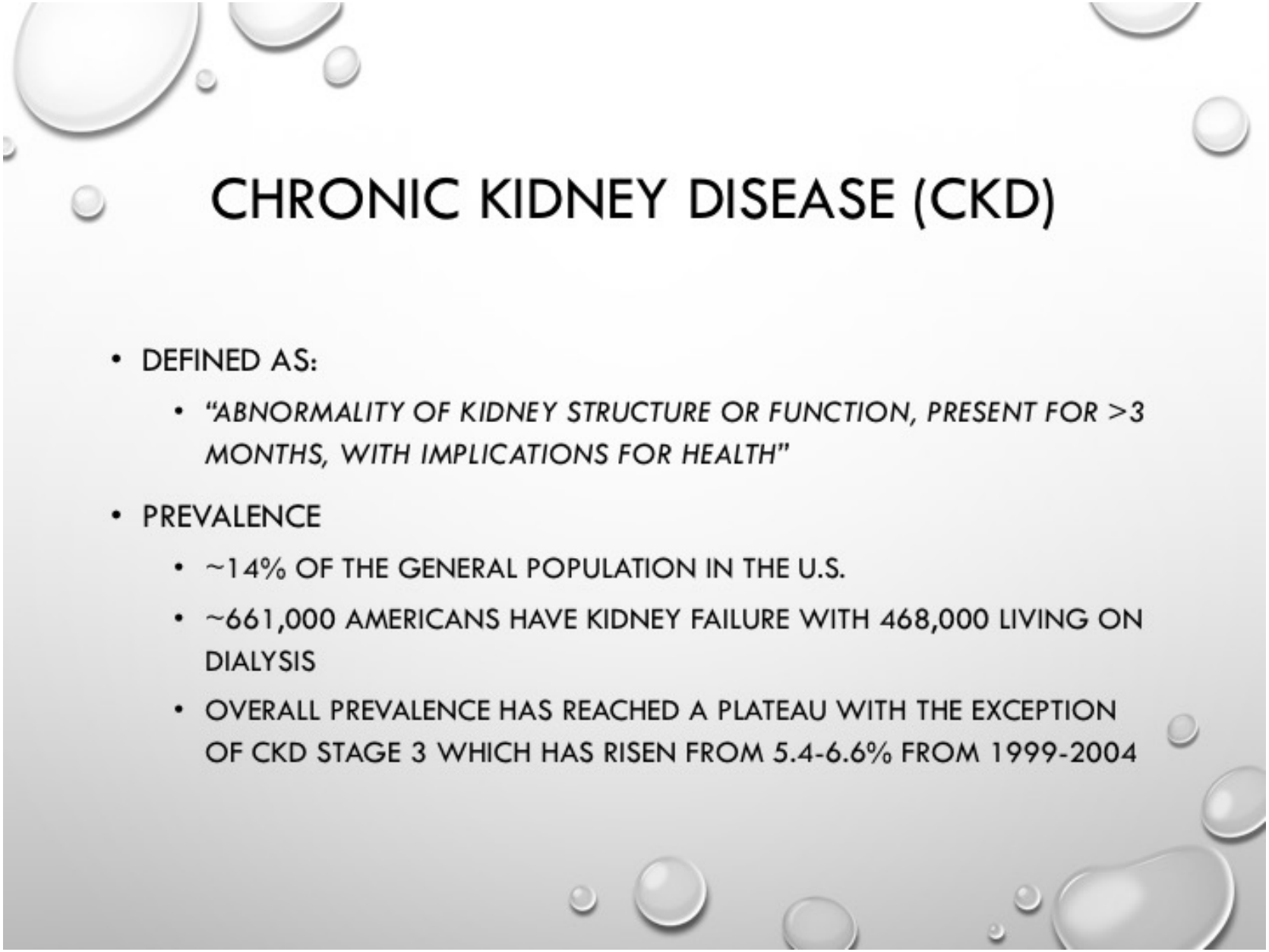
WHAT DO NEPHRONS DO?

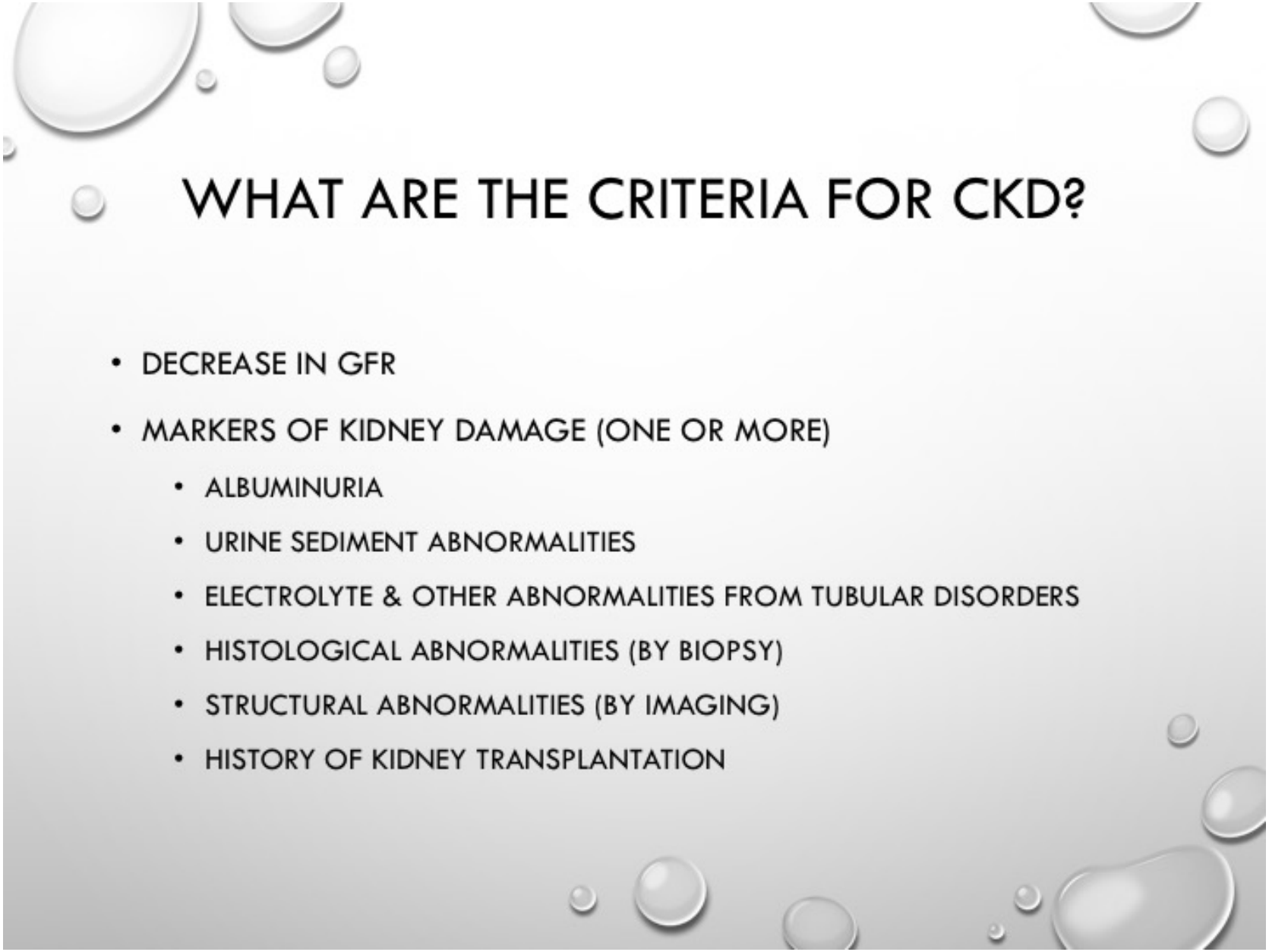


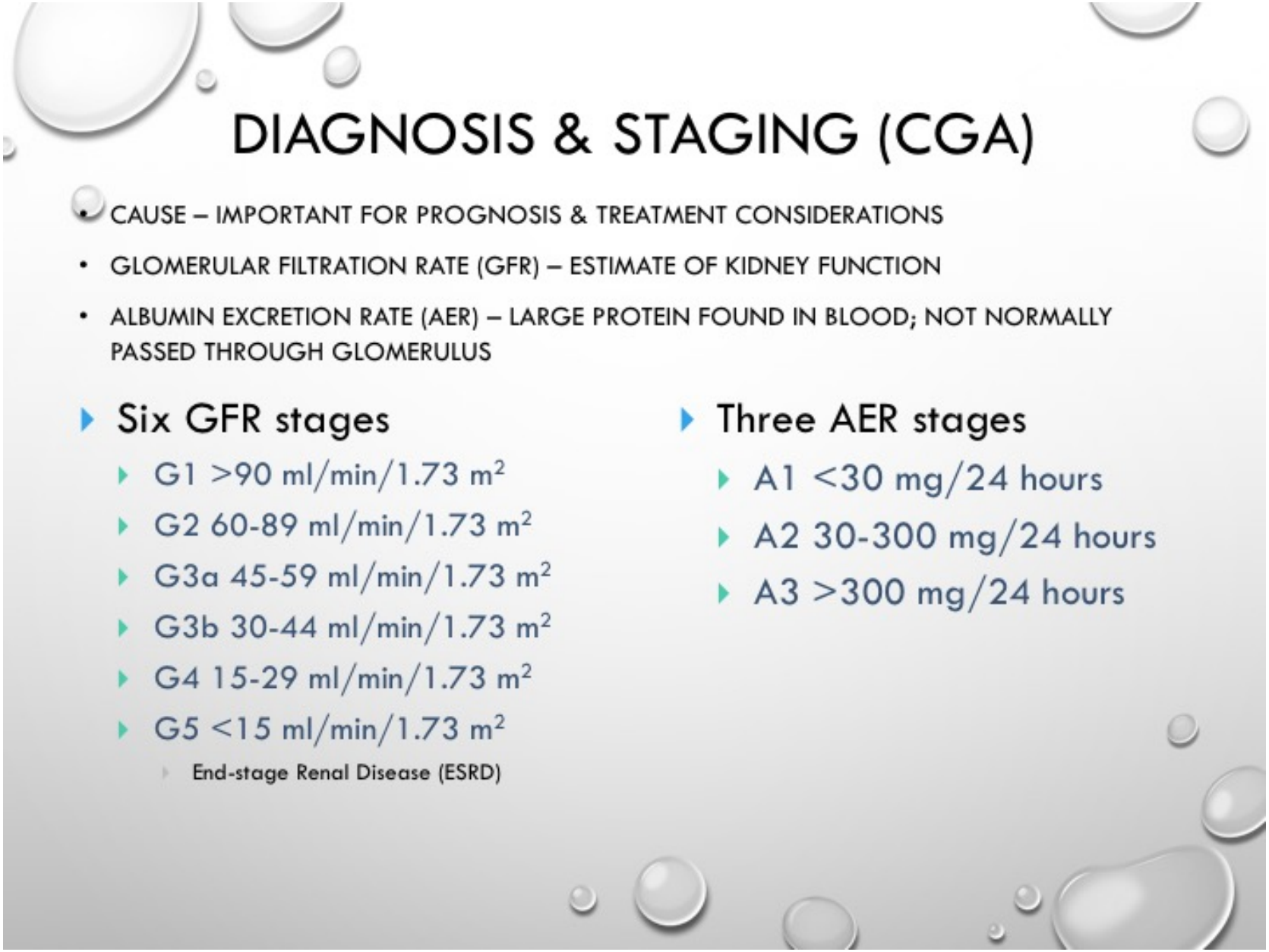
- NEPHRONS ARE THE FUNCTIONAL MICROSCOPIC UNITS WITHIN THE KIDNEY THAT:
  - FILTER BLOOD TO REMOVE EXCESS WASTE AND FLUID
  - BALANCE THE AMOUNT OF FLUID AND CHEMICALS YOUR BODY NEEDS
  - DISCARD WHAT YOUR BODY DOES NOT NEED AS URINE


CATEGORIES OF KIDNEY DYSFUNCTION
ACUTE KIDNEY INJURY (AKI)
ABRUPT LOSS OF FUNCTION
COMMONLY CAUSED BY:
HEMORRHAGE
BURNS
TRAUMA
SEPTIC SHOCK
NEPHROTOXICITY


ACUTE KIDNEY INJURY CAN CAUSE OR CONTRIBUTE TO PROGRESSION OF CHRONIC KIDNEY DISEASE (CKD)


CHRONIC KIDNEY DISEASE (CKD)
• DEFINED AS:
• "ABNORMALITY OF KIDNEY STRUCTURE OR FUNCTION, PRESENT FOR >3 MONTHS, WITH IMPLICATIONS FOR HEALTH"
• PREVALENCE
• ~14% OF THE GENERAL POPULATION IN THE U.S.
• ~661,000 AMERICANS HAVE KIDNEY FAILURE WITH 468,000 LIVING ON DIALYSIS
• OVERALL PREVALENCE HAS REACHED A PLATEAU WITH THE EXCEPTION OF CKD STAGE 3 WHICH HAS RISEN FROM 5.4-6.6% FROM 1999-2004


WHAT ARE THE CRITERIA FOR CKD?
• DECREASE IN GFR
• MARKERS OF KIDNEY DAMAGE (ONE OR MORE)
• ALBUMINURIA
• URINE SEDIMENT ABNORMALITIES
• ELECTROLYTE & OTHER ABNORMALITIES FROM TUBULAR DISORDERS
• HISTOLOGICAL ABNORMALITIES (BY BIOPSY)
• STRUCTURAL ABNORMALITIES (BY IMAGING)
• HISTORY OF KIDNEY TRANSPLANTATION


DIAGNOSIS & STAGING (CGA)
CAUSE – IMPORTANT FOR PROGNOSIS & TREATMENT CONSIDERATIONS
GLOMERULAR FILTRATION RATE (GFR) – ESTIMATE OF KIDNEY FUNCTION
ALBUMIN EXCRETION RATE (AER) – LARGE PROTEIN FOUND IN BLOOD; NOT NORMALLY PASSED THROUGH GLOMERULUS
Six GFR stages
G1 >90 ml/min/1.73 m2
G2 60-89 ml/min/1.73 m2
G3a 45-59 ml/min/1.73 m2
G3b 30-44 ml/min/1.73 m2
G4 15-29 ml/min/1.73 m2
G5 <15 ml/min/1.73 m2
End-stage Renal Disease (ESRD)
Three AER stages
A1 <30 mg/24 hours
A2 30-300 mg/24 hours
A3 >300 mg/24 hours

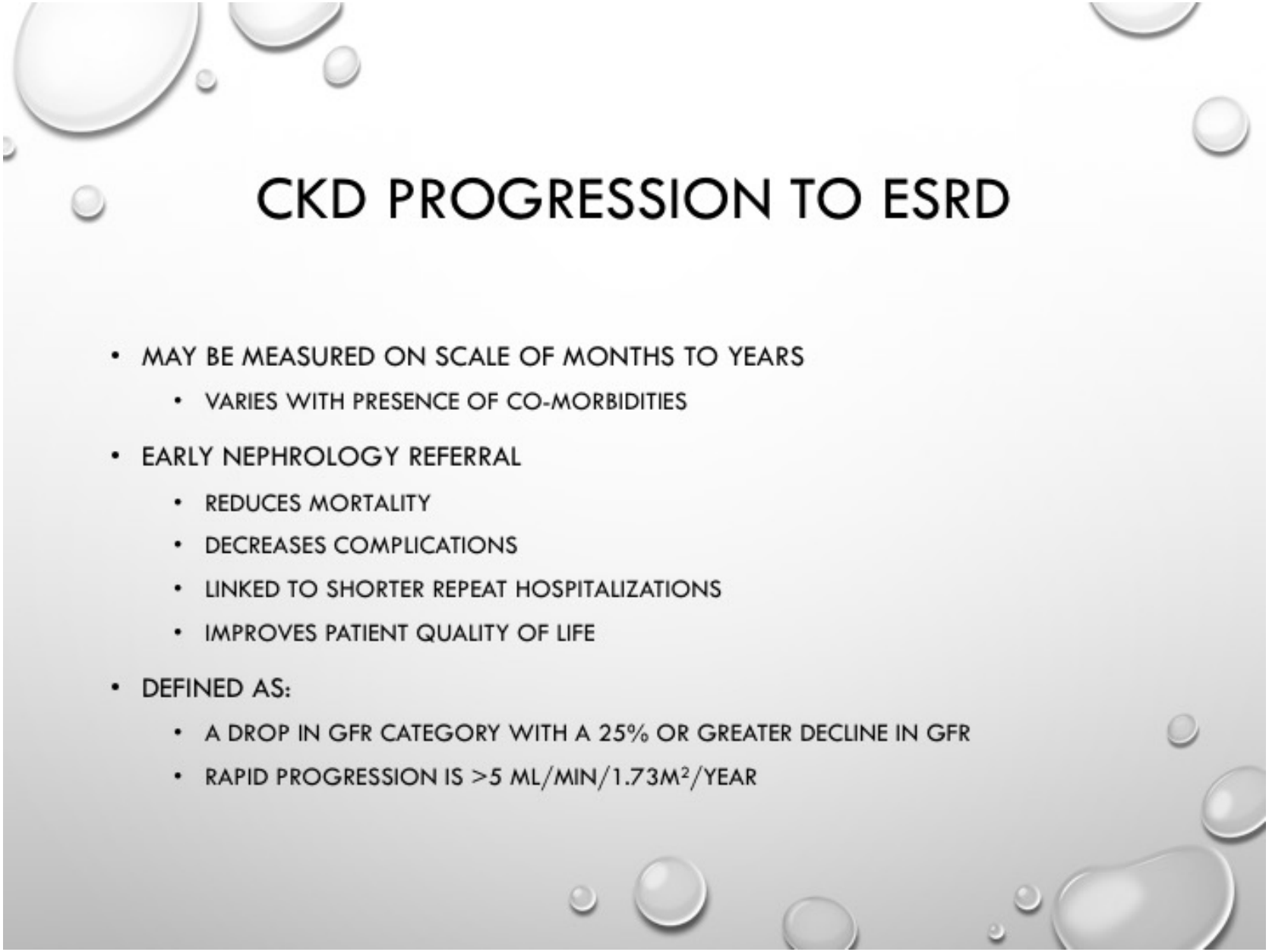
HOW IS GFR CALCULATED?

- SERUM CREATININE
  - MEASURES WASTE PRODUCT IN THE BLOOD THAT COMES FROM MUSCLE ACTIVITY
  - KIDNEYS NORMALLY REMOVE CREATININE FROM THE BLOOD
  - WHEN KIDNEY FUNCTION DECLINES, CREATININE LEVELS GO UP
- AGE
  - GFR DECREASES WITH AGE
- GENDER
  - MEN USUALLY HAVE MORE MUSCLE MASS THAN WOMEN, SO THE CALCULATION IS ADJUSTED
- RACE
  - AFRICAN-AMERICANS TEND TO HAVE MORE MUSCLE MASS THAN OTHER ETHNICITIES, SO THE CALCULATION IS ADJUSTED

PROGNOSIS BY GFR & ALBUMINURIA

CKD Staging by GFR & Albuminuria				ALBUMINURIA CATEGORY		
Low Risk		Moderate Risk		A1	A2	A3
High Risk		Very High Risk		Mild	Moderate	Severe
				<30mg/g	30-300mg/g	>300mg/g
GFR CATEGORY (ml/min/1.73m2)	G1	Normal	>90			
	G2	Mild	60-89			
	G3a	Mild to Moderate	45-59			
	G3b	Moderate to Severe	30-44			
	G4	Severe	15-29			
	G5	Kidney Failure	<15			

Adapted from KDIGOO Guidelines 2012


CKD PROGRESSION TO ESRD
MAY BE MEASURED ON SCALE OF MONTHS TO YEARS
VARIES WITH PRESENCE OF CO-MORBIDITIES
EARLY NEPHROLOGY REFERRAL
REDUCES MORTALITY
DECREASES COMPLICATIONS
LINKED TO SHORTER REPEAT HOSPITALIZATIONS
IMPROVES PATIENT QUALITY OF LIFE
DEFINED AS:
A DROP IN GFR CATEGORY WITH A 25% OR GREATER DECLINE IN GFR
RAPID PROGRESSION IS >5 ML/MIN/1.73M2/YEAR

PREDICTORS OF PROGRESSION

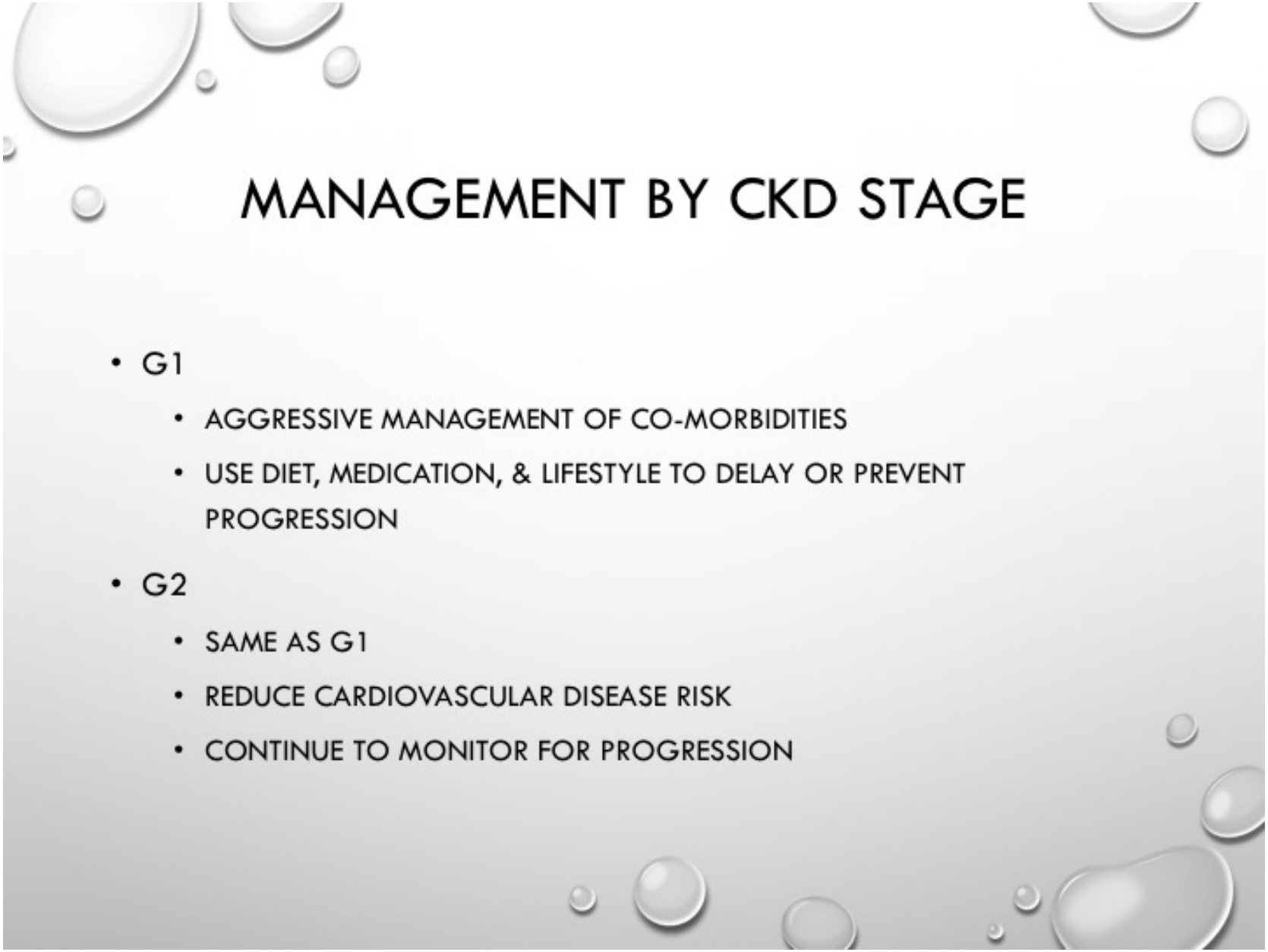
- DEFINED AS:
  - A DROP IN GFR CATEGORY WITH A 25% OR GREATER DECLINE IN GFR
  - RAPID PROGRESSION IS >5 ML/MIN/1.73M^2/YEAR
- CAUSE OF CKD
- GFR LEVEL
- ALBUMINURIA SEVERITY
- HYPERTENSION, HYPERGLYCEMIA, DYSLIPIDEMIA, SMOKING, AGE, OBESITY, RACE, GENDER, CONTINUED EXPOSURE TO NEPHROTOXIC AGENTS

MAJOR CAUSES

- DIABETES MELLITUS
  - LEADING CAUSE
    - 44% OF INCIDENCE
    - 38% OF PREVALENCE
- HYPERTENSION
  - SECOND MAJOR FACTOR
    - 28% OF INCIDENCE
    - 25% OF PREVALENCE
- THESE TWO CO-MORBIDITIES TOGETHER ACCOUNT FOR >60% OF THE ESRD PATIENTS ON DIALYSIS OR TRANSPLANT RECIPIENTS

OTHER CONSIDERABLE RISK FACTORS

- GLOMERULONEPHRITIS
- URINARY TRACT OBSTRUCTION
- AUTOIMMUNE DISORDERS
  - SYSTEMIC LUPUS ERYTHMATOSUS
- INHERITED OR GENETIC CAUSALITY
  - POLYCYSTIC KIDNEY DISEASE
- NEPHROTOXICITY
  - NSAIDS – IBUPROFEN IS BAD!!
  - CONTRAST DYES FOR RADIOLOGY PROCEDURES
  - ENVIRONMENTAL CONTAMINANTS OR OTHER TOXINS

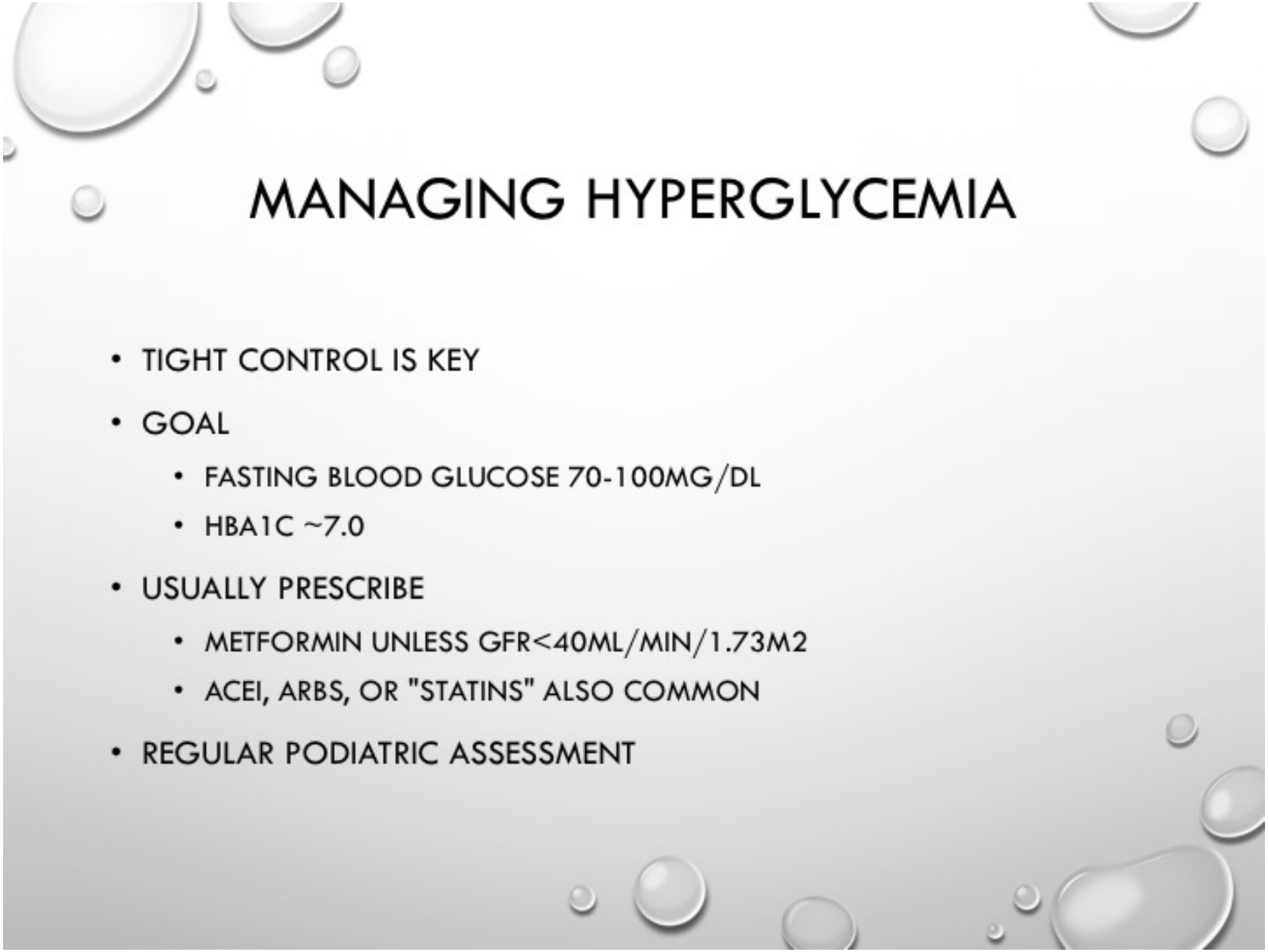

MANAGEMENT BY CKD STAGE
• G1
• AGGRESSIVE MANAGEMENT OF CO-MORBIDITIES
• USE DIET, MEDICATION, & LIFESTYLE TO DELAY OR PREVENT PROGRESSION
• G2
• SAME AS G1
• REDUCE CARDIOVASCULAR DISEASE RISK
• CONTINUE TO MONITOR FOR PROGRESSION


MANAGEMENT BY CKD STAGE
G3A & G3B
SYMPTOMS BEGIN TO EMERGE
EDEMA
UNCONTROLLED HYPERGLYCEMIA
WORSENING HYPERTENSION
SHORTNESS OF BREATH & FATIGUE
DISRUPTED SLEEP PATTERNS
DECREASED APPETITE
INCREASING PO_4 & PTH LEVELS
ADDRESS COMPLICATIONS
ANEMIA
IRON REPLACEMENT OR ERYTHROPOETIN STIMULATING AGENT THERAPY
BONE & MINERAL DISORDERS
USE DIET & PHOSPHORUS BINDERS
TO CONTROL PO_4
MONITOR SERUM CA^{2+}, PTH, ALKALINE PHOSPHATASE, VITAMIN D
METABOLIC ACIDOSIS
MAY SEE DECLINE IN HCO_3
ORAL BICARBONATE SUPPLEMENTATION
HYPERVOLEMIA
SODIUM & FLUID RESTRICTION
DIURETICS IF CHF IS A CONCERN
HYPERKALEMIA
DIETARY RESTRICTIONS
AVOID K^+ SALT SUBSTITUTES
TOMATOES


LABS WE TRULY CARE ABOUT!
HGB = 13-17G/DL(MALES) & 12-16G/DL(FEMALES)
HCT = 38-50% (MALES) & 35-45%
IRON = 38-169UG/DL
FERRITIN = 30-400NG/ML
TSAT = 15-55%
TIBC = 250-450UG/DL
B12 = 110-1500PG/ML
FOLATE = 3-13NG/ML
HBA1C = ~7.0
PTH = 14-64PG/ML
VIT D = 30-100NG/ML
NA+ = 135-145
K+ = 3.5-5.0
CO2 = 20-31
CA2+ = 8.6-10.3MG/DL
PO4 = 2.1-4.3 MG/DL
BUN = 7-25MG/DL
CREATININE = 0.7-1.18MG/DL
GFR = >90ML/MIN/1.73M2

MANAGING HYPERTENSION

- MOST EFFECTIVE INTERVENTION TO SLOW PROGRESSION
- GOAL
  - <140/90 IF ALBUMINURIA <30MG/24 HOURS
  - <130/80 IF ALBUMINURIA >30MG/24 HOURS
  - FIRST LINE AGENT
    - ACEI OR ARBS (RENOPROTECTIVE)
      - USED EVEN IF PATIENT IS NORMOTENSIVE WHEN ALBUMINURIA PRESENT


MANAGING HYPERGLYCEMIA
• TIGHT CONTROL IS KEY
• GOAL
• FASTING BLOOD GLUCOSE 70-100MG/DL
• HBA1C ~7.0
• USUALLY PRESCRIBE
• METFORMIN UNLESS GFR<40ML/MIN/1.73M2
• ACEI, ARBS, OR "STATINS" ALSO COMMON
• REGULAR PODIATRIC ASSESSMENT

MANAGING FLUID BALANCE

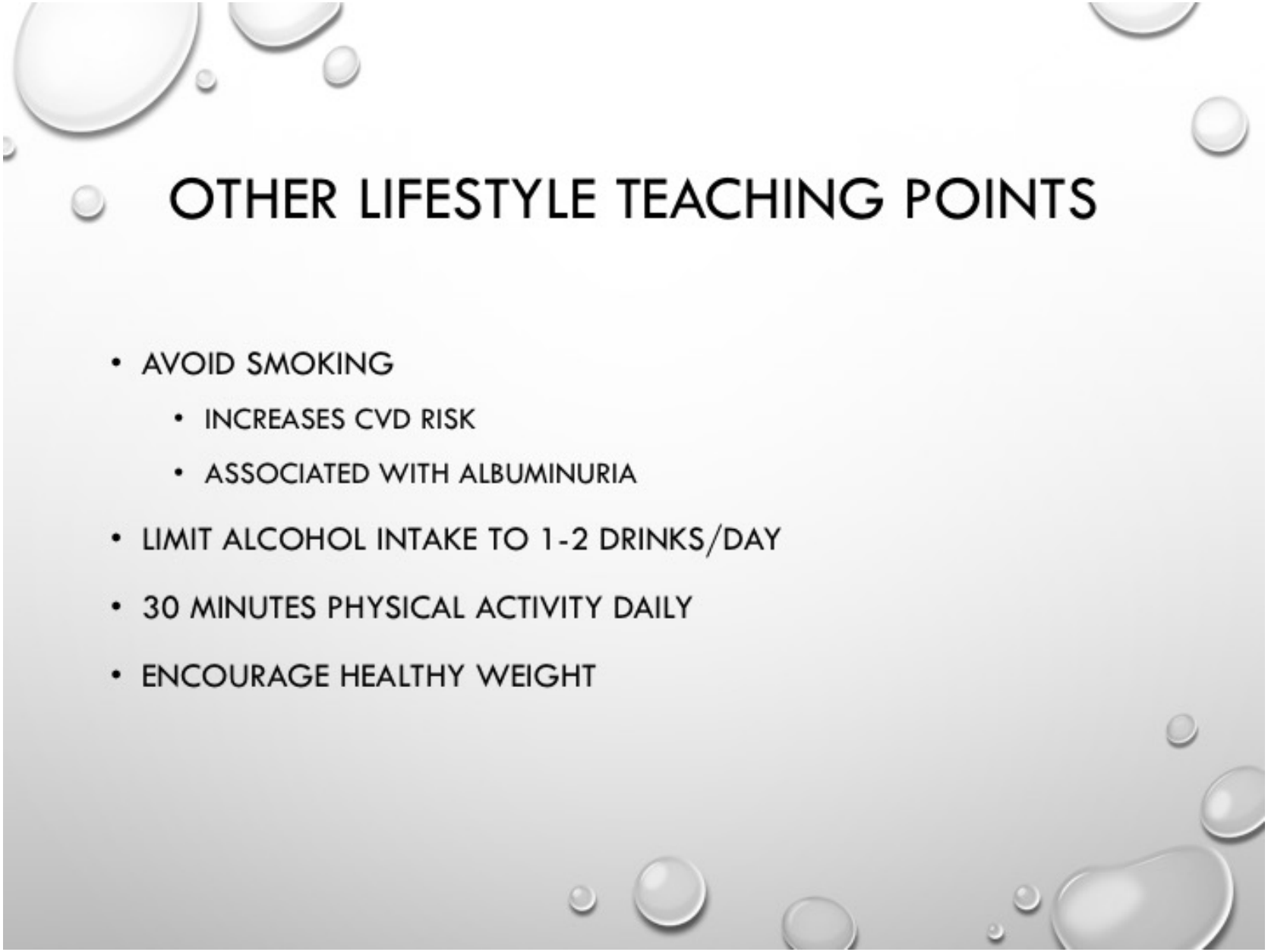
- STAGE CKD 1-3 >> *AVOID HYPOVOLEMIA*
  - S/S DRY MEMBRANES, TACHYCARDIA, DIZZINESS POSTURAL HYPOTENSION, POOR TURGOR
  - CAUTIOUS DIURETIC USE
  - MAY SEE "THIAZIDE" IN COMBINATION WITH ACEI/ARBS FOR HTN
- STAGE CKD 4-5 >> *AVOID HYPERVOLEMIA*
  - S/S EDEMA, SOB, WEIGHT GAIN, ELEVATED BP

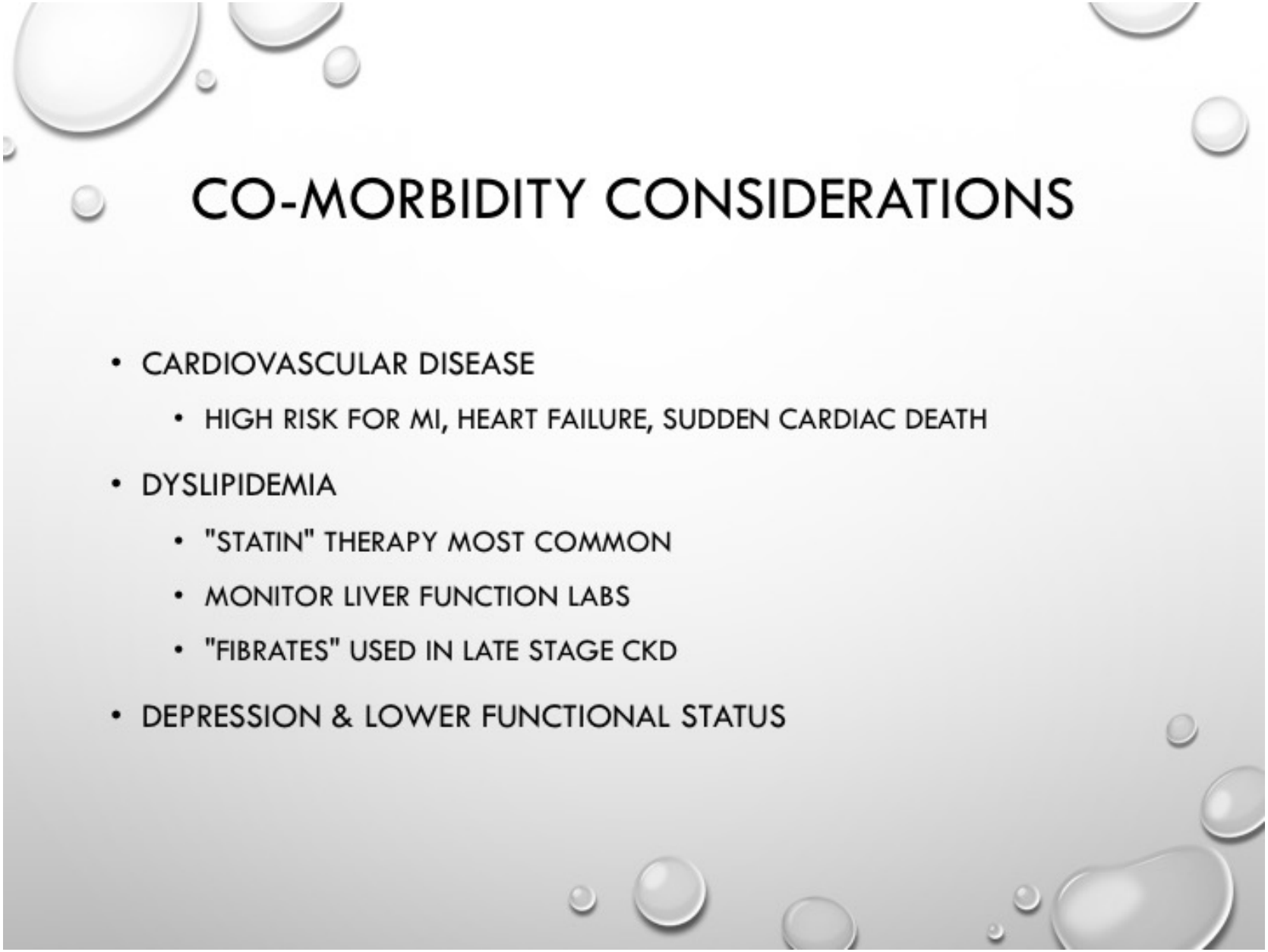
MANAGING NUTRITION

- LIMIT DIETARY SODIUM <2G/DAY
  - EXACERBATES HTN
  - SALT-SUBSTITUTES HIGH IN K+
    - AVOID W/ ACEI OR ARBS
- AVOID EXCESSIVE PROTEIN INTAKE
  - WORSENS ALBUMINURIA
  - LIMIT TO 1.3G/KG/DAY
    - SIZE OF A "DECK OF CARDS"
  - LIMIT TO 0.8G/KG/DAY
    - DIABETICS
    - GFR <30ML/MIN/1.73M2
- DECREASE SIMPLE CARBOHYDRATE INTAKE
- AVOID SATURATED & TRANS-FATS
- INCREASE MONOUNSATURATED & OMEGA 3S
- LIMIT DIETARY PO_4 & K^+ IN STAGE 4-5

ASSESS FOR COMPLICATIONS!

- ANEMIA
  - S/S - FATIGUE, DYSPNEA, PALLOR
  - HGB <12G/DL IN FEMALES
  - HGB <13G/DL IN MALES
  - IRON REPLACEMENT IF INDICATED OR ERYTHOPOETIN STIMULATING AGENT
- MINERAL & BONE DISORDERS
  - MONITOR SERUM CA2+, PO4, PTH, ALKALINE PHOSPHATASE, VITAMIN D
  - CALCIUM SUPPLEMENTS, PHOSPHATE BINDERS
- AVOID NEPHROTOXIC MEDICATIONS IF AT ALL POSSIBLE
  - GLYCOSIDE ANTIBIOTICS, CONTRAST DYES, NSAIDS, COX-2 INHIBITORS, ANTIFUNGALS


OTHER LIFESTYLE TEACHING POINTS
• AVOID SMOKING
• INCREASES CVD RISK
• ASSOCIATED WITH ALBUMINURIA
• LIMIT ALCOHOL INTAKE TO 1-2 DRINKS/DAY
• 30 MINUTES PHYSICAL ACTIVITY DAILY
• ENCOURAGE HEALTHY WEIGHT

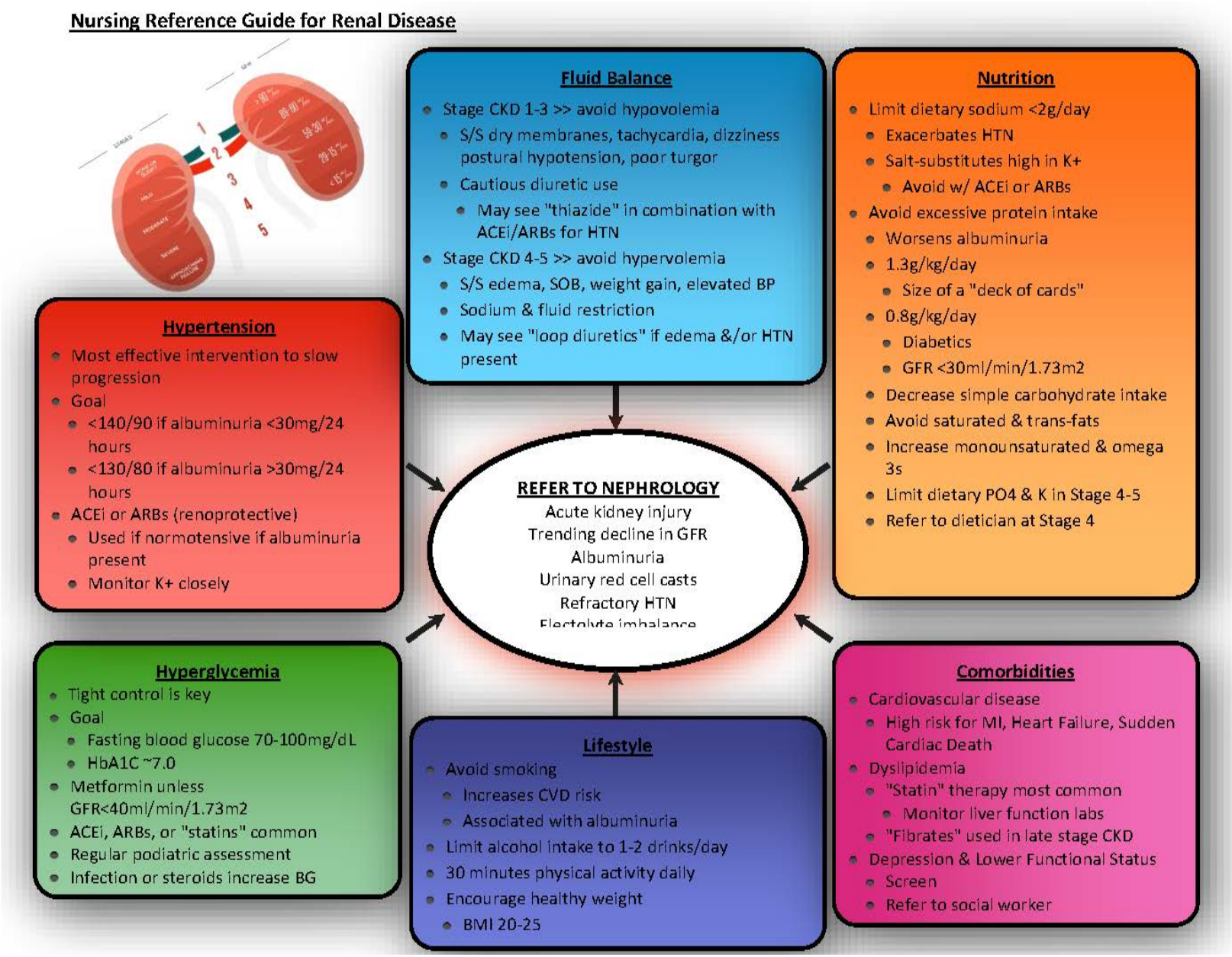

CO-MORBIDITY CONSIDERATIONS
• CARDIOVASCULAR DISEASE
• HIGH RISK FOR MI, HEART FAILURE, SUDDEN CARDIAC DEATH
• DYSLIPIDEMIA
• "STATIN" THERAPY MOST COMMON
• MONITOR LIVER FUNCTION LABS
• "FIBRATES" USED IN LATE STAGE CKD
• DEPRESSION & LOWER FUNCTIONAL STATUS


TYPICAL EMOTIONAL REACTIONS
• A DIAGNOSIS OF CKD BRINGS WITH IT SOME EMOTIONAL REACTIONS
• PATIENTS EXPERIENCE ANGER, GUILT, FEAR, DENIAL, OR DEPRESSION
• ASSURE PATIENTS THESE FEELINGS ARE COMMON
• ENCOURAGE PATIENT TO TALK ABOUT THEIR FEELINGS WITH FAMILY, FRIENDS, AND YOU


TYPICAL BEHAVIOR CHANGES
• PATIENTS MAY EXPERIENCE SOME OF THESE BEHAVIOR CHANGES, BUT OFTEN TIMES THEY MAY BE TEMPORARY
• PROVIDE OPPORTUNITY FOR YOUR PATIENTS TO DISCUSS ANY SYMPTOMS WITH THEIR HEALTH CARE TEAM
• IRRITABILITY
• MOODINESS
• CONFUSION
• DEPRESSION
• FATIGUE
• MEMORY LOSS
• ANGER
• PROBLEMS WITH SLEEP


RECOMMENDATION FOR REFERRAL
• AKI OR RAPID, SUSTAINED FALL IN GFR
• GFR <30 ML/MIN/1.73M2
• AER >300MG/24 HOURS
• PROGRESSIVE CKD
• CKD WITH REFRACTORY HYPERTENSION
• PERSISTENT ELECTROLYTE IMBALANCE
• RECURRING OR EXTENSIVE NEPHROLITHIASIS
• HEREDITARY KIDNEY DISEASE

Appendix B


Nursing Reference Guide for Renal Disease
Fluid Balance
Stage CKD 1-3 >> avoid hypovolemia
S/S dry membranes, tachycardia, dizziness postural hypotension, poor turgor
Cautious diuretic use
May see "thiazide" in combination with ACEi/ARBs for HTN
Stage CKD 4-5 >> avoid hypervolemia
S/S edema, SOB, weight gain, elevated BP
Sodium & fluid restriction
May see "loop diuretics" if edema &/or HTN present
Nutrition
Limit dietary sodium <2g/day
Exacerbates HTN
Salt-substitutes high in K+
Avoid w/ ACEi or ARBs
Avoid excessive protein intake
Worsens albuminuria
1.3g/kg/day
Size of a "deck of cards"
0.8g/kg/day
Diabetics
GFR <30ml/min/1.73m2
Decrease simple carbohydrate intake
Avoid saturated & trans-fats
Increase monounsaturated & omega 3s
Limit dietary PO4 & K in Stage 4-5
Refer to dietician at Stage 4
Hypertension
Most effective intervention to slow progression
Goal
<140/90 if albuminuria <30mg/24 hours
<130/80 if albuminuria >30mg/24 hours
ACEi or ARBs (renoprotective)
Used if normotensive if albuminuria present
Monitor K+ closely
REFER TO NEPHROLOGY
Acute kidney injury
Trending decline in GFR
Albuminuria
Urinary red cell casts
Refractory HTN
Electolyte imbalance
Hyperglycemia
Tight control is key
Goal
Fasting blood glucose 70-100mg/dL
HbA1C ~7.0
Metformin unless GFR<40ml/min/1.73m2
ACEi, ARBs, or "statins" common
Regular podiatric assessment
Infection or steroids increase BG
Lifestyle
Avoid smoking
Increases CVD risk
Associated with albuminuria
Limit alcohol intake to 1-2 drinks/day
30 minutes physical activity daily
Encourage healthy weight
BMI 20-25
Comorbidities
Cardiovascular disease
High risk for MI, Heart Failure, Sudden Cardiac Death
Dyslipidemia
"Statin" therapy most common
Monitor liver function labs
"Fibrates" used in late stage CKD
Depression & Lower Functional Status
Screen
Refer to social worker

Nursing Reference Guide for Renal Disease

CKD Staging by GFR & Albuminuria				ALBUMINURIA CATEGORY		
Low Risk		Moderate Risk		A1	A2	A3
High Risk		Very High Risk		Mild	Moderate	Severe
				<30mg/g	30-300mg/g	>300mg/g
GFR CATEGORY (ml/min/1.73m2)	G1	Normal	>90			
	G2	Mild	60-89			
	G3a	Mild to Moderate	45-59			
	G3b	Moderate to Severe	30-44			
	G4	Severe	15-29			
	G5	Kidney Failure	<15			

DAdapted from KDIGOO Guidelines 2012

IMPORTANT LABS (w/ normal value)

- Hgb = 13-17g/dL(males) & 12-16g/dL(females)
- Hct = 38-50% (males) & 35-45%
- Iron = 38-169ug/dL
- Ferritin = 30-400ng/mL
- TSAT = 15-55%
- TIBC = 250-450ug/dL
- B12 = 110-1500pg/mL
- Folate = 3-13ng/mL
- HbA1C = ~7.0
- PTH = 14-64pg/mL
- Vit D = 30-100ng/mL
- Na+ = 135-145
- K+ = 3.5-5.0
- CO2 = 20-31
- Ca2+ = 8.6-10.3mg/dL
- PO4 = 2.1-4.3 mg/dL
- BUN = 7-25mg/dL
- Creatinine = 0.7-1.18mg/dL
- GFR = >90ml/min/1.73m2
- Urine albumin = <30mg/g

RELATED COMPLICATIONS & CONSIDERATIONS

- Anemia
  - S/S - fatigue, dyspnea, pallor
  - Hgb <12g/dL in females
  - Hgb <13g/dL in males
  - Iron replacement if indicated or erythopoetin stimulating agent
- Mineral & Bone Disorders
  - Monitor serum Ca2+, PO4, PTH, Alkaline phosphatase, Vitamin D
  - Calcium supplements, phosphate binders
- Avoid Nephrotoxic Medications
  - Glycoside antibiotics, contrast dyes, NSAIDS, COX-2 inhibitors, antifungals

Appendix C

Pre-Educational Session KSA Assessment

Demographic

1) Identify your current nursing licensure.
    a. Registered Nurse
    b. Advanced Practice Registered Nurse
2) How many years have you been practice in this role?
    a. Less than 1 year
    b. At least 1 year but less than 3 years
    c. At least 3 years but less than 5 years
    d. At least 5 years but less than 10 years
    e. More than 10 years

If 1) = a, then answer 3 – 18.

If 1) = b, then answer 19 – 35.

RN Knowledge

3) Patients who have risk factor(s) for CKD include: (select all that apply).
    a. Administered nephrotoxins

b. Hypertension

c. Diabetes

d. Family history of CKD

4) The goal for blood pressure management for all CKD patients is <140/90.

a. True

b. False

5) The goal for glycemic control for the CKD patient is less than 5.6%.

a. True

b. False

6) Which medication is administered to normotensive, diabetic patients to protect the kidneys from progressing to CKD?

a. Beta antagonist

b. Metformin

c. ACEi or ARBs

d. Ibuprofen

7) Which two laboratory values are most important to trend when identifying a need for a nephrology consultation?

a. Urine albumin

b. Hemoglobin

c. Serum potassium

d. Glomerular filtration rate

e. Blood urea nitrogen

8) Dietary education for the patient with CKD includes the following (select all that apply).

a. Monounsaturated fat and omega 3 fatty acids

b. Limit protein intake to 1.3g/kg/day

c. Avoid all alcohol

d. Limit sodium intake to less than 2 grams per day

e. Consume complex carbohydrates instead of simple sugars

9) Patients with CKD are at a higher risk for cardiovascular disease and cardiovascular-related events.

a. True

b. False

10) Complications associated with CKD include (select all that apply).

a. Anemia

b. Mineral and bone disorders

c. Electrolyte imbalances

d. Depression

e. Dyslipidemias

RN Skills

11) I assess signs and symptoms of hypertension in patients with chronic kidney disease every 8 hours.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly agree

12) I assess for signs and symptoms of hyperglycemia in patients with chronic kidney disease every 6 hours and as needed.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly disgree

13) I assess for signs and symptoms of fluid volume overload or dehydration in patients with chronic kidney disease daily and as needed.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly disgree

14) I know when to notify medical providers regarding abnormal assessment findings in patients with chronic kidney disease.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly disgree

RN Attitudes

15) Rate your comfort level in assessing complications of chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

16) I am able to collaborate with the medical providers regarding any abnormal findings related to chronic kidney disease.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

17) Rate your comfort level in caring for patients diagnosed with chronic kidney disease.

a. Not comfortable at all
b. Not comfortable
c. Neutral
d. Comfortable
e. Very Comfortable

18) I believe educating patients regarding recommended lifestyle changes and behaviors modifications can positively impact the progression of chronic kidney disease.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree

e. Strongly agree

APRN Knowledge

19) Patients who meet the following criteria are appropriate for nephrology consultation (select all that apply).

a. Creatinine = 2.0

b. GFR less than 60 ml/min/1.73 m2, with or without diabetes

c. ACR 70 mg/mmol or more, unless known to be caused by diabetes and already appropriately treated

d. ACR 30 mg/mmol or more, together with haematuria

e. Sustained decrease in GFR of 25% or more or sustained decrease in GFR of 15 ml/min/1.73 m2 or more within 12 months

f. Hypertension that remains poorly controlled despite the use of at least 4 antihypertensive drugs at therapeutic doses

g. Known or suspected rare or genetic causes of CKD

h. Suspected renal artery stenosis

20) Patients with the following risk factors should be tested for chronic kidney disease (select all that apply).

a. Diabetes

b. Hypertension

c. Acute kidney injury

d. Cardiovascular disease (ischaemic heart disease, chronic heart failure, peripheral vascular disease or cerebral vascular disease)

e. Structural renal tract disease, recurrent renal calculi or prostatic hypertrophy

f. Multisystem diseases with potential kidney involvement – for example, systemic lupus erythematosus

g. Family history of end-stage kidney disease (GFR category G5) or hereditary kidney disease

h. Opportunistic detection of haematuria

21) Patients with the following conditions are at risk for progression of chronic kidney disease (select all that apply).

a. Cardiovascular disease

b. Proteinuria

c. Acute kidney injury

d. Hypertension

e. Diabetes

f. Smoking

g. African, African-Caribbean or Asian family origin

h. Chronic use of NSAIDs

i. Untreated urinary outflow tract obstruction

22) Blood pressure goals for patients diagnosed with chronic kidney disease are to keep the systolic blood pressure below 140 mmHg (target range 120–139 mmHg) and the diastolic blood pressure below 90 mmHg.

a. True

b. False

23) Blood pressure goals for patients diagnosed with chronic kidney disease and diabetes are to keep the systolic blood pressure below 130 mmHg (target range 120–129 mmHg) and the diastolic blood pressure below 80 mmHg.

    a. True

    b. False

24) Blood pressure goals for patients diagnosed with chronic kidney disease and with an ACR of 70 mg/mmol or more are to keep the systolic blood pressure below 130 mmHg (target range 120–129 mmHg) and the diastolic blood pressure below 80 mmHg.

    a. True

    b. False

25) Patients meeting the following parameters should be prescribed a renin-angiotensin system antagonist (select all that apply).

    a. Diabetes and an ACR of 3 mg/mmol or more (ACR category A2 or A3)

    b. Hypertension and an ACR of 30 mg/mmol or more (ACR category A3)

    c. An ACR of 70 mg/mmol or more (irrespective of hypertension or cardiovascular disease)

26) Patients with chronic kidney disease should be prescribed a combination of renin-angiotensin system antagonists.

    a. True

    b. False

<u>APRN Skills</u>

27) I manage hypertension in patients with chronic kidney disease following evidence-based guidelines.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

28) I manage diabetes or hyperglycemia in patients with chronic kidney disease following evidence-based guidelines.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

29) I manage fluid volume status in patients with chronic kidney disease following evidence-based guidelines.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

30) I can appropriately diagnose and classify chronic kidney disease.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

31) I order nephrology consultation for patients with the following chronic kidney disease classification (select all that apply).

a. CKD Stage 1
b. CKD Stage 2
c. CKD Stage 3a
d. CKD Stage 3b
e. CKD Stage 4
f. CKD Stage 5

APRN Attitudes

32) Rate your comfort level in diagnosing chronic kidney disease.

a. Not comfortable at all
b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

33) Rate your comfort level in managing hypertension in patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

34) Rate your comfort level in managing diabetes in patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

35) Rate your comfort level in managing fluid balance in patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

Appendix D

RN Assessment Item Development, Expert Rating, and Content Validity Index

Purpose

The following items were developed to evaluate levels of knowledge, skills, and attitudes of bedside nurses in providing nephrology-specific nursing care for patients admitted to a rehabilitation facility prior to and following a nephrology-specific education course. The questionnaire will be comprised of eight knowledge-based items, four to five skills-based items, and four attitudes-based items.

Objective

1. Identify, evaluate and report hypertension, hyperglycemia and dehydration in patients with CKD

Population

Registered nurses providing bedside care to a diverse population of patients, including those at risk for or diagnosed with chronic kidney disease at a sub-acute rehabilitation facility.

Scoring Procedures to be Used

The web-based questionnaire will be administered via Survey Monkey. Each item will be analyzed using a repeated designs measure comparing KSAs pre and post nephrology-specific educational sessions. Only the knowledge-based items are considered to have a correct response.

Item Format

The questionnaire will be a combination of multiple choice, select all that apply, and true false items.

Test Blueprint

Content	Knowledge	Skills	Attitudes
Risk factors for CKD	1		
Treatment goals	2		
Pharmacotherapy	1		
Lab monitoring	1		
Patient Education	1		1
Risks and complications	1		
Assessment		3	1
Evaluation		1	1
Collaboration			1

Assessment Questions

<u>RN Knowledge</u>

4) Patients who have risk factor(s) for CKD include: (select all that apply).

   f. Administered nephrotoxins

   g. Hypertension

h. Diabetes

i. Family history of CKD

Answer: a-d

Rationale: All listed items are common risk factors for CKD (American Nephrology Nurses Association, 2017).

36) The goal for blood pressure management for all CKD patients is <140/90.

a. True

b. False

Answer: b

Rationale: Blood pressure goals for CKD with diabetes or albuminuria are <130/80 (American Nephrology Nurses Association, 2017).

37) The goal for glycemic control for the CKD patient is less than 5.6%.

a. True

b. False

Answer: a

Rationale: Normal range for HbA1C in CKD in <5.6% (American Nephrology Nurses Association, 2017).

38) Which medication is administered to normotensive, diabetic patients to protect the kidneys from progressing to CKD?

a. Beta antagonist

b. Metformin

c. ACEi or ARBs

d. Ibuprofen

Answer: c

Rationale: Renin-angiotensin system antagonists are indicated for the normotensive, diabetic CKD patient for renoprotection to slow CKD progression (American Nephrology Nurses Association, 2017).

39) Which two laboratory values are most important to trend when identifying a need for a nephrology consultation?

a. Urine albumin
b. Hemoglobin
c. Serum potassium
d. Glomerular filtration rate
e. Blood urea nitrogen

Answer: a & d

Rationale: Abnormal values for albuminuria and GFR are used for the diagnosis and classification of CKD (American Nephrology Nurses Association, 2017).

40) Dietary education for the patient with CKD includes the following (select all that apply).

a. Monounsaturated fat and omega 3 fatty acids
b. Limit protein intake to 1.3g/kg/day
c. Avoid all alcohol
d. Limit sodium intake to less than 2 grams per day
e. Consume complex carbohydrates instead of simple sugars

Answer: All except c

Rationale: Alcohol consumption should be limited to 1-2 drinks daily but absolute elimination is a recommendation (American Nephrology Nurses Association, 2017).

41) Patients with CKD are at a higher risk for cardiovascular disease and cardiovascular-related events.

a. True

b. False

Answer: a

Rationale: CKD patients are at a higher risk of MI, CAD, and sudden cardiac death (American Nephrology Nurses Association, 2017).

42) Complications associated with CKD include (select all that apply).

a. Anemia

b. Mineral and bone disorders

c. Electrolyte imbalances

d. Depression

e. Dyslipidemias

Answer: a-e

Rationale: CKD patients are at a higher risk for all listed conditions (American Nephrology Nurses Association, 2017).

RN Skills

43) I assess signs and symptoms of hypertension in patients with chronic kidney disease every 8 hours.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly agree

44) I assess for signs and symptoms of hyperglycemia in patients with chronic kidney disease every 6 hours and as needed.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly disgree

45) I assess for signs and symptoms of fluid volume overload or dehydration in patients with chronic kidney disease daily and as needed.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly disgree

46) I know when to notify medical providers regarding abnormal assessment findings in patients with chronic kidney disease.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly disgree

RN Attitudes

47) Rate your comfort level in assessing complications of chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

48) I am able to collaborate with the medical providers regarding any abnormal findings related to chronic kidney disease.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly agree

49) Rate your comfort level in caring for patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

50) I believe educating patients regarding recommended lifestyle changes and behaviors modifications can positively impact the progression of chronic kidney disease.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly agree

Rating instructions: For each item, please indicate the following:

Please rate how relevant each item is to the overall construct of chronic kidney disease identification and care by the Registered Nurse by placing a number in the first box to the right of each item.

1 = Not relevant at all

2 = Slightly relevant

3 = Moderately relevant

4= Highly relevant

Your honest feedback is appreciated and will be used to enhance the quality of this questionnaire.

Item	Relevance Rating
Knowledge	
Patients who have risk factor(s) for CKD include: (select all that apply). a. Administered nephrotoxins b. Hypertension c. Diabetes d. Family history of CKD	
The goal for blood pressure management for all CKD patients is <140/90. a. True b. False	
The goal for glycemic control for the CKD patient is less than 5.6%. a. True b. False	
Which medication is administered to normotensive, diabetic patients to protect the kidneys from progressing to CKD? a. Beta antagonist b. Metformin c. ACEi or ARBs d. Ibuprofen	
Which two laboratory values are most important to trend when identifying a need for a nephrology consultation? a. Urine albumin b. Hemoglobin c. Serum potassium d. Glomerular filtration rate e. Blood urea nitrogen	
Dietary education for the patient with CKD includes the following (select all that apply). a. Monounsaturated fat and omega 3 fatty acids b. Limit protein intake to 1.3g/kg/day c. Avoid all alcohol d. Limit sodium intake to less than 2 grams per day e. Consume complex carbohydrates instead of simple sugars	

Patients with CKD are at a higher risk for cardiovascular disease and cardiovascular-related events. a. True b. False	
Complications associated with CKD include (select all that apply). a. Anemia b. Mineral and bone disorders c. Electrolyte imbalances d. Depression e. Dyslipidemias	

Skills	
I assess signs and symptoms of hypertension in patients with chronic kidney disease every 8 hours. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I assess for signs and symptoms of hyperglycemia in patients with chronic kidney disease every 6 hours and as needed. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I assess for signs and symptoms of fluid volume overload or dehydration in patients with chronic kidney disease daily and as needed. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I know when to notify medical providers regarding abnormal assessment findings in patients with chronic kidney disease. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	

Attitudes	
Rate your comfort level in assessing complications of chronic kidney disease. a. Not comfortable at all b. Not comfortable c. Neutral d. Comfortable e. Very Comfortable	
I am able to collaborate with the medical providers regarding any abnormal findings related to chronic kidney disease. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
Rate your comfort level in caring for patients diagnosed with chronic kidney disease. a. Not comfortable at all b. Not comfortable c. Neutral d. Comfortable e. Very Comfortable	
I believe educating patients regarding recommended lifestyle changes and behaviors modifications can positively impact the progression of chronic kidney disease. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	

Content Validity Index Table

RN Knowledge	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert 6	Expert 7	Mean	CVR
1	3	4	3	4	3	3	4	3.43	1
2	4	3	4	4	4	3	4	3.71	1
3	4	3	4	4	3	4	3	3.57	1
4	3	4	2	3	3	4	3	3.14	1
5	4	4	4	4	4	4	4	4.00	1
6	4	4	4	4	4	4	4	4.00	1
7	4	4	3	3	3	3	4	3.43	1
8	3	4	4	4	4	4	4	3.86	1
RN Skills									
1	4	4	4	4	4	3	4	3.86	1
2	4	3	3	3	4	4	3	3.43	1
3	4	4	4	4	4	4	4	4.00	1
4	4	4	4	4	4	4	4	4.00	1
RN Attitudes									
1	4	4	3	3	4	4	3	3.57	1
2	4	4	4	4	4	4	4	4.00	1
3	3	3	3	4	3	3	4	3.29	1
4	4	3	4	4	4	4	4	3.86	1

The mean total of all of the means was 3.71.

CVR = [E-(N/2))/(N/2)]

E = Represents the number of judges rating the item as Moderately Relevant or Highly Relevant

N = Total number of judges

APRN Assessment Item Development, Expert Rating, and Content Validity Index

Purpose

The following items were developed to evaluate levels of knowledge, skills, and attitudes (KSA) of advanced practice registered nurses (APRN) in providing nephrology-specific nursing care for patients admitted to a rehabilitation facility prior to and following a nephrology-specific education course. The questionnaire will be comprised of eight knowledge-based items, five skills-based items, and four attitudes-based items.

Objective

2. Identify, evaluate and manage hypertension, hyperglycemia and dehydration in patients with CKD and provide appropriate, evidence-based care for patients in early stage CKD

Population

APRNs providing primary care services in the diagnosis, treatment, and management of the patient population admitted at a sub-acute rehabilitation facility, including those at risk for or diagnosed with chronic kidney disease

Scoring Procedures to be Used

The web-based questionnaire will be administered via Survey Monkey. Each item will be analyzed using a repeated designs measure comparing KSAs pre and post nephrology-specific educational sessions. Only the knowledge-based items are considered to have a correct response.

Item Format

The questionnaire will be a combination of multiple choice, select all that apply, and true false items.

Test Blueprint

Content	Knowledge	Skills	Attitudes
Indications for referral	**1**		
Risk factors for CKD or progression of CKD	**2**		
Hypertension guideline goals	**3**		
Management of hypertension	**2**		
Management of CKD complications		**3**	**4**
Diagnosis and classification		**2**	

Assessment Questions

APRN Knowledge

51) Patients who meet the following criteria are appropriate for nephrology consultation (select all that apply).

a. Creatinine = 2.0

b. GFR less than 60 ml/min/1.73 m2, with or without diabetes

c. ACR 70 mg/mmol or more, unless known to be caused by diabetes and already appropriately treated

d. ACR 30 mg/mmol or more, together with haematuria

e. Sustained decrease in GFR of 25% or more or sustained decrease in GFR of 15 ml/min/1.73 m2 or more within 12 months

f. Hypertension that remains poorly controlled despite the use of at least 4 antihypertensive drugs at therapeutic doses
g. Known or suspected rare or genetic causes of CKD
h. Suspected renal artery stenosis

Answer: a-h

Rationale: All listed conditions are appropriate indications for referral to a nephrology specialist (National Kidney Foundation, 2012).

52) Patients with the following risk factors should be tested for chronic kidney disease (select all that apply).

a. Diabetes
b. Hypertension
c. Acute kidney injury
d. Cardiovascular disease (ischaemic heart disease, chronic heart failure, peripheral vascular disease or cerebral vascular disease)
e. Structural renal tract disease, recurrent renal calculi or prostatic hypertrophy
f. Multisystem diseases with potential kidney involvement – for example, systemic lupus erythematosus
g. Family history of end-stage kidney disease (GFR category G5) or hereditary kidney disease
h. Opportunistic detection of haematuria

Answer: a-h

Rationale: All listed conditions are risk factors for CKD where testing is recommended (National Kidney Foundation, 2012).

53) Patients with the following conditions are at risk for progression of chronic kidney disease (select all that apply).

a. Cardiovascular disease
b. Proteinuria
c. Acute kidney injury
d. Hypertension
e. Diabetes
f. Smoking
g. African, African-Caribbean or Asian family origin
h. Chronic use of NSAIDs
i. Untreated urinary outflow tract obstruction

Answer: a-i

Rationale: All listed conditions are risk factors for CKD progression (National Kidney Foundation, 2012).

54) Blood pressure goals for patients diagnosed with chronic kidney disease are to keep the systolic blood pressure below 140 mmHg (target range 120–139 mmHg) and the diastolic blood pressure below 90 mmHg.

a. True
b. False

Answer: a

Rationale: Goal for hypertension in CKD is <140/90 (National Kidney Foundation, 2012).

55) Blood pressure goals for patients diagnosed with chronic kidney disease and diabetes are to keep the systolic blood pressure below 130 mmHg (target range 120–129 mmHg) and the diastolic blood pressure below 80 mmHg.

a. True

b. False

Answer: a

Rationale: Goal for hypertension with diabetes in CKD is <130/80 (National Kidney Foundation, 2012).

56) Blood pressure goals for patients diagnosed with chronic kidney disease and with an ACR of 70 mg/mmol or more are to keep the systolic blood pressure below 130 mmHg (target range 120–129 mmHg) and the diastolic blood pressure below 80 mmHg.

a. True

b. False

Answer: a

Rationale: Goal for hypertension in CKD with albuminuria is <130/80 (National Kidney Foundation, 2012).

57) Patients meeting the following parameters should be prescribed a renin-angiotensin system antagonist (select all that apply).

a. Diabetes and an ACR of 3 mg/mmol or more (ACR category A2 or A3)

b. Hypertension and an ACR of 30 mg/mmol or more (ACR category A3)

c. An ACR of 70 mg/mmol or more (irrespective of hypertension or cardiovascular disease)

Answer: a-c

Rationale: Renoprotective therapy with a renin-angiotensin system antagonist is recommended in all listed conditions (National Kidney Foundation, 2012).

58) Patients with chronic kidney disease should be prescribed a combination of renin-angiotensin system antagonists.

a. True

b. False

Answer: b

Rationale: There is insufficient evidence supporting the use of combination ACEi and ARBs to prevent CKD progression (National Kidney Foundation, 2012).

APRN Skills

59) I manage hypertension in patients with chronic kidney disease following evidence-based guidelines.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly agree

60) I manage diabetes or hyperglycemia in patients with chronic kidney disease following evidence-based guidelines.

a. Strongly disagree

b. Disagree

c. Neutral

d. Agree

e. Strongly agree

61) I manage fluid volume status in patients with chronic kidney disease following evidence-based guidelines.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

62) I can appropriately diagnose and classify chronic kidney disease.

a. Strongly disagree
b. Disagree
c. Neutral
d. Agree
e. Strongly agree

63) I order nephrology consultation for patients with the following chronic kidney disease classification (select all that apply).

a. CKD Stage 1
b. CKD Stage 2
c. CKD Stage 3a
d. CKD Stage 3b
e. CKD Stage 4
f. CKD Stage 5

APRN Attitudes

64) Rate your comfort level in diagnosing chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

65) Rate your comfort level in managing hypertension in patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

66) Rate your comfort level in managing diabetes in patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

67) Rate your comfort level in managing fluid balance in patients diagnosed with chronic kidney disease.

a. Not comfortable at all

b. Not comfortable

c. Neutral

d. Comfortable

e. Very Comfortable

Rating instructions: For each item, please indicate the following:

Please rate how relevant each item is to the overall construct of chronic kidney disease identification and care by the APRN by placing a number in the first box to the right of each item.

1 = Not relevant at all

2 = Slightly relevant

3 = Moderately relevant

4= Highly relevant

Your honest feedback is appreciated and will be used to enhance the quality of this questionnaire.

Item	Relevance Rating
Knowledge	
Patients who meet the following criteria are appropriate for nephrology consultation (select all that apply). a. Creatinine = 2.0 b. GFR less than 60 ml/min/1.73 m2, with or without diabetes c. ACR 70 mg/mmol or more, unless known to be caused by diabetes and already appropriately treated d. ACR 30 mg/mmol or more, together with haematuria e. Sustained decrease in GFR of 25% or more or sustained decrease in GFR of 15 ml/min/1.73 m2 or more within 12 months f. Hypertension that remains poorly controlled despite the use of at least 4 antihypertensive drugs at therapeutic doses g. Known or suspected rare or genetic causes of CKD h. Suspected renal artery stenosis	
Patients with the following risk factors should be tested for chronic kidney disease (select all that apply). a. Diabetes b. Hypertension c. Acute kidney injury d. Cardiovascular disease (ischaemic heart disease, chronic heart failure, peripheral vascular disease or cerebral vascular disease) e. Structural renal tract disease, recurrent renal calculi or prostatic hypertrophy f. Multisystem diseases with potential kidney involvement – for example, systemic lupus erythematosus g. Family history of end-stage kidney disease (GFR category G5) or hereditary kidney disease h. Opportunistic detection of haematuria	
Patients with the following conditions are at risk for progression of chronic kidney disease (select all that apply). a. Cardiovascular disease b. Proteinuria c. Acute kidney injury d. Hypertension e. Diabetes f. Smoking g. African, African-Caribbean or Asian family origin h. Chronic use of NSAIDs i. Untreated urinary outflow tract obstruction	

Blood pressure goals for patients diagnosed with chronic kidney disease are to keep the systolic blood pressure below 140 mmHg (target range 120–139 mmHg) and the diastolic blood pressure below 90 mmHg. a. True b. False	
Blood pressure goals for patients diagnosed with chronic kidney disease and diabetes are to keep the systolic blood pressure below 130 mmHg (target range 120–129 mmHg) and the diastolic blood pressure below 80 mmHg. a. True b. False	
Blood pressure goals for patients diagnosed with chronic kidney disease and with an ACR of 70 mg/mmol or more are to keep the systolic blood pressure below 130 mmHg (target range 120–129 mmHg) and the diastolic blood pressure below 80 mmHg. a. True b. False	
Patients meeting the following parameters should be prescribed a renin-angiotensin system antagonist (select all that apply). a. Diabetes and an ACR of 3 mg/mmol or more (ACR category A2 or A3) b. Hypertension and an ACR of 30 mg/mmol or more (ACR category A3) c. An ACR of 70 mg/mmol or more (irrespective of hypertension or cardiovascular disease)	
Patients with chronic kidney disease should be prescribed a combination of renin-angiotensin system antagonists. a. True b. False	

Item	Relevance Rating
Skills	
I manage hypertension in patients with chronic kidney disease following evidence-based guidelines. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I manage diabetes or hyperglycemia in patients with chronic kidney disease following evidence-based guidelines. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I manage fluid volume status in patients with chronic kidney disease following evidence-based guidelines. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I can appropriately diagnose and classify chronic kidney disease. a. Strongly disagree b. Disagree c. Neutral d. Agree e. Strongly agree	
I order nephrology consultation for patients with the following chronic kidney disease classification (select all that apply). a. CKD Stage 1 b. CKD Stage 2 c. CKD Stage 3a d. CKD Stage 3b e. CKD Stage 4 f. CKD Stage 5	

Item	Relevance Rating
Attitudes	
Rate your comfort level in diagnosing chronic kidney disease. a. Not comfortable at all b. Not comfortable c. Neutral d. Comfortable e. Very Comfortable	
Rate your comfort level in managing hypertension in patients diagnosed with chronic kidney disease. a. Not comfortable at all b. Not comfortable c. Neutral d. Comfortable e. Very Comfortable	
Rate your comfort level in managing diabetes in patients diagnosed with chronic kidney disease. a. Not comfortable at all b. Not comfortable c. Neutral d. Comfortable e. Very Comfortable	
Rate your comfort level in managing fluid balance in patients diagnosed with chronic kidney disease. a. Not comfortable at all b. Not comfortable c. Neutral d. Comfortable e. Very Comfortable	

Content Validity Index Table

APRN Knowledge	Expert 1	Expert 2	Expert 3	Expert 4	Mean	CVR
1	4	4	4	4	4.00	1
2	4	4	4	4	4.00	1
3	4	4	3	4	3.75	1
4	4	4	3	4	3.75	1
5	4	4	3	4	3.75	1
6	4	4	3	4	3.75	1
7	4	4	4	4	4.00	1
8	3	3	3	4	3.25	1
APRN Skills						
1	4	4	3	4	3.75	1
2	3	3	3	4	3.25	1
3	4	4	4	4	4.00	1
4	4	4	3	4	3.75	1
5	4	4	4	4	4.00	1
APRN Attitudes						
1	4	4	3	4	3.75	1
2	4	4	4	4	4.00	1
3	3	3	3	4	3.25	1
4	4	3	3	4	3.50	1

The mean total of all of the means was 3.74.

CVR = [E-(N/2))/(N/2)]

E = Represents the number of judges rating the item as Moderately Relevant or Highly Relevant

N = Total number of judges

Appendix E

REHABILITATION FACILITY RETROSPECTIVE CHART AUDIT FOR IDENTIFYING NEPHROLOGY REFERALS										
						TRENDING LABS			Nephrology Indicated	Referral Done
#	ADMITTING DIAGNOSIS	RELATED HISTORY	COMORBIDITIES	MEDICATIONS	DATE:	BUN	CR.	GFR	Y/N	Y/N

Appendix F

	What	How	Who	When	Where	Why
Strategy	KSA assessment tool	Survey Monkey	Lubia	Sep 2017	Online	Establish baseline KSA and compare impact of educational sessions
Strategy	Pre-educational intervention data collection	Chart audit	Lubia Maryanne Cardenas	Oct 2017	Kindred Spring Valley	Establish baseline rate of appropriate and missed nephrology referrals
Strategy	Post-educational intervention data collection	Chart audit	Lubia Maryanne Cardenas	Nov 2017 – Jan 2018	Kindred Spring Valley	Analysis of effectiveness of interventions on rate of appropriate and missed nephrology referrals
People Organization	Recruitment & Reminder flyer	Microsoft Publisher-delivered through facility internal communication, posted in nursing units at facility and through APRN email contacts	Lubia Mary Anne Cardenas	Sep 2017	Kindred Spring Valley	Generate engagement at educational sessions
Process	CKD care guideline tool development	Microsoft Publisher	Lubia	Oct 2017	Kindred Spring Valley	Provides a visual reference tool for nurses to utilize, promotes adherence to evidence-based care
Process	CKD care guideline tool dissemination	Presented during educational sessions & posted in nursing units at facility	Lubia	Nov 2017	Kindred Spring Valley	Ensure participants acknowledge usage and understanding of guidelines
Process	Data analysis	SPSS	Lubia	Feb 2018	Online	Evaluate statistical significance of the impacts of interventions on

						improving process outcome
Technology	Nephrology-specific educational classes	In-person presentation	Lubia	Nov 2017 (multiple sessions)	Kindred Spring Valley	Provide participants with appropriate, evidence-based KSAs for care of the early CKD patient
Technology	Dissemination of findings	In-person presentation	Lubia Mary Anne Cardenas	Feb 2018	Kindred Spring Valley and Touro University Nevada	Provide stakeholder with evidence to support a quality improvement process change in the facility to facilitate integrating guidelines into fully-approved treatment protocol

Appendix G

	Less than 1 year	At least 1 year but less than 3 years	At least 3 years but less than 5 years	At least 5 years but less than 10 years	10 years of more
RN	15.9%	15.9%	11.4%	27.3%	29.5%
APRN	40%	13.3%	26.7%	13.3%	6.7%

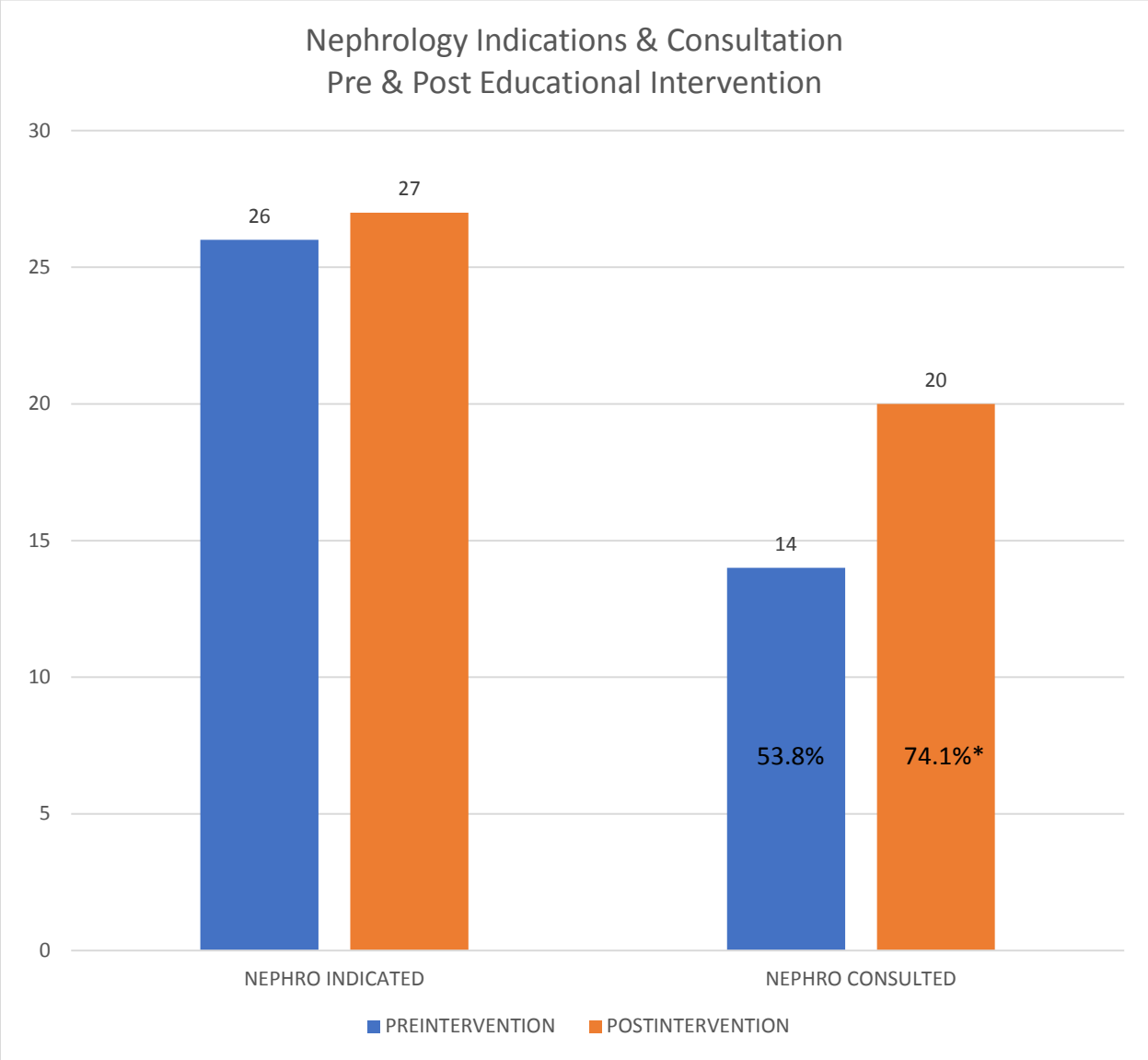
Frequency distribution of study participants based on indicated years of experience in current level of nursing practice.

Appendix H

	Knowledge	Significance	Skills	Significance	Attitudes	Significance
RN Pre	11	0.032	8	0.438	7	0.860
RN Post	13		8		8	
APRN Pre	13	0.002	9	0.017	5	0.020
APRN Post	15		10		8	

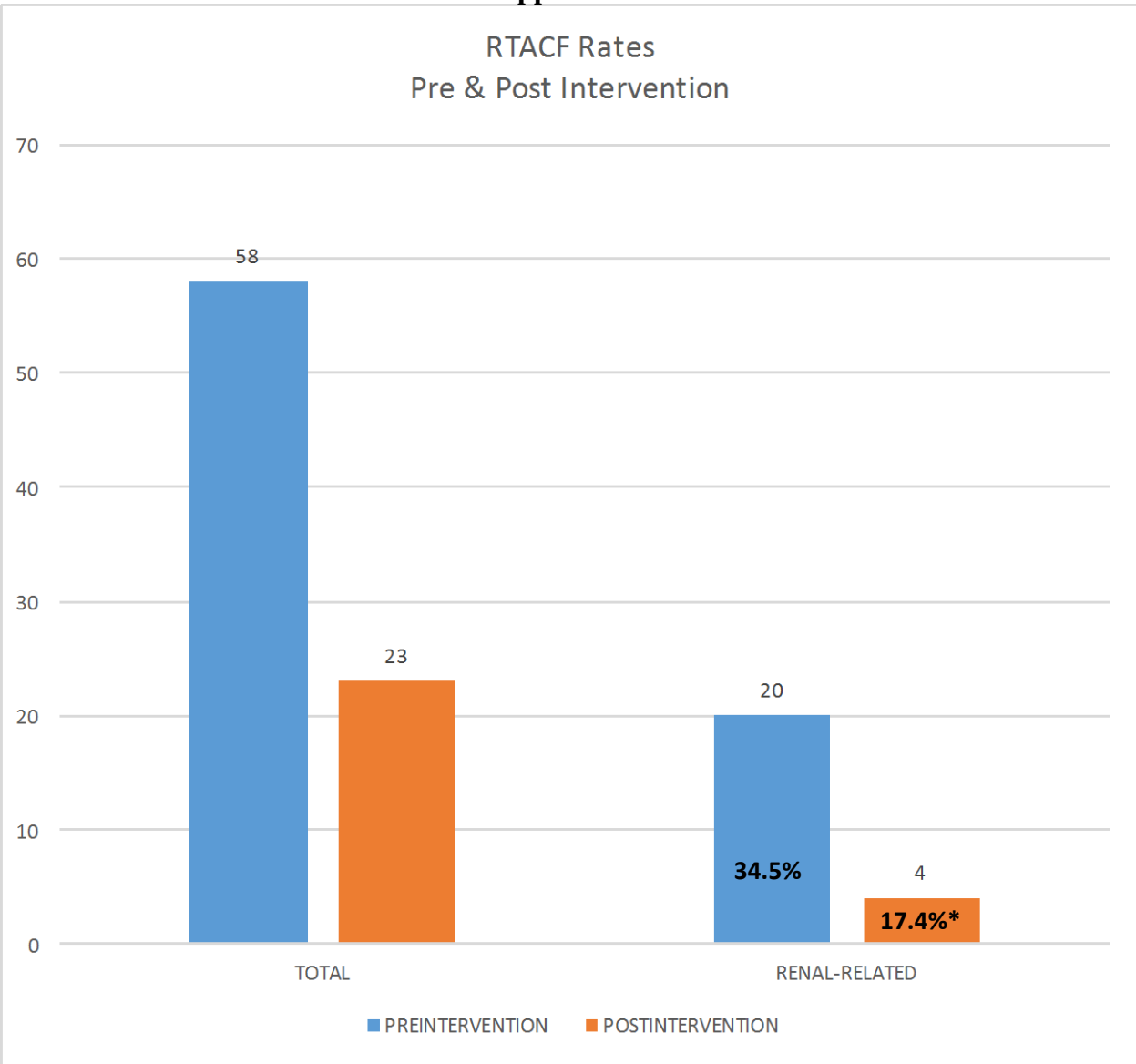
Median scores calculated from summated responses by subgroup bedside nurses (RN) and APRNs. Confidence interval is 95%.

Appendix I



Number and percentages of cases with nephrology consultation indicated and performed pre and post-nephrology specific educational course intervention. *$p < 0.05$.

Appendix J



RTACF total and renal-related pre and post nephrology specific educational intervention. *p = 0.09.