Renal Diseases Health Network

Chronic Kidney Disease Model of Care

Prepared by the
Renal Diseases Health Network
Working Party
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Working Together to Create a Healthy WA

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FOREWORD

Access to renal dialysis or a kidney transplant is literally a matter of life or death for Western Australians who develop Stage 5 end-stage kidney disease (ESKD).

However, renal dialysis is also one of the five highest cost services provided by hospitals and expectations are that those costs will escalate steeply in the near future as the population ages and the prevalence of Type 2 diabetes increases. It therefore makes sense to develop a model of care for chronic kidney disease (CKD) that provides a comprehensive framework for the prevention and treatment of the disease and its complications. Early intervention and better management practices will save lives and vital resources.

The *CKD Model of Care* provides this framework.

CKD is a significant health burden in Australia and across the world, yet it is poorly recognised. The problem is becoming rapidly worse too, due to the growing incidence of hypertension, cardiovascular conditions and diabetes, which is now the major cause of ESKD. CKD also disproportionately affects indigenous people and the economically disadvantaged.

Nevertheless, because chronic diseases are strongly influenced by behaviour and lifestyle factors, there are very real opportunities to prevent the incidence and development of these conditions, particularly through proven interventions, targeted early screening and timely specialist referrals.

The *CKD Model of Care* identifies gaps in the current delivery of renal services and provides strategies to improve and integrate service provision for the different stages of the disease. The model emphasises the importance of partnership and collaboration with primary care, community health workers, nephrologists and renal professionals in the management of CKD.

The establishment of multidisciplinary CKD management clinics, to address the growing demand for renal services, in specific metropolitan, rural and remote sites offers an innovative model of service provision for advanced CKD.

This document is a result of dedication and commitment of consumers and partnerships within WA Health and across the non-government sector. I thank all those who contributed to its development. I am confident this Model of Care will significantly enhance the health of West Australians who have, or are at risk of developing, CKD.

Dr Neale Fong
Director General of Health

EXECUTIVE SUMMARY

The Chronic Kidney Disease (CKD) Model of Care provides a framework for comprehensive, accessible and efficient provision of prevention and treatment of CKD and its complications for all Western Australians.

Key objectives of the CKD Model of Care are to ensure that renal services are optimally configured to:

1. Prevent or delay the onset of CKD
2. Prevent and slow progression of CKD and its complications, especially end-stage renal disease, heart disease, stroke and peripheral vascular disease
3. Improve the quality of life of people who have CKD
4. Reduce CKD-related presentations to tertiary hospitals

Additional objectives include addressing inequities in renal service provision, particularly for Aboriginal people and other disadvantaged groups. The RDHN recognises the magnitude and complexity of the problems around provision of renal care to Aboriginal and Torres Strait Islander people and has engaged a dedicated taskforce to specifically address these issues.

CKD shares a number of common risk factors with diabetes, hypertension and cardiovascular disease. End-stage kidney disease (ESKD) is commonly a consequence of diabetes and hypertension and these conditions are preventable. Collaborative partnership with the Endocrine (Diabetes), Cardiovascular (hypertension), Neurosciences and the Senses (stroke) Health Networks is regarded as valuable in preventing and addressing the incidence, prevalence and in minimising and managing the progression of these diseases.

Identification of early CKD is critical to ensure appropriate management, to delay and minimise or halt its progression. CKD is irreversible and there are five stages to the disease. Stage 5 ESKD is fatal unless treated by dialysis or kidney transplantation.

In 2005 there were 236 new patients diagnosed with ESKD in WA, compared to 74 in 1990. Similarly, the prevalence rate for renal dialysis has continued to rise from 222 patients in 1990 to 848 in 2005, an increase of 281%. Renal dialysis is a high-cost, high-volume specialised service accounting for 71% of all hospital separations of the top 5 high cost users.

The CKD Model of Care encompasses **seven key action** areas:

1. Prevention strategies – primary, early detection and secondary prevention
2. Appropriate and timely referral to a nephrologist
3. Establishment of multi-disciplinary clinics in the metropolitan and regional areas
4. Early evaluation and management of patients with advanced CKD, where renal replacement therapy is anticipated
5. Preparation and care of patients suitable for kidney transplantation
6. End of life and palliative care
7. Appropriate number of renal workforce personnel to provide high quality service.

KEY RECOMMENDATIONS

Recommendation 1: That Population Health implements documented effective strategies to reduce the burden of hypertension and diabetes.

Recommendation 2: That a targeted opportunistic screening program in primary care among high-risk individuals to identify those with CKD is promoted and appropriate treatment be provided in those patients identified with early CKD.

Recommendation 3: That community services and chronic disease management teams be utilised to facilitate the development of clients self-management skills and to case manage patients with multiple and complex co-morbid conditions.

Recommendation 4: That the guidelines 'Referral to Nephrology Specialist Outpatient Appointment' be implemented across the State and the intake and timeliness of referrals be monitored.

Recommendation 5: That all people with chronic kidney disease have access to information that enables them and their carers to make informed decisions, encourages partnership in decision-making and an agreed care plan that supports them in managing their condition to achieve the best possible quality of life.

Recommendation 6: That all Units with responsibility for preparing patients for Dialysis require experienced and adequate trained Nurse Educators and support from adequate number of Aboriginal Liaison Officers appropriate to the number of Aboriginal patients under care.

Recommendation 7: That dialysis access surgery meets the international benchmark of 1 dialysis access session per 120 dialysis patients, 1.0 FTE surgeon per 350 cases per year.

Recommendation 8: That a dedicated central line insertion service via Radiology be established to maintain best practice outcomes for CKD patients.

Recommendation 9: That a renal access nurse be mandatory for all centres involved in assessment and management of patients with CKD requiring vascular surgery.

Recommendation 10: That high level, integrated and multidisciplinary CKD management clinics for all patients with advanced stage CKD be established in metropolitan tertiary centres.

Recommendation 11: That establishment of nurse-led multidisciplinary CKD management clinics for patients with advanced stage CKD in the outer metropolitan hospitals be considered.

Recommendation 12: That nurse-led multidisciplinary CKD management clinics for patients with advanced stage CKD be established at 12 identified rural and remote regions in WACHS.

Recommendation 13: That the Palliative Care Network works with existing organisations for conditions other than cancer to develop an appropriate model of care to meet the needs of people with non-malignant diseases.

Recommendation 14: That an appropriate number of nephrologists be recruited and maintained to align the physicians' workforce more closely with national workforce standards and international benchmarks.

Recommendation 15: That the dialysis care assistant role be established in order to devolve non-nursing tasks onto less skilled personnel to overcome the critical shortage of nurses particularly in rural and remote areas.

Recommendation 16: That appropriate staffing and service levels be funded, achieved and maintained to ensure that all patients have access to renal services that are recognised as necessary for optimal patient management, in the appropriate location.

ACRONYMS

ACE inhibitor	Angiotensin-Converting Enzyme inhibitor
ACR	Albumin/creatinine ratio
ARB	Angiotensin II Receptor Blockers
AHP	Allied Health Professionals
ANZDATA	Australian New Zealand Dialysis and Transplant Registry
ANZSN	Australian New Zealand Society of Nephrology
APD	Automated peritoneal dialysis
ARF	Acute Renal Failure
ATSI	Aboriginal & Torres Strait Islanders
AVF	Arteriovenous fistula
BMI	Body mass index
BP	Blood pressure
BRS	British Renal Society
CAPD	Continuous Ambulatory Peritoneal Dialysis
CARI	Caring for Australasians with Renal Impairment
CHD	Coronary Heart Disease
CKD	Chronic Kidney Disease
CVD	Cardiovascular disease
DoH	Department of Health
eGFR	Estimated glomerular filtration rate
ESKD	End Stage Kidney Disease
FTE	Full Time Equivalent
GFR	Glomerular Filtration Rate
HD	Haemodialysis
HDU	High Dependency Unit
KHA	Kidney Health Australia
DOPPS	International Dialysis Outcomes and Practice Patterns Study
IT	Information Technology
MDRD	Modification of Diet in Renal Disease
NHpPD	Nursing Hours per Patient Day
NHS	National Health Service
NCCGs	Non Consultant Clinical Grade Practitioners
NSAIDS	Non-steroidal anti-inflammatory drugs
NTN	National Training Numbers
NICE	National Institute for Clinical Excellence
NSIF	National Service Improvement Framework
PBS	Pharmaceutical Benefits Scheme
PCR	Protein/creatinine ratio
PD	Peritoneal Dialysis
PMP	Per Million Population
PTH	Parathyroid hormone
RRT	Renal Replacement Therapy
VMP	Visiting Medical Practitioner
WACHS	WA Country Health Service

METHODOLOGY

The CKD Model of Care was developed by members of a working group comprising of a multidisciplinary team of health professionals with diverse expertise and experience.

Members of the group expressed their interest to be involved in the working group at the Renal Diseases Health Network (RDHN) March 2007 Stakeholders Forum. The group chaired by Prof Paolo Ferrari, Clinical Lead of the RDHN, included representatives from Health Consumer Council and a non-government agency, the private sector, Office of Aboriginal Health, renal nurses, pharmacist, nephrologists, dietitian, community health practitioners and a GP. (Membership of the working group is in Appendix 1)

The working group reviewed current literature, analysed the current service delivery and activities to identify shortcomings and gaps to determine an appropriate Model of Care that can provide sustainable services for CKD across the continuum of care from prevention of CKD in the well population through to the management of the end stage of the disease.

In recognition of the common risk factors that CKD shares with diabetes, hypertension and cardiovascular disease, the WA Health and Wellbeing Surveillance System (HWSS) and the Australian Diabetes, Obesity and Lifestyle (AusDiab) study were used to estimate the prevalence and impact of hypertension and diabetes on CKD.

WA Health and Wellbeing Surveillance System (HWSS)

The Department of Health in WA has been collecting health and lifestyle information from WA residents since 2002. The data is self-reported by persons aged 16 years and over throughout the State. Disproportionate random sampling was used. The data has been weighted and adjusted to the age and sex structure of the WA Estimated Resident Population, 2005 to allow valid comparisons to be made between regions and from each region to the State.

The Australian Diabetes, Obesity and Lifestyle (AusDiab) study

The Australian Diabetes, Obesity and Lifestyle (AusDiab) study is the largest Australian longitudinal population-based study that follows the progression of diabetes, pre-diabetes (in which glucose metabolism is impaired but not to the level to cause diabetes), heart disease and kidney disease. The baseline study conducted in 1999-2000 provided benchmark national data on the prevalence (or number of people) with diabetes, obesity, hypertension and kidney disease in Australia (Chadban et al, 2003). The second phase of AusDiab, completed in December 2005, is a 5-year follow-up of the people who participated in the baseline survey. The survey sites of the AusDiab study in WA were Trigg, Kardinya, Mt Helena, Scarborough, High Wycombe and Oakford.

Results on progression and mortality from the AusDiab study were used to infer morbidity and mortality from CKD associated with diabetes and, or hypertension in WA.

PathWest Data

There is a paucity of data on the prevalence of CKD in Western Australia. PathWest data with patient unique identifier (MRN) on sex, age and postcode, with test results for creatinine, glucose, haemoglobin, and derived GFR (mL/min) for March to June 2007 were extracted. A total of 24,741 records for 15,757 individuals identified by MRN were extracted. A comparison of population and number of record proportions for each health region indicated that only residents in the North and South metropolitan areas should be included in the analysis.

Data for 10,161 individual patients from North and South metropolitan areas aged 15 years or older were analysed. The five stages of CKD were inferred using the estimated GFR.

CHRONIC KIDNEY DISEASE - SUMMARY OF STRATEGIES

PRIMARY PREVENTION - The Well Population

Aim

To reduce the number of people in the population at risk of developing chronic kidney disease (CKD) associated with hypertension or diabetes.

Strategies

1. Adopt national, state and local plans and school based education programs to promote awareness of risk factors for diabetes and hypertension, in collaboration with other national health priorities and policies.
2. Investigate national, state economic and legislative strategies to reduce population exposure to known risk factors for diabetes and hypertension.
3. Establish and implement national, state, and local plans and incentives to increase opportunities for physical activity through open space and urban planning norms.
4. Provide access to culturally appropriate information on food, nutrition & physical activity to assist in mitigating the risks of overweight, obesity & Type 2 diabetes especially in high-risk groups & in those people with impaired glucose metabolism.
5. Develop & implement in collaboration with NGOs & other key stakeholders a CKD-specific community awareness strategy that focuses on modifying risk factors for developing CKD.
6. Explore the feasibility of a database that captures the incidence & prevalence of early stages of CKD.

EARLY DETECTION - Population at Risk

Aim

To reduce the number of people in the population who develop CKD.

Strategies

1. Promote awareness of the need for regular monitoring of blood pressure and of diabetes.
2. Include CKD early detection & management principles into core curriculum for GPs & other relevant primary care health professionals.
3. Establish and implement a targeted, opportunistic CKD screening program to increase early detection of asymptomatic chronic kidney disease in people at high risk.
4. Provide people with appropriate information about the disease, treatment options and expected outcomes, follow up and support services to facilitate self-management of the physical, psychosocial and economic impacts of their condition.
5. Ensure processes are in place to assess the extent to which clinical practice guidelines are adopted and to encourage their implementation to prevent CKD progression & reduce physical & psychosocial complications.
6. Include CKD content in current & future chronic disease self- management programs & services. Improve access to self-management education programs and support groups to help people develop the knowledge, skills and confidence to self-manage.

SECONDARY PREVENTION - Minimising the progression and consequences of CKD

Aim

To improve the long-term outcomes for people with chronic kidney disease by minimising the progression and consequences of the disease.

Strategies

1. Promote the implementation & evaluation of best practice guidelines designed to prevent CKD progression & reduce physical & psychosocial complications.

2. Develop & implement multi-disciplinary teams for people with established CKD by developing a purpose-trained workforce to improve the coordinated, multidisciplinary care of patients with CKD such as appropriate care plans, defined referral pathways, and designated coordinators of care.
3. Improve access to culturally appropriate care and support for all Australians with the conditions, and in particular ATSI people, people with diverse language and literacy needs, and people in rural and remote areas.
4. Implement models of communication & co-ordination between primary care providers and specialist services, which assist provision of multidisciplinary integrated care.
5. Ensure that psychosocial needs of people with CKD are met across the patient journey.
6. Implement policies to encourage the safe and quality use of medicines

SPECIALIST NEPHROLOGY SERVICES - Coordinated management of the advanced established condition

Aim

To co-ordinate and individualise the systematic care of patients with established renal failure by a comprehensive range of professional staff sympathetic and responsive to their individual needs and personal preferences.

Strategies

1. Establish integrated multidisciplinary CKD management clinics for all patients with advanced stage CKD in tertiary centres and selected outer metropolitan and rural resource centres.
2. Establish a defined management pathway for the evaluation and management of patients with CKD stages 4 and 5, where Renal Replacement Therapy (RRT) is anticipated.
3. Ensure that all people with chronic kidney disease have access to information that enables them and their carers to make informed decisions, encourages partnership in decision-making and an agreed care plan that supports them in managing their condition to achieve the best possible quality of life.
4. Enable all people approaching established renal failure to receive timely preparation for RRT so the complications and progression of their disease are minimised, and their choice of clinically appropriate treatment options is maximised.
5. Improve communication & co-ordination of care between hospitals, specialists & primary care providers to enhance appropriate & timely referral of people with advanced CKD.

DIALYSIS AND TRANSPLANTATION SERVICES - End Stage

Aim

To provide integrated and coordinated care and management to patients with end stage kidney disease.

Strategies

1. Provide all people with advanced CKD with appropriate access to all modalities of RRT & opportunities for active involvement in the identification of preferred treatment options.
2. Ensure that the delivery of high quality clinically appropriate forms of dialysis services is designed around individual needs and preferences and is available to patients of all ages throughout their lives.
3. Ensure that all people likely to benefit from a kidney transplant are to receive a high quality service, which supports them in managing their transplant and enables them to achieve the best possible quality of life.
4. Improve timely and appropriate access to adequate palliative care service, which are integrated with treatment services.

Adapted from: National Service Improvement Frameworks 2006 (Diabetes; Heart stroke and Vascular Disease)
National Chronic Kidney Disease Strategy (2006)
National Chronic Disease Strategy (2006)

1. INTRODUCTION

Chronic kidney disease (CKD) is a continuum of disease consisting of mild kidney damage through to end-stage kidney disease (ESKD). Kidney disease can be detected by blood and urine testing, but nearly 90% of early CKD is unrecognised and untreated, as its early occurrence does not manifest in symptoms of ill health (Chadban et al, 2003). CKD is irreversible and there are five stages to the disease, which are defined by the estimated renal function or glomerular filtration rate (GFR). ESKD stage 5 has more than 85% loss of renal functions and death will occur unless treated by dialysis or kidney transplantation.

Many Australian adults have one or more indicators of kidney damage and, given the asymptomatic nature of the condition, most are totally unaware of its presence. Of these, an estimated 45,000 are in stages 4 and 5 (Chadban et al, 2003). Approximately 2,000 patients are entering ESKD dialysis programs per year with the mean duration of antecedent CKD being approximately 10 years.

Chronic kidney disease (CKD) is a significant and growing public health problem responsible for substantial burden of illness and premature mortality:

- CKD is the 7th most common cause of death, exceeding diabetes and respiratory disease and suicide (Kidney Health Australia, 2006).
- Nearly half of the people with diabetes have CKD, which increases the risk of cardiovascular by up to 20 times (Keith et al, 2004))
- Death and disability due to CKD in Aboriginal and Torres Strait Islanders is extremely high (Howard et al, 2006).
- Treating early CKD slows progression of kidney damage and reduces cardiovascular risk (Keith et al, 2004)
- The direct costs of CKD estimated at $650 million in 2006 will continue to rise (Cass et al, 2006)
- In Australia the projected costs for treating patients with ESKD will be approximately $4 billion by the end of this decade, rising to almost $6 billion by 2019 (Cass et al, 2006).
- Early detection and management of CKD in general practice is highly cost-effective (Howard et al, 2006)

2. BURDEN OF DISEASE IN WA

CKD shares a number of common risk factors with diabetes, hypertension and cardiovascular disease. Kidney disease, coronary heart disease, diabetes and stroke are forms of vascular disease affecting the blood vessels. In addition to the risk of ESKD, patients with CKD are at much greater risk of dying from a heart attack or stroke than they are of progressing to ESKD. Patients with Stage 3 CKD are 20 times more likely to die of a vascular illness than they are of requiring dialysis or transplantation (Keith et al 2004).

The most common causes of ESKD are glomerulonephritis, diabetic nephropathy and hypertension, accounting for 80% of the causes (ANZDATA Annual Report, 2006). Future efforts should focus on strategies to prevent CKD and minimise progression to ESKD caused by diabetes and hypertension, as these latter conditions are potentially preventable. Assessing the magnitude of burden of these conditions in WA will help to identify future needs and determine intervention strategies.

2.1. The burden of hypertension in WA

The WA HWSS data show that the prevalence of hypertension in WA in 2005-2006 is estimated at 24.7% (95% CI 23.7-25.7) with an estimated **379,200** adults reporting high blood pressure (BP).

Table 1. HWSS data on the prevalence of hypertension in WA in 2005-2006

	35-44	45-54	55-64	65-74	75+
WA Males	8.3%	16.9%	32.7%	42.2%	45.5%
WA Females	6.0%	14.3%	30.5%	46.2%	54.9%

The data indicates that the prevalence of

- people from the State who had high BP was higher for females compared with males.
- females who had high BP was lower for females from the Kimberley (18.2%) compared with the State.
- females who had high BP was higher for females from the Midwest (33.4%) compared with the State.

Table 2. AusDiab age and gender specific prevalence of hypertension - Australia vs WA

	35-44	45-54	55-64	65-74	75+
WA Males	15.9%	23.4%	49.0%	65.7%	72.7%
WA Females	6.6%	21.1%	41.7%	63.1%	82.0%
Aust Males	16.9%	30.6%	46.7%	67.9%	78.1%
Aust Females	7.5%	23.0%	42.7%	67.0%	74.4%

Based on the AusDiab survey the HWSS data underestimate prevalence of hypertension by 35-60%. The number of adults with hypertension in WA can be estimated at **570,000**.

2.2. The burden of diabetes in WA

HWSS data show that the prevalence of diabetes in WA in 2005-2006 is estimated at 5.8% (95% CI 5.3-6.3), which equates to **91,400** adults having diabetes.

Table 3. HWSS data on the prevalence of diabetes in WA in 2005-2006

	35-44	45-54	55-64	65-74	75+
WA Males	2.7%	5.8%	12.1%	18.0%	18.0%
WA Females	4.4%	5.1%	7.9%	14.9%	12.9%

- The prevalence estimates for diabetes increased significantly with age. The prevalence of diabetes is 2.7% for people aged 25 to 44 years, 7.4% for people aged 45 to 64 years, and 15.9%, for people aged 65 years or over.
- For people aged 25 to 44 years, the prevalence of reported diabetes was higher for females (8.5%) compared with males (6.3%).

Table 4. AusDiab age and gender specific prevalence of diabetes – Australia vs. WA

	35-44	45-54	55-64	65-74	75+
WA Males	3.7%	5.3%	15.8%	13.4%	25.0%
WA Females	1.7%	4.6%	8.5%	14.1%	17.3%
Aust Males	2.6%	6.8%	16.1%	21.6%	22.4%
Aust Females	2.3%	5.5%	9.9%	16.1%	25.5%

The AusDiab results show that 7.2% of adult Australians in the community have diabetes and 29% have hypertension (Chadban et al, 2003). Around 18% of adult Australians have at least one indicator of CKD (Chadban et al, 2003).

Based on the AusDiab survey the HWSS data underestimate prevalence of diabetes by 30% in the age groups 55-64 and 75+, but overestimates it in the age group 65-74. Thus, the number of adults having diabetes in WA can be estimated at **120,000**.

2.3. The burden of CKD in WA

The prevalence of CKD in the general population in WA is unknown, as there are no reliable data available. PathWest data extracted from March to June 2007 were used to infer the five stages of CKD using the estimated GFR.

An eGFR<60mL/min/1.73m^2 was present in 22.4% of the sample population, with the prevalence rising with increasing age from as little as 6.0% in subjects <45 years of age to 38.6% in subjects >65 years of age.

Table 5. Stages of chronic kidney disease

eGFR mL/min/1.73m^2	Description
≥ 90	Stage 1 CKD - kidney damage with normal kidney function
60-89	Stage 2 CKD - kidney damage with mild ↓ kidney function
30 - 59	Stage 3 CKD - moderate ↓ kidney function
15 - 29	Stage 4 CKD - severe ↓ kidney function
< 15	Stage 5 CKD - end-stage kidney disease

Based on projections from the PathWest results (see table 6) it can be interpreted that in the general population the prevalence of CKD stage 3-5 in people under the age of 45 years is extremely low.

Table 6: PathWest: Age specific prevalence of CKD in metropolitan WA

Age group	N	GFR (mL/min/1.73m^2) 30-59		15-29	
		No. patients	%	No. patients	%
15-24 years	438	10	2.3	1	0.2
25-44 years	1876	99	5.3	29	1.5
45-64 years	3650	486	13.3	77	2.1
>65 years	4197	1401	33.4	221	5.3
Total	10161	2001	19.1	329	3.1

Source: Data extracted March to June 2007, courtesy A.Ukich

Estimation of the prevalence of CKD in WA in 2007 was based on a state population aged 45 years or older of approximately 755,000 people. Hence, the prevalence of CKD is estimated at 83,000 patients for stage 3 or higher and 2,265 patients for stage 4-5.

Table 7. AusDiab: age and gender specific prevalence of CKD in Australia

	GFR (mL/min/1.73m^2) <60	30 to 59	<30
All men	**9.3 (7.3, 11.4)**	**9.1 (7.0, 11.1)**	**0.3 (0.1, 0.4)**
45 to 64 yr	1.8 (1.0, 2.6)	1.8 (1.0, 2.6)	0.0 (0.0, 0.0)
≥65 yr	51.8 (47.1, 56.5)	50.3 (45.6, 55.0)	1.5 (0.6, 2.3)
All women	**13.0 (9.6, 16.4)**	**12.6 (9.4, 15.8)**	**0.4 (0.1, 0.7)**
45 to 64 yr	3.2 (1.9, 4.4)	3.2 (1.9, 4.4)	-
≥65 yr	57.2 (51.4, 63.0)	55.3 (49.2, 61.4)	1.9 (0.7, 0.5)
All subjects	**11.2 (8.6, 13.8)**	**10.9 (8.4, 13.3)**	**0.3 (0.2, 0.5)**
45 to 64 yr	2.5 (1.6, 3.3)	2.5 (1.6, 3.3)	0.0 (0.0, 0.0)
≥65 yr	54.8 (50.2, 60.0)	53.1 (48.7, 57.5)	1.7 (1.1, 2.4)

(Source: Chadban S et al. J Am Soc Nephrol 2003; 14:131-138)

2.4. The cardiovascular burden of CKD

CKD is an important risk factor for total mortality in the Australian population. Cardiovascular disease mortality is the major cause for this increase in mortality

among patients with CKD. Thus, identification of CKD accompanied by specific targeted interventions is an important public health priority.

Table 8. All cause mortality and chronic kidney disease in the AusDiab study

	Normal population	GFR 30 to 59 mL/min per 1.73m^2	GFR <30 mL/min per 1.73m^2
Mortality per 100 patients years	0.43	3.76	9.61
Unadjusted OR		10.32	26.43
Adjusted* OR		1.83	3.44

OR: odds ratio, * adjusted for: age, diabetes, hypertension, BMI, albuminuria, cardiovascular disease and smoking.

(Source: Polkinghorne K et al. Nephrology 2006; 11 (suppl 2):A35)

3. CURRENT PROVISION OF SERVICES

3.1. Dialysis services

Renal dialysis is a high-cost, high-volume specialised service provided across all health regions to patients with ESKD. Extracorporeal dialysis is the most common reason for high-cost hospital use in WA, accounting for most separations, which in 2002 equated to 69,619 separations (ICD-10 category Z49.1), corresponding to 71% of all separations of the top 5 high-cost users (Calver et al, 2006).

A detailed description of existing dialysis services for the treatment of patients with ESKD, projections for future demand and planned services delivery in WA can be found in the *WA Plan for Renal Dialysis Services 2008-2013.*

In WA, the three tertiary hospitals, Royal Perth (RPH), Sir Charles Gairdner (SCGH) and Fremantle (FH) provide in-centre Haemodialysis (HD). The Western Australian Home Dialysis Program (WAHDiP) provides support through the Home Therapy Centres in the North Metropolitan Area Health Service (NMAHS) and South Metropolitan Area Health Service (SMAHS) for metropolitan and remote home HD and Peritoneal Dialysis (PD). Patient training and technical support are included. Limited support for metropolitan and rural and remote PD is still provided by the tertiary hospitals. Princess Margaret Hospital provides paediatric HD and PD services on a clinical needs basis.

The incidence rate of ESKD in WA has grown by 139% from 1990 to 2005 (from 49 patients per million population in 1990 to 117 patients per million population in 2005). This compares to a national increase in the incidence rate of ESKD of 89% from 1990 to 2005 (from 56 patients per million population in 1990 to 109 patients per million population in 2005). In WA there were 236 new patients diagnosed and reported to the Australian and New Zealand Dialysis and Transplant Registry (ANZDATA) as having ESKD in 2005, as compared to 74 patients in 1990.

Prevalence rates for renal dialysis have continued to rise across WA and Australia. In 1990, there were 222 patients on renal dialysis in WA. This climbed to 848 patients in 2005, an increase of 281%. This compares to a national increase in the number of patients on dialysis of only 191% from 1990 to 2005 (from 2929 patients in 1990 to 8528 patients in 2005).

In 2005 the number of dialysis patients in the greater metropolitan area was 625 (74%) and in country/rural area was 221 (26%). The increase in dialysis patients from 1999 to 2005 was 47.7% in the metropolitan region and 27.7% in rural WA. The majority of country dialysis patients (>60%) is concentrated around 7 areas (Broome, Derby, East Pilbara/Port Hedland, Geraldton, Kalgoorlie, Bunbury/Busselton and Albany).

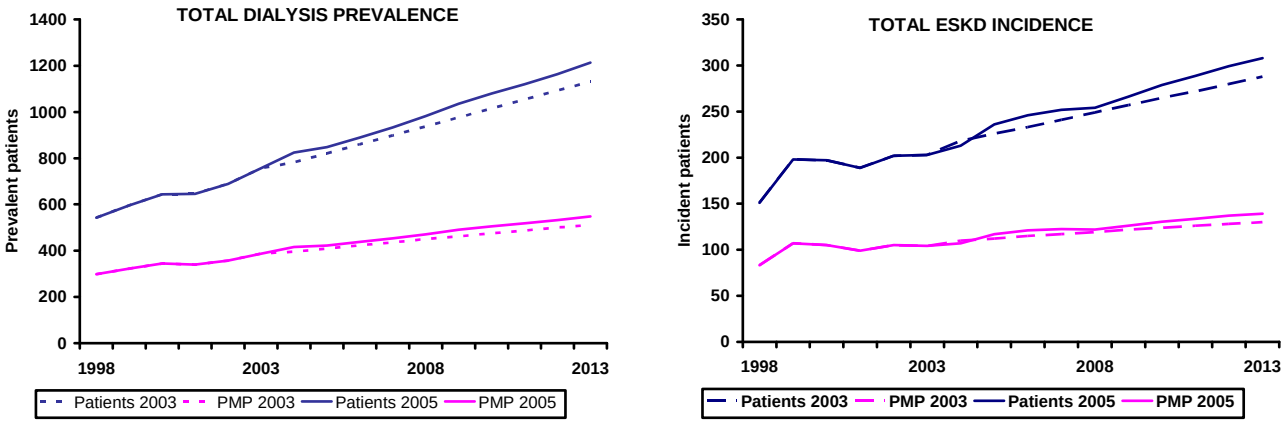
Table 9. Dialysis population in Western Australia in 2006

Division	Population	N=	/100,000
Perth	1,477,815	652	44
Kimberley	35,748	69	193
Goldfields	53,661	33	61
Pilbara	39,282	32	81
South West	219,812	28	13
Midwest	52,372	27	52
Great Southern	71,498	10	14
Wheatbelt	59,925	9	15
Western Australia	**2,010,113**	**860**	**43**

(Source: Australian Bureau of Statistics, Demographic Summary, Statistical Divisions, WA and ANZDATA Registry, 2006)

The projections for the whole of WA have been determined using ANZDATA Registry information of new patients and known dialysis population numbers for 1998 to 2005 using a linear regression model to the year 2013. The assumption is that survival on dialysis will remain constant, that no new interventions to prevent ESKD will be implemented and that transplantation rates remain the same.

Table 10. Projected demand on dialysis services WA metropolitan and rural areas



Linear trends for projections allow projecting an annual increase of 6.3% in prevalent ESKD patients. While there is considerable work being done to improve access to renal dialysis services in Western Australia, ESKD incidence and dialysis prevalence projections suggest that there will be a need for continual service development to sustain service levels.

3.2. Renal Medicine Services

The management of patients with chronic kidney disorders, particularly in advanced stages is complex and requires a multidisciplinary approach, including specialist medical services (diabetes), surgical services (vascular and transplant surgery), radiology, allied health (dieticians, social workers, podiatrists) and others. This level of service can currently be supplied only by tertiary hospitals.

The entire spectrum of clinical nephrology is managed by the consultative services at the three teaching hospitals, Fremantle Hospital & Health Services (FHHS), Royal Perth Hospital (RPH) and Sir Charles Gairdner Hospital (SCGH). These hospitals also provide State-of-the-art renal replacement therapies for the high-dependency admitted ESKD patients.

3.2.1. Metropolitan area

Activity and staffing at tertiary hospitals

Table 11 indicates the presentations to outpatient clinics at tertiary hospitals and associated metropolitan clinics where renal services are provided.

Table 11. Annual outpatient clinics (OPC) attendances (2004/05) at teaching hospitals

	OPC presentations
FHHS	3720*
RPH	4860
SCGH	4500
PMH	870

* incl. OPC (Outpatient Clinic) at Armadale

Data for outpatient, transplant, pre-dialysis education and allied health services are complex and incomplete. Further work is needed to present a clear picture of these activities. Information on inpatients can be found in the *Metropolitan Clinical Services Masterplan* November 2005

Table 12. Medical, nursing and allied health staffing (in FTE) at tertiary hospitals

	Consultant	Registrar	RMO/ intern
FH	2.8	2.0	2.0
RPH	4.0	3.0	2.0
SCGH	4.1	3.0	2.0
PMH	1.35	0.2	0.2

	CNM	CNS	Social	Dietician	Pharmacist
FH	1.0	3.5	0.8	0.8	0.2
RPH	1.0	4.6	1.0	1.2	0.5
SCGH	1.0	4.1	0.4	0.6	0
PMH	0	1.0	0.2	0.2	0.2

CNM: Clinical Nurse Manager, CNS: Clinical Nurse Specialists (transplant, access, dialysis, …)

Table 13. Patients with end stage kidney disease by modality and parent hospital care

	Dialysis		Transplants, caring hospital	Total ESKD	ESKD per consultant FTE
	CAPD	HD			
FH	42	196	141	379	118 / 1
RPH	84	300	257	641	160 / 1
SCGH	57	176	259	492	114 / 1
PMH	5	0	18	23	

(Source: ANZDATA Registry, 2006)

Activity and staffing at general hospitals:

Although there is a sessional specialist clinic at Armadale Health Service the other non-tertiary hospitals have their nephrology services met largely by general practitioners who consult with their nephrology colleagues in the tertiary hospitals and may refer to them for a clinical opinion if and when appropriate.

Table 14. Renal medicine and dialysis services and staffing (in FTE) at metropolitan general hospitals

	Renal Service	On-site dialysis	Visiting Consultant	Nurse specialist	Social worker	Dietician	Pharmacist
Joondalup	Level 3	Yes	0.05	1.0	Nil	Nil	Nil
Swan	Level 3	No	Nil	Nil	Nil	Nil	Nil
Bentley	Level 2	No	Nil	Nil	Nil	Nil	Nil
Kalamunda	Nil	No	Nil	Nil	Nil	Nil	Nil
Armadale	Level 4	Yes	0.4	1.0*	0.2	0.2	Nil
Rockingham	(2008)	(2008)	Nil	Nil	Nil	Nil	Nil
Peel	Level 3	Yes	0.05	1.0	0.1	0.1	Nil

* Nurse Practitioner

Satellite Units:

In the metropolitan area there are satellite dialysis units at Melville (managed by Fremantle Hospital), Cannington, Midland and Shenton Park (all managed by Royal Perth Hospital). Patients treated at these sites rely on Nurse Specialists and Allied Health Professionals from their parent hospital.

3.2.2 Country region

Renal services in country WA are largely restricted to dialysis services, with 4 to 6 weekly visits by a specialist renal physician from Perth. Visiting renal physicians also conduct outpatient clinics for patients with CKD during these visits.

There are currently 6 dialysis units operating in the country. The units in Albany, Kalgoorlie, Geraldton, Port Hedland are managed by WACHS. St John Of God Health Care manages the Bunbury dialysis unit. The Kimberley Satellite Dialysis Centre (KSDC) in Broome and the Derby unit are managed by Broome Regional Aboriginal Medical Service (BRAMS).

Staffing

Table 15 indicates the current workforce that provides renal services in regional WA. The current workforce that maintains additional rural satellite renal services in WA is also illustrated in Table 16.

Table 15. Renal medicine and dialysis services and staffing (in FTE) at country general hospitals

	On-site dialysis	Visiting Consultant	Nurse specialist	Social Worker	Dietician	Pharmacist
Bunbury	Yes*	0.05	1.0	Nil	Nil	Nil
Geraldton	Yes	0.05	1.0	Nil	0.1	0.1
Kalgoorlie	Yes	0.05	1.0	Nil	Nil	Nil
Port Hedland	Yes	0.05	1.0	Nil	Nil	Nil

* SJOG

Table 16. Satellite dialysis services and staffing (in FTE) at country satellite dialysis units

	Visiting Consultant	Nurse specialist	Social Worker	Dietician	Pharmacist
Albany	0.05	0.6	Nil	Nil	Nil
Kimberley	0.1*	Nil	1.0	Nil	Nil

+ 0.5FTE GP

Primary Care:

There is currently no dedicated team or specific programs for the management of chronic kidney disease patients in primary care.

4. COLLABORATIVE CHRONIC KIDNEY DISEASE STRATEGY

4.1. National and State Chronic Disease Strategies

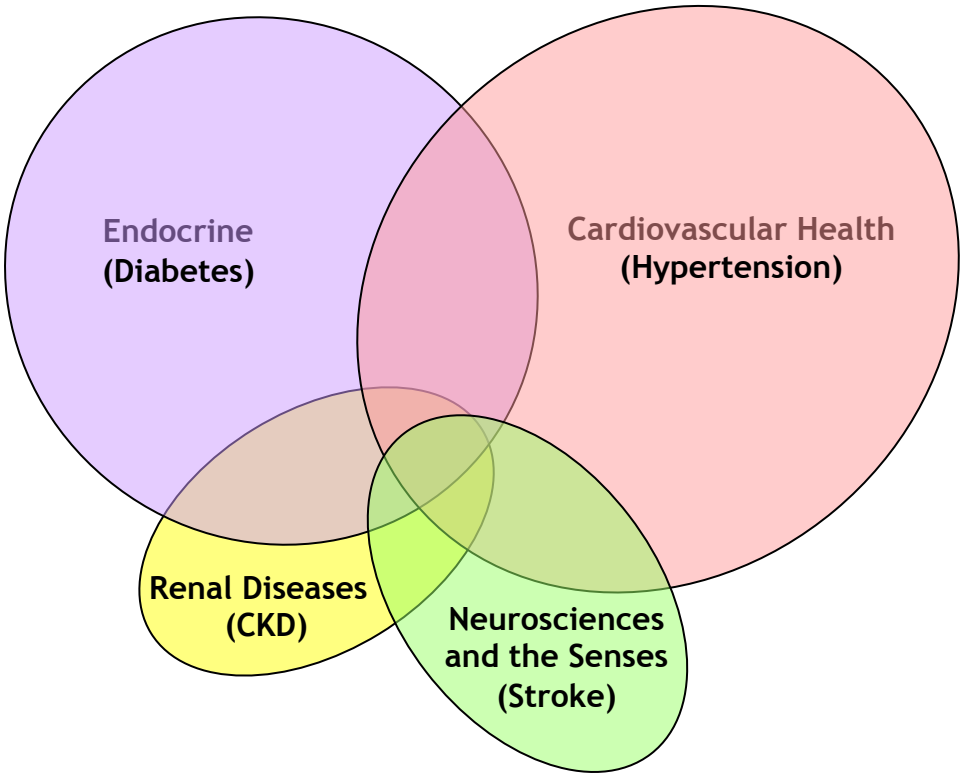
- **National Chronic Disease Strategy**
- **National Chronic Kidney Disease Strategy**
- **National Service Improvement Frameworks**
- **Chronic Conditions Framework for Western Australia 2005-2010**

The high prevalence of CKD and its substantial burden of illness necessitate an effective strategy to address the disease as a significant public health problem.

The National Chronic Disease Strategy, the National Service Improvement Framework (NSIF) for Diabetes and the NSIF for Heart, Stroke and Vascular Diseases serve as high-level guides for strategies to achieve optimal care in the areas of diabetes and cardiovascular disease, including hypertension. The shared risk factors for these chronic conditions with CKD exist across the continuum of care from prevention and risk reduction, early detection and screening to minimising disease progression, treatment and management. Gains in optimal service delivery for these conditions will also benefit CKD.

The Renal Disease Health Network (RDHN) has adopted the overarching principles within the National Chronic Disease Strategy, the WA Framework for Chronic Conditions and the two NSIFs in defining the structure of the CKD Model of Care for WA. Kidney Health Australia (2006), *National Chronic Kidney Disease Strategy* is a valuable source of information in the development of this document. The RDHN has collaborated with the Endocrine, Cardiovascular and the Neurosciences Health Networks to produce a consistent approach to address the shared risk factors (Figure 1) in the prevention, detection and management of renal diseases to minimise their progression and complications.

Figure 1. Common vascular agenda for four Health Networks – prevention, screening and managing risks



4.2. Related Health Reform Committee Recommendations:

Consistent with recommendation 17 of the Health Reform Committee Report (2004) the RDHN has developed an algorithm for general practitioners to facilitate the early detection and specialist referral of CKD and in proposing the establishment of CKD Clinics:

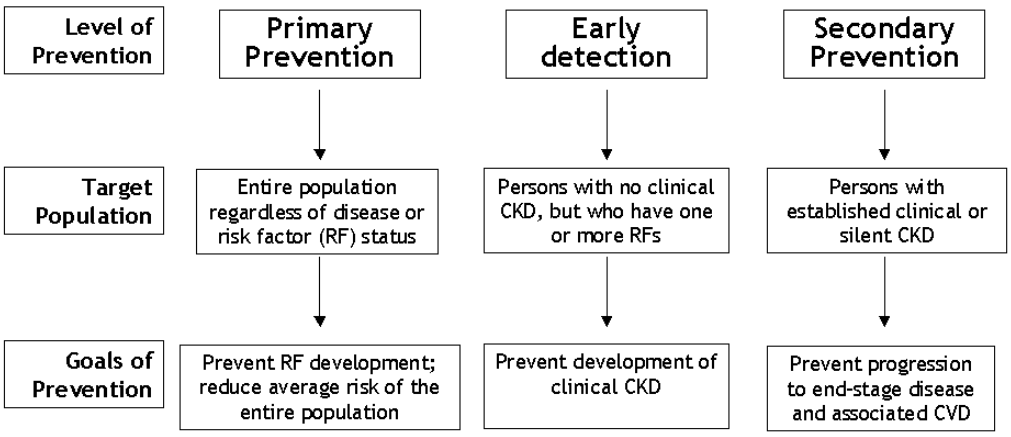
"Recommendation 17: Evidence-based clinical guidelines should be developed and implemented, focusing in the first instance on the needs of patients with chronic and complex conditions. This development should involve a multi-disciplinary clinical team, both hospital and community-based and consumers."

CKD is a multi-system disease and optimal therapy for CKD will address its many facets. Although CKD management may seem complex and daunting, the disease process is predictable enough to warrant the use of treatment algorithms, which can be updated to reflect new knowledge.

5. CKD MODEL OF CARE

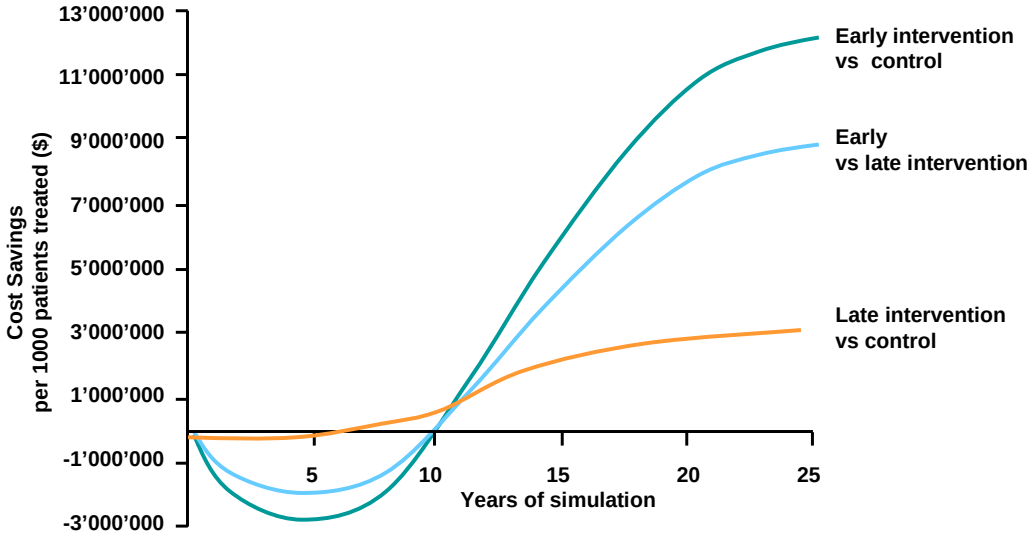
The CKD Model of Care provides a framework for a comprehensive approach to the prevention, early detection and management of CKD across the continuum of care (Figure 2). Within each stage in the course of the development and progression of CKD there are opportunities for prevention and health gain. The characteristics of prevention and early intervention levels for CKD as outlined in sections 6 to 8 are summarised below.

Figure 2. Comprehensive approach to the prevention, early detection and management of CKD



Efforts to promote early detection and to implement established secondary preventative measures would need to be supported by adequate funding. The initial costs will result in greater savings on the long term, as demonstrated in Figure 3 in the case of CKD due to diabetes (Palmer et al, 2004).

Figure 3. Cost-effectiveness of early or late intervention with an angiotension receptor blocker (ARB) in type 2 diabetes and renal disease



(Source: Palmer A, et al. *Diabetes Care* 2004; 27:1897-903)

Early intervention improves life expectancy and reduces costs in hypertensive patients with type 2 diabetes and microalbuminuria. Although late intervention in overt CKD is superior to standard care, benefits are less significant in terms of patient outcomes.

A Markov model–simulated progression from microalbuminuria to overt nephropathy, doubling of serum creatinine, ESKD and death in hypertensive patients with type 2 diabetes showed that treatment of diabetic renal disease with an angiotensin receptor blocker (ARB) is cost-saving. The costs-benefit analysis was based on ESKD treatment costs for dialysis of $60,133 per patient per year and for transplantation of $62,442 in the 1st year and $27,600 per patient per year in the following years (Palmer et al, 2004). The annual costs of the drug treatment average $573 per patient per year.

OVERVIEW OF CHRONIC KIDNEY DISEASE MODEL OF CARE

Table 17. The Continuum of Care

National Service Improvement Framework for Diabetes and Heart, Stroke and Vascular Disease – Care Continuum	Responsibility	Primary Prevention – The well population	Early Detection – Population at risk	Secondary Prevention – Minimising progression & consequences of CKD	Specialist Nephrology Services - Coordinated management of the established condition	End Stage – Dialysis and transplant services
CKD Model of Care for WA Health	Population Health	Services for people to reduce preventable causes of CKD				
	Primary care		Services for people at risk of developing CKD			
	Primary care + Chronic disease management team + Tertiary and secondary hospital services		Services for people with early, stable CKD	Services for people with advanced stage CKD		Services for people with end-stage disease

CKD CONTINUUM OF CARE

PRIMARY PREVENTION - The Well Population

National Service Improvement Framework for Diabetes and Heart, Stroke and Vascular Disease – Care Continuum	Responsibility	Primary Prevention – The well population	Early Detection – Population at risk	Secondary Prevention – Minimising progression & consequences of CKD	Specialist Nephrology Services - Coordinated management of the established condition	End Stage – Dialysis and transplant services
CKD Model of Care for WA Health	Population Health	Services for people to reduce preventable causes of CKD				
	Primary care		Services for people at risk of developing CKD			
	Primary care + Chronic disease management team + Tertiary and secondary hospital services		Services for people with early, stable CKD	Services for people with advanced stage CKD		Services for people with end-stage disease

6. PRIMARY PREVENTION - THE WELL POPULATION

Aim

To reduce the population at risk of developing chronic kidney disease (CKD) associated with hypertension or diabetes.

Quality requirement

People at increased risk of developing or having undiagnosed diabetes or hypertension, are identified and their condition managed to prevent CKD.

Rationale

The people most at risk of CKD are those with diabetes and hypertension. They are known to have a higher rate of kidney problems than a normal healthy population.

Hypertension and diabetes can be prevented by complementary application of strategies that target the general population with particular focus on individuals and groups at higher risk for these conditions.

Prevention strategies applied early in life provide the greatest long-term potential for avoiding the precursors that lead to hypertension or diabetes and for reducing the overall burden of blood pressure–related and diabetes-related complications in the community.

6.1. Approaches to Primary Prevention of Hypertension

Hypertension can be prevented by complementary application of strategies that target the general population, individuals and groups at higher risk for high blood pressure (National Health Institute of Health, 2002). Lifestyle interventions are more likely to be successful, and the absolute reductions in risk of hypertension are likely to be greater when targeted in persons who are older and those who have a higher risk of developing hypertension. However, prevention strategies applied early in life provide the greatest long-term potential for avoiding the precursors that lead to hypertension and elevated blood pressure (BP) levels and for reducing the overall burden of BP–related complications in the community.

High Risk Groups

Groups at high risk for hypertension include those at the maximum level of normal BP, a family history of hypertension, overweight or obesity, a sedentary lifestyle, excess intake of dietary sodium, insufficient intake of potassium, or excess consumption of alcohol.

Population based strategy

The DoH *Healthy Lifestyles – A Strategic Framework for Primary Prevention of Diabetes and Cardiovascular Disease in Western Australia 2002-2007* **outlines a primary prevention, population approach to reducing or eliminating lifestyle and environmental risk factors.**

Key strategies for the promotion of healthy lifestyles and environments to reduce the risk of chronic diseases such as hypertension and diabetes are also detailed in the DoH *Western Australian Health Promotion Strategic Framework 2007-2011*. **The document describes the actions to be implemented to promote healthy eating, healthy weight, limiting alcohol use, encouraging physical activity and cessation of smoking.**

A population-based approach aimed at achieving a downward shift in the distribution of BP in the general population is an important component for any comprehensive plan to prevent hypertension. A small reduction in the distribution of systolic BP is likely to result in a substantial decrease in the burden of BP-related illness. Such approaches include:

1. *Lowering sodium content or caloric density in the food supply* (Sacks et al, 2001)
2. Providing attractive, safe, and convenient *opportunities for exercise* (Whelton et al, 2002)
3. Enhancing **access to appropriate facilities** (parks, walking & bike trails)
4. Utilising **effective behaviour** change models.

Intensive targeted strategy

More intensive targeted approaches, aimed at achieving a greater reduction in BP in those who are most likely to develop hypertension, complement the above population-based strategies. Intensive targeted interventions can be conducted in health care settings and senior centres that have BP screening and referral programs.

Interventions with documented efficacy

The National Institute for Health, 2002 listed 6 recommended lifestyles with proven efficacy for prevention of hypertension:

1. Maintain normal body weight for adults (BMI, 18.5 - 24.9kg/m^2)
2. Reduce dietary sodium intake to no more than 100 mmol [2.4g] daily (~6g of sodium chloride per day)
3. Engage in regular aerobic physical activity such as brisk walking (at least 30 minutes per day, most days of the week)
4. Limit alcohol consumption to no more than 30ml of ethanol (e.g., 720mL of beer, 300mL of wine, or 160mL of spirits) per day in most men and to no more than 15mL of ethanol per day in women
5. Maintain adequate intake of dietary potassium (> 90mmol [3.5g] daily)

6. Consume a diet that is rich in fruits and vegetables and low-fat dairy products with a reduced content of saturated and total fat (DASH diet) (Sacks et al, 2001).

Primary prevention for children

1. Promote the use of heart-healthy foods in schools
2. Encourage parents to read food labels and make wise choices for lunches prepared at home
3. Include health education programs that promote increased physical activity and other healthy lifestyles in school curricula, aimed at preventing cardiovascular and other chronic diseases

Barriers to improvement

1. Insufficient attention to health education, including nutrition education, by health care providers, school systems, public health and voluntary associations
2. Lack of referral to registered dietitians and inadequate reimbursement for hypertension prevention counselling services
3. Economic disincentives to healthier lifestyles such as higher prices for low-sodium products and lower unit pricing for larger portions.

To overcome these barriers, professional associations and policy developers should work with the food industry to increase availability of lower-sodium food products and to provide educational programs for consumers regarding portion size and heart-healthy food choices.

6.2. Approaches to Primary Prevention of Diabetes

The Model of Care (MoC) for Diabetes, developed by the Endocrine Health Network of WA provides a framework for comprehensive, accessible and efficient provision of co-ordinated diabetes prevention and management services in Western Australia. The Diabetes MoC addresses the following stages of diabetes prevention and management:

- Community awareness and prevention of diabetes
- Prevention and early diagnosis of diabetes in high-risk groups
- Optimal initial and long-term management of diabetes
- Early detection and optimal management of complications of diabetes
- Coordinated prevention and management of acute episodes and advanced complications.

Consistent with the *Western Australian Health Promotion Strategic Framework 2007-2011* and the National Service Improvement Frameworks, 2006, the Diabetes MoC advocates whole population approach and specific targeting of high risk groups. The population strategy consists of the following elements:

1. Multi-sector promotion of a healthy environment and lifestyle to ensure that people live in an environment that supports and encourages healthy lifestyles

2. Health promotion activities to ensure that people at risk of developing diabetes and related disorders are aware of their risk and have access to appropriate information and resources to enable them to adopt healthy lifestyles.

Recommendation 1

- That Population Health implements documented effective strategies to reduce the burden of hypertension and diabetes.

CKD CONTINUUM OF CARE

EARLY DETECTION - Population at Risk

National Service Improvement Framework for Diabetes and Heart, Stroke and Vascular Disease – Care Continuum	Responsibility	Primary Prevention – The well population	Early Detection – Population at risk	Secondary Prevention – Minimising progression & consequences of CKD	Specialist Nephrology Services - Coordinated management of the established condition	End Stage – Dialysis and transplant services
CKD Model of Care for WA Health	Population Health	Services for people to reduce preventable causes of CKD				
	Primary care		Services for people at risk of developing CKD			
	Primary care + Chronic disease management team + Tertiary and secondary hospital services		Services for people with early, stable CKD	Services for people with advanced stage CKD		Services for people with end-stage disease

7. EARLY DETECTION - POPULATION AT RISK

Aim

To reduce the population who develops chronic kidney disease.

Quality requirement

People at increased risk of developing or having undiagnosed chronic kidney disease, especially those with diabetes or hypertension, are identified, assessed and their condition managed to preserve their kidney function.

Rationale

The people most at risk of CKD are those with diabetes and hypertension. They are known to have a higher rate of kidney problems than a normal healthy population (Kissmeyer et al, 1999). CKD, diabetes, hypertension and cardiovascular disease tend to affect and react on each other in a complex way. For example, it is well recognised that in some people hypertension may be an early sign of undiagnosed CKD, indicating the importance of checking kidney function in this group.

The risks of developing CKD increase with age, being male, a family history of ESKD and those of Indigenous ethnicity. People of Indigenous origin are particularly at risk of CKD linked to diabetes, as diabetes is more common in this community than in the general population (Hoy et al, 2005).

As the progression of CKD can be slowed or halted in certain circumstances, before dialysis or transplantation become necessary, early identification of kidney disease and timely interventions are the key to prevention. Many people are unaware of their condition as CKD in its early stages generally produces few if any symptoms.

The surveillance of people from Indigenous origin, those being treated for hypertension, diabetes, vascular disease, heart failure or a family history of CKD (Brown et al, 2003), is recommended. However, the evidence does not support screening the whole adult population for CKD. Craig et al, (2002) estimated that 20,000 people over 50 years old would have to be screened to prevent one case of ESKD.

Testing the urine of at-risk populations can help detect CKD, as the presence of excess protein (ie proteinuria), especially with blood, is a marker of kidney disease.

Follow-up blood test of kidney function should be a formula-based estimation of the glomerular filtration rate (estimated GFR) rather than the serum creatinine concentration alone. Creatinine concentration varies according to factors such as age, body mass and ethnic origin, and does not always reflect abnormal kidney function (Swedko et al, 2003).

7.1. CKD high risk groups

The people most at risk of CKD are those with diabetes and hypertension, who are known to have a higher rate of kidney problems than a normal healthy population (Kissmeyer et al, 1999). The chances of developing CKD increase with age, male sex and Indigenous ethnicity. CKD resulting from **diabetes** or **hypertension** represents approximately 60% of all causes of ESKD and is potentially **preventable**.

Table 18. Who is at risk of CKD?

Modifiable risk factors	Non-modifiable risk factors
diabetes high blood pressure obesity smoking	age over 50 years family history of kidney disease Aboriginal or Torres Strait Islander heritage

Future efforts should focus on strategies to prevent or postpone ESKD due to diabetes and hypertension as well as reducing cardiovascular morbidity and mortality associated with impaired kidney function.

Strategies

1. CKD education for health professionals to publicise CKD awareness
2. Targeted, opportunistic CKD screening program and early detection for the high-risk individuals
3. Promote guideline driven approaches of early intervention among non-nephrologists to delay disease progression
4. All high risks individuals attending their general practitioner should be assessed for CKD risk factors as part of routine primary health encounters.

7.2. Screening for CKD

Current evidence does not support screening the whole adult population for CKD. However, the surveillance of people being treated for hypertension, those with diabetes, vascular disease, heart failure or a family history of CKD (Brown et al 2003), especially Indigenous origin is cost effective.

Table 19. Targeted early detection of CKD

Who is at higher risk of kidney disease?	What should be done?	How often?
Age > 50 years Diabetes High blood pressure Smoking Obesity Family history of kidney disease Aboriginal or Torres Strait Islander	blood pressure eGFR urine dipstick (microalbuminuria if diabetes present)	Every 12 months

Source: Guidelines for preventive activities in general practice (The Red Book) 6th edition. 2005. The Royal Australian College of General Practitioners, South Melbourne, Victoria, Australia.

7.3. Importance of early detection of CKD

- Increasing amounts of protein in the urine correlate directly with an increased rate of progression into end-stage kidney disease
- The amount of proteinuria/albuminuria in the urine can be reduced significantly by the use of an ACE inhibitor or ARB agent singly or in combination
- Reduction in the amount of proteinuria is associated with improved outcomes
- Early intervention can reduce CKD progression and cardiovascular risk by 50%, and improves quality of life (Johnson, 2004).

7.4. Goals of early stage CKD management

- Investigations to exclude treatable kidney disease (Snyder et al, 2005)
- Reduce progression of kidney disease (Peterson et al, 1995; Jafar et al, 2003)
- Reduce cardiovascular risk (Weiner et al, 2004).

An eGFR 45-60mL/min/1.73m^2 in the absence of albuminuria/proteinuria is not associated with renal disease progression or increased cardiovascular risk in subjects without hypertension or diabetes.

Appendix 2 – *Guidelines to detect, monitor and treat early stage CKD.*

Recommendation 2

That a targeted opportunistic screening program in primary care among high-risk individuals to identify those with CKD be promoted and appropriate treatment be provided in those patients identified with early CKD.

CONTINUUM OF CARE

SECONDARY PREVENTION - Minimising the progression and consequences of CKD

<table>
<tr><th>National Service Improvement Framework for Diabetes and Heart, Stroke and Vascular Disease – Care Continuum</th><th>Responsibility</th><th>Primary Prevention – The well population</th><th>Early Detection – Population at risk</th><th>Secondary Prevention – Minimising progression & consequences of CKD</th><th>Specialist Nephrology Services - Coordinated management of the established condition</th><th>End Stage – Dialysis and transplant services</th></tr>
<tr><td rowspan="4">CKD Model of Care for WA Health</td><td>Population Health</td><td>Services for people to reduce preventable causes of CKD</td><td colspan="4" rowspan="4"></td></tr>
<tr><td>Primary care</td><td colspan="2">Services for people at risk of developing CKD</td></tr>
<tr><td>Primary care
+
Chronic disease management team
+</td><td colspan="3">Services for people with early, stable CKD</td></tr>
<tr><td>Tertiary and secondary hospital services</td><td colspan="2">Services for people with advanced stage CKD</td><td>Services for people with end-stage disease</td></tr>
</table>

8. SECONDARY PREVENTION - Minimising the progression and consequences of CKD

Aim

To improve the long-term outcomes for people with chronic kidney disease by minimising the progression and consequences of the disease.

Quality requirement

People with a diagnosis of chronic kidney disease receive timely, appropriate and effective investigation, treatment and follow-up to reduce the risk of progression and complications.

Rationale

Medical interventions and life-style changes can prevent CKD and minimise the progression and consequences of the disease, and are likely to have the greatest impact if applied early. Many people with CKD, especially those with coronary heart disease and diabetes are already receiving structured care for these chronic conditions within primary care. However the degree of reduced kidney function may not be recognised.

Optimal management in primary care, including referral to the specialist renal service at the appropriate stage, could improve outcomes for people with CKD and reduce the organisational pressures on specialist renal services caused by emergency cases.

Lowering BP in people with CKD reduces the deterioration of their kidney function, whether or not they have hypertension or diabetes (Jafar et al, 2003; Ferrari, 2007). ACE inhibitors and ARBs are generally more effective than other antihypertensive drugs in minimising deterioration in kidney function, and this effect is most marked when there is significant proteinuria (Ferrari, 2007; Weidman et al, 1995). Such treatment is also cost effective.

For optimal health some people with CKD, particularly those with proteinuria, will need to maintain their BP at a lower level than the general population.

An eGFR 45-60mL/min in the absence of proteinuria is not associated with renal disease progression or increased cardiovascular risk in subjects without hypertension or diabetes (Halbesma et al, 2006).

8.1. Where kidney disease is treated

Primary care and specialist care have complementary roles in the management of CKD, and will be most effective if services are co-ordinated. The identification of people with CKD and the management of the disease in its early stages can take place in primary care (Appendix 2). This can avoid unnecessary travelling to hospital, reduce pressures on non-emergency patient transport and strengthen the capacity of primary care staff to care for people in their own homes, whether in a rural or urban setting. CKD care management can be

provided in combination with the treatment for diabetes and coronary heart disease and public health measures to improve diet, reduce obesity and smoking cessation (Joint Advisory Group on General Practice & Population Health, 2001). However, links with specialist care for those requiring complex investigations and those with ESKD will enable access to the specialist renal team (Refer to appendix 3).

There is considerable scope for integrating the care pathways for diabetes, coronary heart disease and CKD to manage and reduce the impact of these interacting long-term conditions.

Recommendation 3

That community services and chronic disease management teams be utilised to facilitate the development of clients self-management skills and to case manage patients with multiple and complex co-morbid conditions.

8.2. Hypertensive kidney disease

Hypertension is a major modifiable contributing factor in cardiovascular diseases (CVD) such as ischaemic heart disease (IHD), stroke and chronic kidney disease (CKD). It is important to assess hypertensive risk before CKD develops and monitoring for persistently raised BP is one aspect of CV risk assessment to decrease morbidity and mortality.

The *Guidelines to detect, monitor and treat early stage CKD* (Appendix 2) make recommendations on management of hypertension with a specific focus on early detection and management of hypertensive CKD. The Guidelines are aimed at approaches both identifying patients with hypertension at risk of developing CKD and managing hypertension when CKD is present.

A management plan to cover renal care for all people with hypertension needs to include:

1. Arrangements to recall and an annual review for people with hypertension
2. Annual review of complications and risk factors
3. Annual measurements of serum creatinine
4. Annual screen for proteinuria (dipstick).

Proteinuria can be reduced significantly by the use of an ACE inhibitor or ARB agent singly or in combination. A reduction in proteinuria is associated with improved clinical outcomes.

Once protein in the urine has been detected, quantitative measurements are necessary to determine the protein excretion for prognostic purposes.

8.3. Diabetic renal disease

Microalbuminuria (albumin:creatinine ratio greater than or equal to 2.5mg/mmol for men or 3.5mg/mmol for women), is the earliest indicator of renal disease (nephropathy) attributable to diabetes. Microalbuminuria relates to a range of albumin values in the urine that, while low, are above normal levels. A review

of longitudinal studies has shown microalbuminuria to be predictive of total mortality, cardiovascular mortality and cardiovascular morbidity (Dineen & Gerstein, 1997).

Proteinuria, or macroalbuminuria (albumin:creatinine ratio greater than or equal to 30mg/mmol), relates to a more extreme increase in the level of albumin in the urine. It represents a progression of urine albumin excretion from microalbuminuria. There is no definitive level of albumin to describe a clear cut-off point for proteinuria in the literature. There is also overlap between the albumin ranges used to define microalbuminuria and the cut-off points for proteinuria across some studies.

People with type 2 diabetes can progress from proteinuria to end-stage renal failure, though this outcome is rare in comparison with cardiovascular mortality and morbidity (Adler et al, 2003).

Refer to *Guidelines to detect, monitor and treat early stage CKD* (Appendix 2)

8.4. Indications for Referral to a Nephrologist

In patients with hypertension and/or diabetes referral to nephrologist is usually indicated for physical and psychosocial preparation for RRT (dialysis, pre-emptive transplantation, transplantation) or conservative medical management when eGFR falls <30mL/min/1.73m^2 (Boulware et al, 2006; Giles & Fitzmaurice 2007). In selected cases a referral at an earlier stage (eGFR 30-59mL/min/1.73m^2) is also appropriate (see Appendix 4 - *Referral to Nephrology Specialist Outpatient Appointment*). There are a number of exceptions to the rule of eGFR for referral, such as cases of acute renal failure, severe proteinuria, nephrotic syndrome, systemic illnesses with kidney involvement and others.

There has been an increased volume of referrals from primary care following introduction of automated eGFR reporting to assess kidney function when eGFR is <60mL/min/1.73m^2 (Giles & Fitzmaurice 2007). Moreover, an eGFR 45-60mL/min in the absence of proteinuria is not associated with renal disease progression or increased cardiovascular risk in subjects without hypertension or diabetes (Halbesma et al, 2006).

In collaboration with GPs, NGO's and consumers, the RDHN has developed guidelines (algorithm) to provide advice and support to primary care teams on referral indicators and management of a condition that is not well understood.

8.4.1. Role of general practitioners in the co-management of CKD

Patients with CKD, particularly those in the more advanced stages of the disease often require ongoing specialist care. The GP will continue to play a crucial role, maintaining an ongoing relationship with the patient and their family, coordinating the care provided by others and ensuring that this care remains focused on the patient's own goals and priorities.

As the patient progresses to ESKD and has regular contact with the dialysis or transplant team, the GP, practice staff and other health professionals remain vital to optimal care.

Items in the Medicare Benefits Schedule (Table 14) support GPs to provide a proactive, integrated, multidisciplinary care of patients with chronic disease.

Table 20. Useful MBS items for CKD and its complications

For general practitioners	
721	Preparation of a general practitioner management plan
723	Coordination of team care arrangements
725, 727, 729, 731	Contribution to or review of multidisciplinary care
734, 736, 738, 740, 742, 744, 746, 749, 757	Organisation and coordination of case conferences
759, 762, 765, 768, 771, 773, 775, 778, 779	Participation in case conferences
900, 903	Medication management review
For nephrologists	
820, 822, 823, 830, 832, 834	Organisation and coordination of case conferences
825, 826, 828, 835, 837, 838	Participation in case conferences
For other health professionals	
10950, 10951, 10954, 10956, 10958, 10968	Allied health services

Further information about these items is available at: www.health.gov.au/epc.

8.4.2. Referral to Nephrology Specialist Outpatient Appointment

The Specialist Outpatient Services Access Policy (Metropolitan Health Services, 2007) provides a consistent and structured approach to the management of specialist outpatient services with the use of appointments list provided to all relevant outpatients personnel. To streamline the process with the centralised booking service and consistent with the Specialist Outpatient Services Access Policy, the referral algorithm developed by the RDHN for general practitioners is tailored to create a relatively simple one page, tick-box checklist for referral of renal patients (Appendix 3). Selection of the reason for specialist referral automatically defines the wait-list category and allocation of treatment priority to ensure patients are receiving the most appropriate care within the desired timeframe.

The Algorithm for referral and management of CKD and the Clinical Priority Access Criteria (CPAC) guideline for First Specialist Assessment are available at http://www.gp.health.wa.gov.au/CPAC/speciality/index.cfm?speciality=21.

Recommendation 4

That the guidelines 'Referral to Nephrology Specialist Outpatient Appointment' be implemented across the State and the intake and timeliness of referrals be monitored.

CKD CONTINUUM OF CARE

SPECIALIST NEPHROLOGY SERVICES - Coordinated management of the advanced established condition

<table>
<tr><td>National Service Improvement Framework for Diabetes and Heart, Stroke and Vascular Disease – Care Continuum</td><td>Responsibility</td><td>Primary Prevention – The well population</td><td>Early Detection – Population at risk</td><td>Secondary Prevention – Minimising progression & consequences of CKD</td><td>Specialist Nephrology Services - Coordinated management of the established condition</td><td>End Stage – Dialysis and transplant services</td></tr>
<tr><td rowspan="5">CKD Model of Care for WA Health</td><td>Population Health</td><td>Services for people to reduce preventable causes of CKD</td><td colspan="4" rowspan="2"></td></tr>
<tr><td>Primary care</td><td rowspan="4"></td><td>Services for people at risk of developing CKD</td><td colspan="3" rowspan="2"></td></tr>
<tr><td>Primary care
+</td><td colspan="2">Services for people with early, stable CKD</td><td colspan="2" rowspan="2"></td></tr>
<tr><td>Chronic disease management team
+
Tertiary and secondary hospital services</td><td colspan="2">Services for people with advanced stage CKD</td></tr>
<tr><td colspan="2"></td><td>Services for people with end-stage disease</td></tr>
</table>

9. SPECIALIST NEPHROLOGY SERVICES - Coordinated management of the advanced established condition

Aim

To co-ordinate and individualise the systematic care of patients with established renal failure by a comprehensive range of professional staff sympathetic and responsive to individual needs and personal preferences.

Quality requirement

All patients with established renal failure are to receive best practice interventions to reduce progression of their disease, timely education and preparation for renal replacement therapy and/or renal transplant (where appropriate) and expedient referral and creation of dialysis access, so that their choice of clinically appropriate treatment options is maximised. Care should be consistent with national and international guidelines for best practice and outcomes regularly monitored and reported to ensure standards meet or exceed all RDHN mandated Clinical Practice Improvement (CPI) initiatives.

Rationale

Patients known to the renal service for more than 90 days before starting RRT have better outcomes (Lorenzo et al, 2004). However, up to 30% of patients first reach the specialist renal service <1 month before requiring RRT. This group has poorer outcomes, characterised by longer hospitalisation and higher early mortality on RRT (Lorenzo et al, 2004). In up to 50% of cases there is evidence of missed opportunities for earlier referral (Roderick et al, 2002).

The complexity of dialysis therapy and the enormous social and family impact require prolonged and repeated education to maximise knowledge and informed decision making. Timely referral for assessment and investigation for the best means of dialysis access and timely surgery, which enables patients to begin dialysis with their vascular or peritoneal dialysis access established and functioning, is the principal determinant of a successful model of care. Up to 12 months may be required to fully prepare a patient and their carers for RRT and implement an individualised model of care.

Renal service clinicians can be proactive when managing patients with established renal failure. The multi-skilled renal team will prepare patients both medically and psychologically, and minimise the complications of their disease.

In the primary care setting, regular monitoring of kidney function in patients with diabetes and hypertension should be standard of care (in accordance with section 6) and progressive CKD should therefore be readily identified with timely referral to a renal service (see referral algorithm). Ideally no patients with diabetes or hypertension should commence RRT as a late referral. However, this is not the case. One in five patients with kidney disease due to diabetes or hypertension are referred late to a renal specialist service in WA (ANZDATA 2005).

Appropriate and early referral is associated with specific individual and system wide benefits:

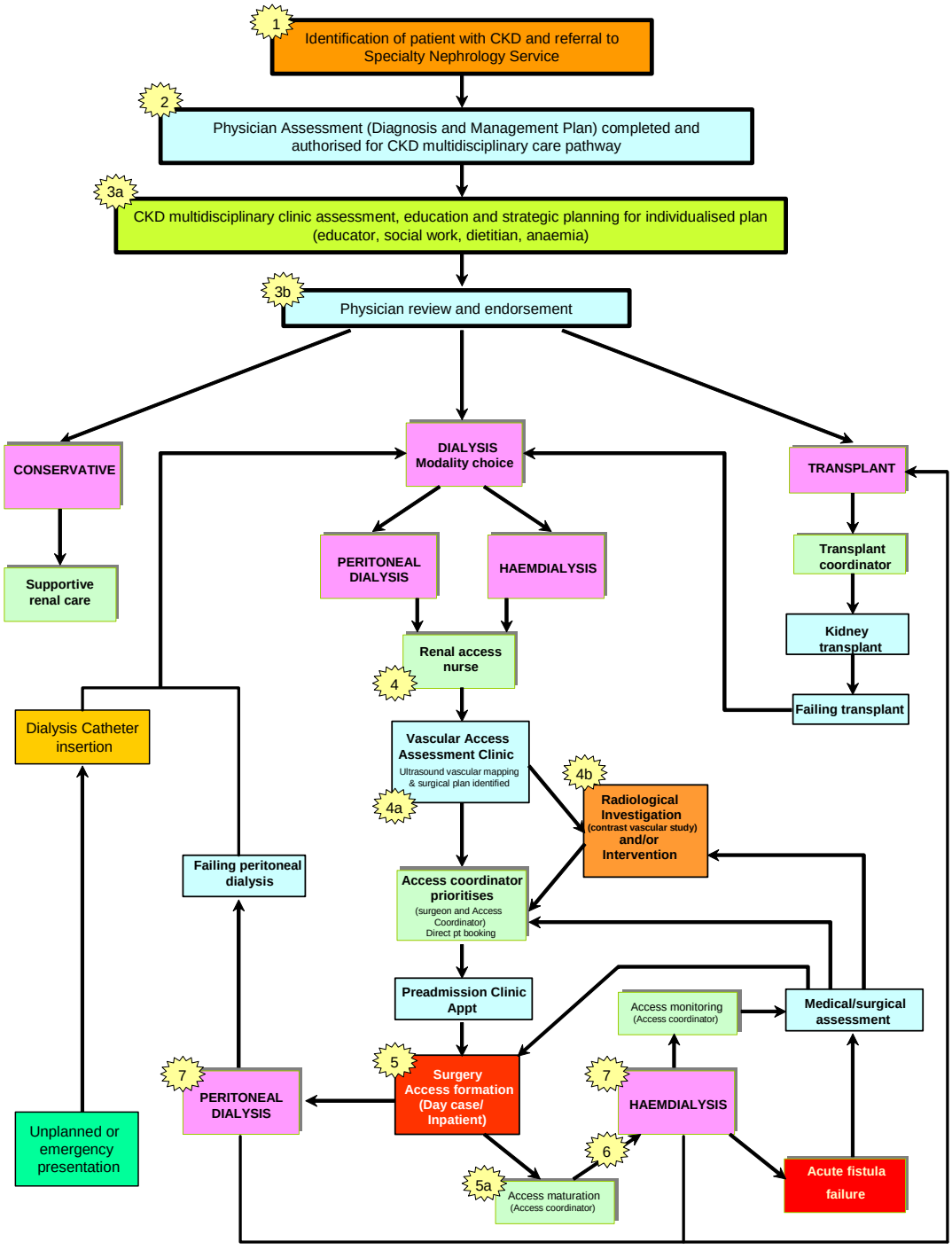
- Reduced rates of progression to end stage kidney disease
- Decreased need for and duration of hospitalisation
- Increased likelihood of permanent dialysis access created prior to dialysis onset
- Reduced initial costs of care following the commencement of dialysis
- Increased likelihood of kidney transplantation
- Decreased patient morbidity and mortality.

It is recommended that a defined management pathway (algorithm) is to be followed for the evaluation and management of patients with CKD stages 4 and 5, where RRT is anticipated (see Fig 4). The algorithm defines decision points or gateways where appropriate transfer of care and responsibility occurs within the pathway. Specific points involve input from additional service providers (radiology and surgical), which have additional workforce, infrastructure and resource implications for their provision. It identifies specific points for audit to evaluate the effectiveness of the operational components and review of outcomes to identify barriers or impediments to a smooth transition along this pathway (Table 21). Adequate resources must be in place to ensure that the identified decision points function effectively and integrate seamlessly. The algorithm provides the model, however the transition through the pathway also requires regular review and endorsement by the patient (consumer) and physician in order to maintain the flexibility for review and change where patient circumstances require.

Table 21. Key points for evaluation of the pathway of patients with stage 4-5 CKD

	Tests	**Audit Tool**
Point 1	Early referral and identification	Proportion of patients known to GPs with CKD requiring to start dialysis within 90 days of first referral
Point 2	Adequacy of Medical Services for assessment of referrals	Proportion of patients referred by GP's seen within appropriate category waiting time
Point 3	Adequacy of nursing and allied health services for provision of multidisclipinary CKD Care	Proportion of patients assessed and educated within 4 weeks of referral
Point 4	Referral for Vascular Access and support services (radiology ultrasound), surgical clinic waiting times	Proportion of patients evaluated and reviewed within 4 weeks of referral
Point 5	Adequacy of Surgical Support (Surgeons, Theatre availability)	Proportion of patients receiving designated access within 6 weeks of acceptance for surgery
Point 6	Adequacy and Competency of Surgical Services	Primary and Secondary Failure rates of Access Proportion of patients with non-permanent access.
Point 7	Adequacy of care pathway	Proportion of patients starting their intended therapy with a functioning device. Proportion of patients with non-permanent access. Blood Stream Infection Rates

Figure 4. Algorithm for evaluation and management of patients with CKD stage 4/5 where renal replacement therapy is anticipated



9.1. A patient-centred service

Aim

All people with chronic kidney disease receive information, education and support enabling them to make informed decisions in managing their condition and choose the treatment process that best suits their needs.

In line with the declaration of the *International Alliance of Patients' Organizations* on patient-centred healthcare we recognise that a system of care to renal patients needs to be designed and delivered to address the healthcare needs and preferences of patients so that healthcare is appropriate and cost-effective (IAPO, 2006).

People need information, education and support if they are to be full partners in care. Most patients will want to be involved in decisions and choose the treatment process that best suits their needs and to share responsibility for managing their own condition with professional staff, their families or carers.

Educational programs have been shown to improve people's knowledge of ESKD and its treatment by RRT (Klang et al, 1999; Devins et al, 2000). Patients will need information on the nature and consequences of CKD including advice on nutrition, anaemia, hypertension and lipid control, bone disease, exercise and smoking cessation.

Education programs are most effective when they are tailored to individual needs, both culturally and linguistically, and take account of other influences such as age and disability. Patients with CKD who choose to undergo an education program have improved psychological and social outcomes. Studies have shown that information and support enable patients to maintain employment and to ward off the depressive symptoms associated with long-term dialysis (Klang et al, 1999; Errico et al, 1990).

Recommendation 5

That all people with chronic kidney disease have access to information that enables them and their carers to make informed decisions, encourages partnership in decision-making and an agreed care plan that supports them in managing their condition to achieve the best possible quality of life.

For patients in the care of a multi-skilled renal team, a named contact (doctor or nurse) for each patient should be identified at each stage of the care pathway the team. The named contact shall help the patient navigate their way around the system, to be responsible for ensuring an agreed care plan is in place and to make sure it is regularly reviewed by the clinical team in partnership with the patient (Korniewicz & O'Brien, 1994).

The RDHN recommends that all units caring for patients with CKD require trained CKD educators to ensure that education is given in a professional, structured and reproducible manner. In general, nursing staff with considerable involvement in

dialysis and care of patients with CKD has proven roles as dialysis educators. A broad depth of experience and involvement with dialysis improves the confidence and accuracy of information, and promotes adoption of self-care dialysis and empowerment of choice. Within WA, specific allowance for ethnic and indigenous cultural awareness is important and will require access to Aboriginal Liaison Officers (ALO).

Recommendation 6

That all Units with responsibility for preparing patients for dialysis require experienced and adequate trained Nurse Educators and support from adequate number of Aboriginal Liaison Officers appropriate to the number of Aboriginal patients under care.

An agreed care plan fosters a partnership between clinicians and patients and clarify what each will do to reach agreed goals. An agreed care plan would also identify the social work support required to help patients with problems relating to benefits, work and family matters and can highlight the need for psychological support and recognition and management of depression.

9.2. Preparation and choice

Aim

All people approaching established renal failure are to receive timely preparation for renal replacement therapy so the complications and progression of their disease are minimised, and their choice of clinically appropriate treatment options is maximised.

On referral to renal services, clinicians in conjunction with other members of the multi-skilled renal team will undertake a number of interventions aimed at preparing patients medically and psychologically.

Suitable patients close to ESKD may benefit if they have a transplant before they need to start dialysis. This is known as a 'pre-emptive' transplant and is possible when a willing and suitable living donor is available.

For the third of patients who begin RRT as an emergency, their first treatment will almost always be haemodialysis via a venous catheter, although they should be offered the choice of all appropriate treatment methods once their condition stabilises, usually before they are discharged from hospital (Metcalfe et al, 2003).

9.3. Preparation for dialysis

Aim

All people with established renal failure requiring dialysis are to have timely and appropriate surgery for permanent vascular or peritoneal dialysis access.

Optimal dialysis access requires best practice initiatives for surgical access creation and monitoring to achieve its maximum longevity.

Haemodialysis requires regular and repeated access to the blood stream and specialised vascular surgery is required for its creation and maintenance. An arteriovenous fistula (AVF), formed by connecting a vein to a nearby artery, provides the best long-term vascular access with the least complications. AVFs take up to three months to develop and require more interventions to achieve long-term success. A proportion of AVFs fail before dialysis is due to start or require additional surgery to allow maturity and it is important to plan well in advance so that a second procedure or revision can be undertaken. An alternative is for a tube of synthetic material to be connected to blood vessels, when blood vessels are damaged or in poor condition, this is known as a 'graft' (AVG). If someone presents as an emergency or it is not possible to establish mature access before dialysis is required, a central venous catheter (CVC) can be inserted. The complications of temporary CVC are increased blood stream infections (BSI) and the rate and absolute number of infections provide powerful data regarding the adequacy of vascular access programs. Over-use of CVC due to poor planning, surgical services or referral will increase BSI rates and this creates increased morbidity, mortality and hospitalisations.

There is strong evidence to suggest that permanent vascular access should be established as soon as possible. Current best practice suggests this should be six months before starting dialysis. For example, evidence from Australia, Europe and the US demonstrates that patients who start dialysis without a properly established and healed access site suffer higher morbidity and mortality (Pisoni et al, 2002; Polkinghorne et al, 2004).

Although an AVF is considered the best and most reliable form of access to the patient's blood supply for haemodialysis, when compared with other countries (Pisoni et al, 2002) and the rest of Australia (Polkinghorne et al, 2003), fewer WA patients start haemodialysis with a permanent AVF (Table 22) and a smaller proportion of the overall number of haemodialysis patients have an AVF (ANZDATA Registry, 2006).

Table 22. Haemodialysis patients with an arteriovenous fistula

Country	Patients beginning haemodialysis with an AVF (%)	Overall number of haemodialysis patients with an AVF (%)
Germany	83	84
Spain	71	82
France	62	77
Italy	60	90
UK	47	67
Australia	45	76
WA	34	74

(Source: Pisoni et, 2002; ANZDATA Registry, 2006)

In WA around 200 patients a year start dialysis, nearly 80% on haemodialysis. This requires at least 160 de novo vascular access operations per year, with 50% requiring a second or third operation. There are 600 existing patients on haemodialysis of whom 20% will require revision of access annually (120 cases per year). Therefore, annually across WA at a minimum 360 vascular surgical procedures are required (=7 week), which equates to 2 surgical sessions per week. The creation of arterio-venous fistula and grafts is usually provided by vascular or transplant surgeons. Britain's National Health Service (NHS) has set a benchmark for dialysis access surgery (National Renal Workforce Planning Group, 2002). A dedicated operating theatre session per 120 dialysis patients has been recommended on the assumption that each operating list could contain up to 3 primary access cases or depending on complexity 1 or 2 secondary access cases under local or general anaesthesia. A case load of 350 vascular access procedures would require 1.0 FTE surgeon but it is recognised that vascular access is likely to be provided by a number of surgeons working as a team, each with vascular access as a component of their job plan.

Recommendation 7

That dialysis access surgery meets the international benchmark of 1 dialysis access session per 120 dialysis patients, 1.0 FTE surgeon per 350 cases per year.

Surgical planning and support requires high level radiological support for the non-invasive (duplex ultrasound) and invasive (angiography, interventional radiology) services required. In addition the requirement for CVC placement and maintenance (10 insertions/week = 520 per year 520/385 = 1.4 CVC per dialysis patient per year at RPH) requires high-level support from radiology to achieve optimal outcomes (safety and quality) and equates to 2 radiology sessions per week.

Recommendation 8

That a dedicated central line insertion service via Radiology be established to maintain best practice outcomes for CKD patients.

A dedicated full time renal access nurse is best suited to manage the volume of surgery, diversity of referral, and complexity of liaison between nurses, patients, surgeons, radiology and physicians. This nurse co-ordinates the vascular access pathway and facilitates its implementation and outcomes.

Recommendation 9

That a renal access nurse be mandatory for all centres involved in assessment and management of patients with CKD requiring vascular surgery.

Late referral for patients whose primary renal disease is due to diabetes or hypertension represented 21% of all cases in WA (ANZDATA). Not surprisingly, 75% of those patients commence dialysis with a central venous catheter (CVC). For the same conditions late referral among the indigenous population

in WA (32%) is even more common, although the proportion of these patients commencing dialysis with a CVC is somewhat better (69%).

One of the aims of the RDHN is to reduce the number of late referrals of patients with kidney disease due to diabetes or hypertension to <5% by 2015 through the use of a statewide standard referral pathway.

The RDHN aims to improve performance in WA and will explore strategies to re-design elective dialysis access surgery. Different solutions for improving access to, and bringing down waiting times for, elective fistula surgery will be examined. Consideration will be given to the appropriateness of treating more patients as day cases and allowing alternative patient management arrangements by using capacity in both the public and private sector.

9.4. Multidisciplinary Care

Although the GP has continuing responsibility for primary care of the patient, as kidney function declines and as complications and co-morbidities increase, it becomes increasingly likely that the contribution of others will be needed for optimal care. At times the GP may be required to advocate for the patient with other professionals. These may include:

- Nephrologist
- Endocrinologist/diabetologist
- Vascular and transplant surgeon
- Practice nurse/nurse practitioner
- Renal nurse
- Dietician
- Social worker
- Pharmacist
- Mental health professionals
- Community health professionals
- Family members or other lay carers
- Aboriginal Health Workers

The GP will continue to play a crucial role, sustaining an ongoing relationship with the patient and their family, coordinating the care provided by others, ensuring that this care remains focused on the patient's own goals and priorities. Even if the patient progresses to ESKD and has regular contact with the dialysis or transplant team, the GP, practice staff and other health professionals remain vital to optimal care.

9.5. Multidisciplinary team CKD clinics

A multidisciplinary team CKD clinic is a health care network devoted to identifying, preventing and managing the complications of CKD (Bolton et al, 2000). The clinic is designed to provide accurate and standardized clinical care and to educate and inform patients, which optimises both short and long-term patient outcomes, including improved quality of life and survival (Batlle et al, 2006). Management of CKD patients is essentially preventive medicine. A multidisciplinary approach would permit a small number of nephrologists to influence and direct the care of larger numbers of CKD patients.

Benefits of Multidisciplinary team CKD clinics

- Multidisciplinary team CKD clinics are an efficient and effective way to provide care for patients with CKD (Levin, 2005)
- Data in patients with advanced CKD show that multidisciplinary care leads to improved renal outcomes, including delay in the initiation of renal replacement therapy (Batlle et al, 2006)
- Economic analysis of early versus late referral suggests that timely referral of patients to a multidisciplinary clinic are cost-effective (McLaughlin et al, 2001) and the
- Financial benefits of delaying progression of CKD may more than pay for the costs of the multidisciplinary approach (Batlle et al, 2006).

The main objectives of multidisciplinary care are:

1. To provide specific therapy based on diagnosis
2. To slow down the progression of CKD
3. To evaluate and manage co-morbid conditions (e.g. diabetes, hypertension, dyslipidaemia)
4. To prevent and manage cardiovascular disease
5. To identify, prevent and manage CKD specific complications (e.g. management of nutrition, anaemia, renal bone disease as well as fluid, electrolyte and acid-base problems)
6. To plan and prepare for renal replacement therapy (e.g. choice of dialysis modality, access-placement and care, pre-emptive transplantation)
7. To support and provide conservative care and palliative care options.

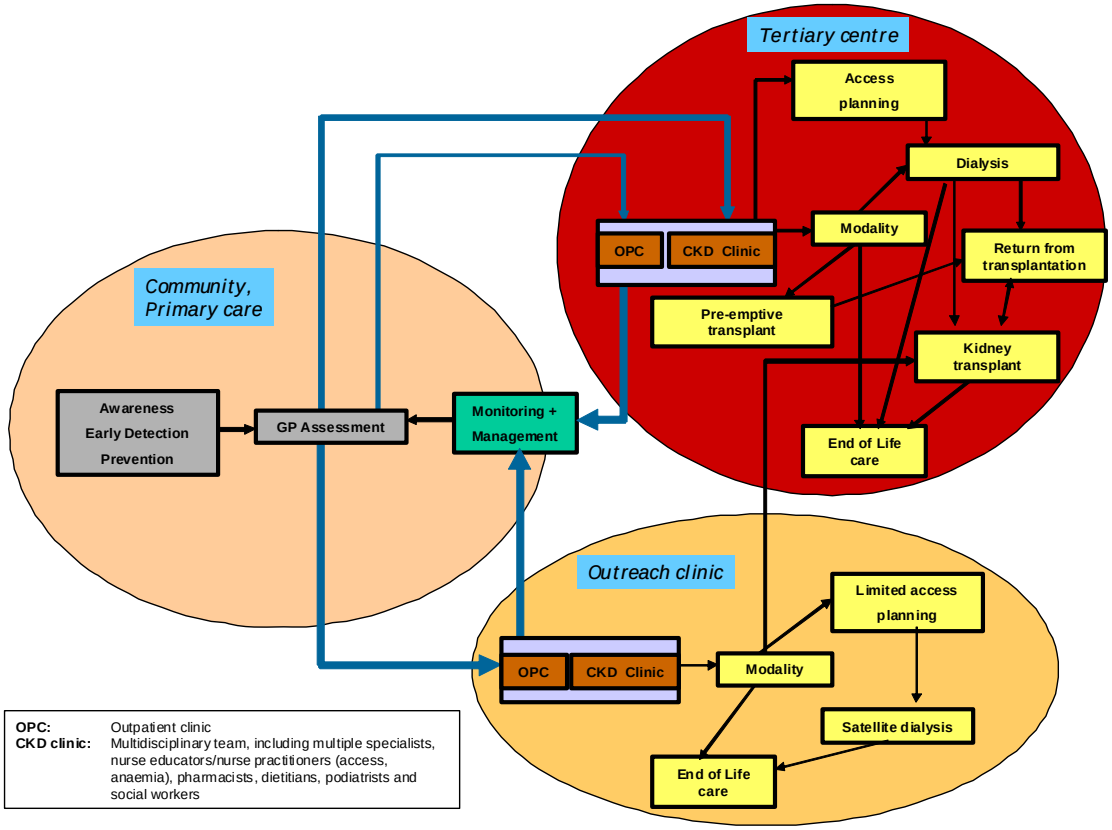
In order to achieve these standards it is clear that disease management care will require considerable resources and integration of care between primary care providers, nephrologists, specially trained nurses, dietitians, social workers, pharmacists and other health service providers (Barrett et al, 2003).

The overhead costs of such multidisciplinary teams, including nurse practitioners, nurse educators, pharmacists, nutritionists, and social workers, can be overwhelming and well beyond the scope and budgets of general medicine clinics and small group practices. Therefore, the RDHN proposes the establishment of a number of multidisciplinary team CKD clinics, where appropriate and sustainable, to support the management of CKD in a collaborative effort, involving at least the patient and their GP.

The RDHN recommends the establishment of multidisciplinary CKD management clinics for all clients with Stage 4 CKD (eGFR < 30mL/min/1.73m^2) in metropolitan, rural and remote areas. The introduction of this service should increase the new patient capacity of the nephrology service by 50%.

The WA Health Clinical Services Framework 2005 – 2015 provides a clear role statement for each metropolitan public hospital and provides an outline of the type and level of clinical services to be provided at each of these sites. Only tertiary hospitals should provide renal services at a level 6 according to the clinical services definition. The other metropolitan hospitals will provide level 4 renal medicine services, with Joondalup increasing to a level 5 service by 2015. The level of service provision will determine the type of multidisciplinary CKD clinics that can be delivered and are sustainable.

Figure 5. Proposed integration of primary care and multidisciplinary team CKD clinics



9.5.1. Tertiary hospital multidisciplinary CKD clinics

At the metropolitan tertiary hospitals CKD clinics will provide high-level (Level 6) coordinated multidisciplinary care to renal patients, maximising services provided through the tertiary sector. After initial assessment, recommendations for follow-up and management can be provided to the GPs or general hospital physicians.

The number of CKD clinics at each tertiary hospital should be based on the number of patients with CKD stage 4 or higher and selected patients with CKD stage 3, recorded in the unit database. Estimation will be made from a minimum of 3-monthly follow-ups with the renal physician, with 12 OPC available appointments per physician per session (i.e. 12 patients x 13 weeks = 156 individual patients).

At each clinic there will be a variable number of *nephrologists and trainees* to provide the medical follow up. In terms of non-physician staff, there will be *nurse practitioners, patient educators, access nurses, transplant nurses, social workers, dietitians, pharmacists, aboriginal health workers, etc.* All of these personnel have other duties within the program, but they come together for the multidisciplinary clinic.

The roles of the individuals are self-explanatory:

- The *nurse practitioner* will be responsible for the clinical assessment and management of renal patients, from established CKD through to ESKD. The nurse practitioner as case manager will provide the continuity and follow up of care with the multidisciplinary team.
- The *clinic nurses* will be responsible to initially assess patients (BP, weight), update their medication lists and ask screening medical questions (eg dyspnea, nausea, anorexia etc).
- The *patient educator* will be responsible for setting up and running individual and group teaching for patients and their families. The education will cover a broad range of topics (e.g. diet, modality selection, access, anaemia etc). Their role is also to encourage patient empowerment by providing support and education to develop patients self-management skills, including anaemia management. An *Aboriginal Health Worker* will work in collaboration with the nurses to provide clinical and educational support to indigenous patients.
- The *access nurse* will be responsible for providing a coordinated approach to patient work-up and planning for access placement for both peritoneal dialysis and haemodialysis. The aim is to ensure optimal choice of vessels for AV fistula formation utilising pre-surgical vessel mapping/assessment.
- The *transplant nurse* co-ordinates the management of potential live donors for pre-emptive transplant and patients entering the renal transplant waiting list.
- The *renal dietitian* will do nutritional assessments, provide specific dietary advice and play an important role in determining dialysis start time (due to the need to begin dialysis before the patient becomes nutritionally compromised).

- The *pharmacist* will be consulted on an individual patient basis and will be responsible for medication review.
- The *physiotherapist* has the responsibility of helping patients maintain their strength and mobility as their kidneys fail and to provide specific advice on exercise for patients based on individual needs.
- The *social worker* will play a vital role in easing the path to ESKD care for the patients. She will facilitate with resolving financial and insurance matters as well as assisting with travel to clinic as well as to dialysis. An *Aboriginal Liaison Officer* will work in collaboration with the social worker to provide emotional, social and cultural support to indigenous patients and their families.
- The *renal physicians* will deal with the purely medical issues.
- The *transplant nurse* co-ordinates the management of potential live donors for pre-emptive transplant and patients entering the renal transplant waiting list.

Integration of a *vascular surgeon*, an *endocrinologist* (~40% of patients will be diabetics) and a *podiatrist* in CKD clinics should be implemented by no later than 2012.

The multidisciplinary approach has the benefits of enabling each of the health professionals the freedom to refer any patient to the other relevant practitioner on the spot if a particular problem arises. At each attendance every patient will see at least the clinic nurse and the renal physician. An example of an individual patient's schedule could look as follows:

Table 23. Example of patient's schedule for a multidisciplinary CKD clinic

	J	F	M	A	M	J	J	A	S	O	N	D
Clinic nurse	√			√			√			√		
Nephrologist	√						√			√		
Nurse practitioner	√			√						√		
Anaemia nurse	√											
Access nurse				√						√		
Vascular surgeon							√					
Dietitian				√						√		
Physiotherapist							√					
Social worker	√									√		
Endocrinologist				√								
Podiatrist							√					

J -D: January to December

Recommendation 10

That high level, integrated multidisciplinary CKD management clinics for all patients with advanced stage CKD be established in metropolitan tertiary centres.

9.5.2. Outer metropolitan and rural multidisciplinary CKD clinics

In selected outer metropolitan hospitals and in rural and remote regions, nurse-led clinics should be set up specifically designed to assess and provide a management plan for patients with CKD. A full renal assessment will be provided, with case note review in conjunction with a visiting consultant nephrologist. These patients are then either referred back to the GP with a management plan or to the nephrology clinic, with all relevant investigations undertaken prior to the first consultation with the visiting nephrologist.

These non-tertiary multidisciplinary CKD clinics may include:

- Renal nurse/nurse practitioner
- Allied health professional (dietician, social worker)
- Pharmacist
- Visiting renal physician
- Aboriginal Health Workers

On average 12 patients per ½ day session should be managed by a multidisciplinary care team in this setting. This allows estimating the demand, i.e. running one ½ day (=session) clinic per week would enable to manage approximately 150 individual patients (estimation based on 3-monthly follow-ups as described in point 9.5.1).

In *outer metropolitan hospitals* multidisciplinary CKD clinics should be considered at Swan, Armadale, Bentley, Rockingham, Mandurah, Osborne Park, and Joondalup.

Recommendation 11

That establishment of nurse-led multidisciplinary CKD management clinics for patients with advanced stage CKD in the outer metropolitan hospitals be considered.

In *rural and remote regions* multidisciplinary CKD clinics should be considered in all major regional centres. The demand depends on the distances, density of population and expected prevalence of disease in the region.

Using the AusDiab data, Table 24 is an approximation on the projected service demand by estimating the expected prevalence of patients with advanced CKD for each region in WA. The table shows a prevalence of stage 4-5 CKD of 0.4%, adjusted for variance in the prevalence of end-stage kidney disease by region as outlined in Table 10.

It is worth noting that there are significant differences in the regional prevalence of ESKD (135/100'000 in the Kimberley vs 13/100'000 in the South West) that cannot exclusively be explained by differences in the ethnicity, health status, prevention or primary care. The low prevalence of dialysis in the South West is partly due to a small proportion of indigenous patients and higher transplants rates, but also due to the lack of local regional services and the willingness of patients to relocate to the metropolitan area.

Table 24. Major country centres (population >5,000*) and projected number of stage 4-5 CKD patients by region

Major Centres	Population	Distance from Perth	Projected # with stage 4-5 CKD	CKD clinic per week
Kimberley	**35,748**		**660**	
Broome	15,242	2230km		1 day
Kununurra	5,220	3206km		1 day
Pilbara	**39,282**		**310**	
Newman*	3515	1186km		1 day
Port Hedland	12,697	1638km		1 day
Midwest	**52,372**		**260**	
Geraldton	25,324	427km		½ day
Carnarvon	7,189	904km		½ day
Goldfields	**53,661**		**320**	
Kalgoorlie	28,196	595km		1 day
Esperance	9,365	730km		½ day
Wheatbelt	**59,925**		**240**	
Northam	6,137	97km		½ day
Southwest	**219,812**		**880**	
Bunbury	45, 153	179km		2 days
Busselton	13, 863	228km		1 day
Great Southern	**71,498**		**290**	
Albany	22,256	540km		1 day

* For the Pilbara, due to geographical reasons a second service next to Port Hedland should be in Newman (rather than in Karratha, population: 10,730)

Recommendation 12

That nurse-led multidisciplinary CKD management clinics for patients with advanced stage CKD be established at 12 specified rural and remote regions in WACHS.

CONTINUUM OF CARE

DIALYSIS AND TRANSPLANTATION SERVICES - End Stage

National Service Improvement Framework for Diabetes and Heart, Stroke and Vascular Disease – Care Continuum	Responsibility	Primary Prevention – The well population	Early Detection – Population at risk	Secondary Prevention – Minimising progression & consequences of CKD	Specialist Nephrology Services - Coordinated management of the established condition	End Stage – Dialysis and transplant services
CKD Model of Care for WA Health	Population Health	Services for people to reduce preventable causes of CKD				
	Primary care		Services for people at risk of developing CKD			
	Primary care +		Services for people with early, stable CKD			
	Chronic disease management team +			Services for people with advanced stage CKD		
	Tertiary and secondary hospital services					Services for people with end-stage disease

10. DIALYSIS AND TRANSPLANTATION SERVICES - End Stage

Aim

To provide integrated and coordinated care and management to patients with end stage kidney disease.

Quality requirement

To ensure the delivery of high quality clinically appropriate forms of dialysis services is designed around individual needs and preferences and are available to patients of all ages throughout their lives.

Patients, relatives and carers are provided with culturally appropriate information, including discussion and counselling about the risks and benefits of transplantation with a clear explanation of tests, procedures and results.

People with established renal failure near the end of life receive a jointly agreed palliative care plan, built around their individual needs and preferences.

Rationale

Growth in the renal replacement therapy population in WA has been estimated to rise from 848 patients in 2005 to around 1,215 patients by 2013. This is because the number of new patients developing established renal failure exceeds the numbers who progress to transplantation or death.

The main growth in this population will be in older patients with additional medical complications such as diabetes and hypertension. These patients may not be suitable for transplantation or other forms of dialysis and are likely to require haemodialysis.

Early referral for assessment and investigation for the best means of haemodialysis access and timely surgery to ensure their vascular or peritoneal dialysis access is established and functioning is paramount, to enable patients to begin dialysis.

Renal transplantation is often the optimal choice for suitable patients in established renal failure and is the most cost effective therapy, but is limited by the availability of donor organs and the patients' suitability.

The Transplant Framework outlines the importance of meeting national transplant rate targets through increasing organ donation and registered organ donor rates and highlighting initiatives such as live organ donor reimbursement.

The Department of Health will have to deliver three standards:

1. Manage demand
2. Increase fairness of access
3. Improve choice and quality in dialysis and kidney transplant services.

10.1. Dialysis

Aim

That the delivery of high quality clinically appropriate forms of dialysis services is designed around individual needs and preferences and are available to patients of all ages throughout their lives.

Key elements of high quality care provided in dialysis units can be audited against clinical standards provided by the Australian New Zealand Society of Nephrology (ANZSN) (http://www.nephrology.edu.au/) and, by the Caring for Australasians with Renal Impairment (CARI) guidelines (http://www.cari.org.au/index.php).

Good practice suggests the following areas are the pivotal points for both the delivery of high quality dialysis treatment and the best possible patient experience and wellbeing.

1. *For haemodialysis:*

- *Frequency*: for most patients haemodialysis is a centre-based service that involves treatment three times a week for three or four hours (CARI Guidelines, 2005)[1]. For patients using home haemodialysis, more frequent but shorter treatments are also possible and may be more convenient to meet individual needs.
- *Adequacy*: the effectiveness of dialysis can be assessed numerically by measuring the clearance of certain molecules from the blood. Two widely used formulae for calculating effectiveness are the urea reduction ratio (URR) and Kt/V (CARI Guidelines, 2005 [2]; Marshall et al, 2006).

2. *For peritoneal dialysis:*

- *Prevention of peritonitis*: the major risk to physical wellbeing is the development of peritonitis (an infection of the peritoneal membrane). Repeated attacks of peritonitis are linked with early treatment failure and considerable morbidity. Hence, the aim should be to keep peritonitis rates below one episode for every 18 patient months (Boeschoten et al, 2006).
- *Automated peritoneal* dialysis uses a machine that performs several fluid exchanges, usually overnight. Some patients may prefer this to conventional peritoneal dialysis because it provides more free time during the day for work, schooling or social activities (Negoi & Nolph, 2006). Initially this treatment was more expensive than conventional peritoneal dialysis but this difference is diminishing over time.

3. *Continuing management of underlying diseases, risk factors and complications:*

- *Anaemia*: patients with ESKD are frequently anaemic, mainly as a result of the lack of production of the hormone erythropoietin naturally formed by the normal kidney (CARI Guidelines, 2005[3])

- *Cardiovascular disease* is the main cause of premature death in patients with ESKD, and ESKD hastens its progression, so the continued management of cardiovascular risk in people on dialysis represents a special challenge for renal units
- *Undernutrition*: malnutrition is associated with poor outcome, and patients on dialysis will need their nutritional status monitored, with appropriate nutritional advice and support provided where necessary
- Prevention of *renal bone disease* eg by control of phosphate levels.

10.1.1. Haemodialysis at home

Some people prefer home haemodialysis. The benefits include more flexibility to tailor the individual's dialysis regimen, and freedom from the travel and waiting involved in hospital attendance. However, others find it onerous or feel it places too much of a burden on carers who need to support them in the process.

10.1.2. Haemodialysis in a unit

Transport

People on haemodialysis have to travel three times a week to their dialysis unit. Haemodialysis patients are disproportionately dependent on hospital transport services and the time and costs associated with hospital transport are major areas of concern (Rodriguez-Carmona et al, 1996; Brammah et al, 2001). Adequate transport is so important to people on haemodialysis that it plays a vital role in the formation of patient views and attitudes towards dialysis. Good transport systems can improve patient attendance (Knapp, 1991), and efficient transport facilities reduce interruption of patients' social life and may therefore improve their quality of life. The development of satellite units and an increased availability of home haemodialysis can be convenient for the patient and also minimise transport costs.

Satellite dialysis units

There is good evidence that for many patients satellite units are as effective as main renal units and often more acceptable and accessible. Satellite units may be attached to primary care centres, or can be located in shopping centres and other public areas. However, main renal units will still need to manage patients for whom satellite or home haemodialysis care would be inappropriate (Roderick et al, 2005).

Renal communities can work up local clinical criteria to determine which patients need to be treated in a main unit. But decisions about the type of dialysis a person receives and where it takes place are best made by the patient as far as possible, with the help of information and advice from the multi-skilled team.

When undergoing dialysis, people require access to suitable food and drink. This may be particularly important for older patients receiving "Meals on Wheels" or the equivalent, who may miss meals when attending for dialysis.

The environment where people dialyse is particularly important. Careful attention to the site and the design of dialysis units is needed so they meet modern requirements, provide patients with good access, including dedicated parking spaces, and have a positive impact on patients' wellbeing. Building guidances for main renal units and satellites have been developed in the UK (details can be found at www.nhsestates.gov.uk).

10.1.3. Dialysis while an inpatient

Patients with ESKD undergoing either haemodialysis or peritoneal dialysis are increasingly elderly and often have other illnesses. Some therefore require relatively frequent hospital admissions. When patients are admitted they should, wherever possible, be cared for by health professionals trained in renal medicine because this has been shown to improve outcomes (Kshirsagar et al, 2000). If they require admission to another specialised unit, eg a critical care unit, close liaison with the renal team is needed.

Similarly, patients admitted to a renal ward who have other conditions such as diabetes or coronary heart disease will need access to specialist advice from the diabetes or cardiac team.

The 'WA PLAN FOR RENAL DIALYSIS SERVICES 2008-2013' provides specific details on the current state of play, needs and future plans for dialysis services in WA.

10.2. Transplantation

Aim

All people likely to benefit from a kidney transplant are to receive a high quality service, which supports them in managing their transplant and enables them to achieve the best possible quality of life.

A successful kidney transplant is the most clinically and cost-effective treatment for many patients with ESKD. However, a considerable increase in the number of kidneys donated will be needed to make this an option for all who could benefit. It can be difficult to find well-matched kidneys for transplantation for the Indigenous population. Many Indigenous people have a tissue type, which is uncommon in the population as a whole, some may be unable to receive kidneys from the majority of donors.

There are various guidelines and other documents available to professionals and patients, and these have been used to inform this standard. They can aid the assessment, preparation and care of transplant patients.

The Western Australian Kidney Transplant Service (WAKTS) strategy for transplantation, *Improving the health of patients with kidney and liver disease by increasing abdominal organ transplants* (Delriviere & Elmes, 2004) recognises the difficulties of supplying sufficient kidneys to meet demand, and proposes ways to optimise the potential of heartbeating donor, non-heartbeating donor and living donor programmes.

Where a kidney is available there are three key stages in the patient's pathway to transplantation:

- psychological and physical preparation
- pre- and post-operative care
- long-term follow-up.

10.2.1. Psychological and physical preparation

For most patients approaching ESKD, the concept of transplantation is introduced by the renal team, and a basic description of transplantation is given. The risks and benefits of a transplant are discussed, including information on the types of kidney that may become available and associated problems.

Patients who are offered a kidney from a deceased person will need further detailed information about the particular organ available (for example an increased risk of transmitting disease, of the donated kidney not working or only working after a delay), so they can make an informed decision about whether to accept it.

Some patients will have a potential living kidney donor among their family or friends. In this case, the risks and benefits for both the donor and the recipient will need to be discussed with the renal team, who can explain that kidneys obtained from living donors have a better long-term survival rate than those from people who have died.

The gift of an organ to another will have implications for the donor, the relationship with the recipient, and the feelings the recipient has about the transplanted organ. Potential living donors require independent, confidential advice about the risks and implications to make an informed decision about whether to proceed, and this should remain available throughout the donation process. Many studies have shown that following kidney donation a living donor experiences very few, if any, long-term complications.

Not all people with ESKD are suitable for a kidney transplant because of other medical problems they may have. If suitable for transplantation, the recipient will undergo tests including tissue typing and be placed on the national transplant list. Patients need to be aware that their name is registered on the national transplant list. Sometimes it may be necessary for a patient to be suspended or removed from the national transplant list, for example due to serious illness or major surgery. When these decisions are taken the patient needs to be fully involved, to know whether removal from the list is temporary or permanent, and to have that noted in their care plan.

10.2.2. Pre- and post-operative care

There are some essential pre- and post-operative considerations for a successful transplant operation to restore kidney function. Evidence indicates that to obtain the best results:

1. The organ should be adequately matched to the recipient's blood group, tissue type etc (using National Organ Matching System (NOMS) matching criteria for kidneys from deceased donors) and be in the best possible condition, with short ischemia times. The ischemia time relates to periods between removal of a kidney from the donor and its insertion into the recipient. Keeping ischemia times below certain limits is important for the successful outcome of the transplant.
2. Prophylactic or pre-emptive therapy should be used to control infections. Infection is a risk in transplantation. It can be transmitted with the organ, and opportunistic infections are potentially more serious because the immune system is suppressed. Patients may need prophylactic treatment, or careful monitoring and pre-emptive treatment to control infections such as cytomegalovirus.
3. National and international guidelines should be followed for immunosuppressive therapy and the treatment of acute rejection episodes. Medication to suppress the body's natural immune defence mechanisms is required to decrease the risk of rejection of the kidney once transplanted, and to treat rejection episodes if they occur. Several regimens are currently in use and are regularly undergo rigorous scrutiny by organisations such as the National Institute for Clinical Excellence (NICE).
4. Management of complications and risk factors, such as cardiovascular problems, should continue.

10.2.3. Long-term follow-up

People with a renal transplant will require long-term follow-up. The risk of acute rejection diminishes over time, but there will be a continuing need to monitor the function of the transplant, the risk of complications or infection, and the side effects of anti-rejection therapy, such as skin cancer or impaired liver function.

Evidence suggests that patients want tests and treatments clearly explained. For transplant patients this is especially true of tests, procedures and results concerning the survival of the transplanted kidney.

The patient's care plan can be used to agree the role of primary care, and the precautions and life-style changes that will maximise the success of the operation. Giving information and education to people as part of follow-up improves their knowledge of anti-rejection therapy and can diminish weight gain, cardiovascular risk factors and the incidence of urinary tract infections following a transplant. People also need to be aware of the risks of not taking their anti-rejection therapy as prescribed.

Patients with a transplant, who are admitted to hospital, whatever the setting, will need access to appropriate specialist advice from the transplant team.

10.3. End of life and palliative care services

Chronic symptom management and palliative care services in WA are limited to patients clearly defined as end of life or with uncontrollable pain. Health professionals receive little education or support regarding the use of palliative care services and discussing end of life issues (Lambie et al, 2006). One in-centre in Perth offers the option for patients to opt out of resuscitation and this is chosen by 10% of patients (Renal Unit Policy, SCGH). A second centre (Renal Unit, FH) offered the *Respecting Patient Choices Program* (Austin Health) to allow patients to determine a plan for the end of their life but reduced funding has placed limitations on the current program in WA. End of life issues decisions are supported through the proposed legislation in the Acts Amendment (consent to Medical Treatment) Bill of the *Guardianship and Administration Act 1990* introduced to Parliament in June 2006.

Survival is often less than 1 year following commencement of dialysis in ESKD patients with poor functional status, severe co-existing conditions and advanced age (Chandna et al, 1999). It is clear that for this group dialysis may be palliative rather than rehabilitative.

A 'no-dialysis' option is not a 'no-treatment' option. Non-dialytic therapy can relieve many symptoms, and maximise the person's health during the remainder of their life. Many patients with ESKD will live for several months without dialysis. Indeed, in older patients not undertaking dialysis there may be no significant shortening of life expectancy. Patients need to be reassured that whenever they make a choice, they still retain the right to re-discuss their options with the multi-skilled team and receive full supportive care from the resources of the renal service, even if they choose not to dialyse.

Consideration must be given to the Quality of Life (QOL) in conjunction with physical health when determining and altering the dialysis regime (Wu et al, 2004). ESKD patients report chronic symptoms including sleep disturbance, itch, shortness of breath, restless legs, cramps and chronic low-grade pain (Jablonski, 2007). Symptoms such as >10% weight loss in 6 months are strong predictors of mortality and indicate the need for palliative care support (Thomas, 2006; Coventry et al, 2005). Renal patients should receive palliative support throughout their care pathway (WA Centre for Cancer and Palliative Care, 2005). However, less than 10% of people who died of non-malignant conditions have access to specialist palliative care services, compared with 66% of people who died of malignant conditions (McNamara et al, 2004).

In-centre HD patients fall an average of 1.18 times per year, with diabetes as a positive risk factor (Volpato et al, 2005; Desmet et al, 2005). These falls increase morbidity, mortality, chronic pain, and hospitalisation. The state has extensive falls management programmes in metro facilities and via GPs, yet dialysis patients access these only sporadically.

Palliative care referral, falls risk management and active patient participation in determining their own pathway towards the end of life require state-wide introduction regardless of modality choice and geographical location.

Pathways for palliative care should be developed acting within recommendations 13, 14, 15, 29 of the Palliative care report and specifically recommendation 27 Service Provision. The Palliative Care Network will work with existing organisations for conditions other than cancer to develop an appropriate model of care to meet the needs of people with non-malignant diseases' (WA Centre for Cancer and Palliative Care, 2005).

Recommendation 13:

That the Palliative Care Network works with existing organisations for conditions other than cancer to develop an appropriate model of care to meet the needs of people with non-malignant diseases

11. RENAL WORKFORCE PLANNING

Aim

To provide a robust renal workforce plan based on National and International benchmarks to support the implementation of the proposed Chronic Kidney Disease Model of Care.

The complexity of renal healthcare requires integrated, multi-professional and multi-agency working to provide a high quality service. This requires co-ordinated workforce planning and a multi-professional approach to such issues such as patient education, modality choice and rehabilitation.

This section provides a robust renal workforce plan to support the implementation of the proposed model of care.

11.1. Renal physicians

A survey conducted by the Dialysis Nephrology Transplant (DNT) Subcommittee (joint Kidney Health Australia - ANZSN) in 2007 demonstrated that WA has the lowest ratio of renal physicians per million population in the country and that the number of patients with ESKD per nephrologist in WA (1:113) is nearly double the number to that of Victoria or New South Wales (1:69). A more careful analysis of the number non-paediatric ESKD patients per adult nephrologist in WA reveals an even higher ratio of 134 patients per 1.0FTE.

The British Renal Society (BRS) established a multi-professional national renal workforce planning group in January 2001 to prepare recommendations for establishments and staffing levels across each professional group involved in renal healthcare (National Renal Workforce Planning Group, 2002). The BRS has calculated that the required number of consultants in the UK equates to 2.45FTE per 250,000 population. It has also set a benchmark of ESKD patients per nephrologist of 75 or less, or 100 patients per 1.0FTE (National Renal Workforce Planning Group, 2002). Adopting the proposed UK benchmark and depending on the model used to calculate the current requirements (per population vs. ESKD patients) 4 to 5 nephrologists would need to be recruited in WA to achieve the national workforce standards and international benchmarks.

Table 25: Estimated consultant requirements

		2007 Actual		2007 Required	
	Population	Consultants 2007	FTE in Nephrology	Consultants	FTE in Nephrology
Total	1,477,815	16	11.3	20	14.5
ESKD	1,535	16	11.3	21	15.3

Consultant requirements are based on an estimate of the nephrology needs of a population of one million and take into account the service contribution of trainees and the demands of General Medicine, academic commitments and part-timework for personal reasons.

Alternative workforce models will need to be considered in the future. For instance in the UK, Non Consultant Career Grade practitioners (NCCGs) provide

valuable support to many renal programs. NCCG were shown to provide on average 9.4 sessions per week, the majority of which are devoted to the management of dialysis patients.

Recommendation 14:

That an appropriate number of nephrologists be recruited and maintained to align the physicians' workforce more closely with national workforce standards and international benchmarks.

11.2. Nursing

Renal services are heavily reliant on nursing staff. Haemodialysis nursing requires the skills and competencies to manage both the technical aspects of the haemodialysis process and the holistic care of patients receiving this form of renal replacement therapy.

Patients with a need for high level nursing care, eg replacement therapy and those with a severe inter-current problem, are usually managed in a dedicated renal high dependency unit (HDU). The staffing levels required to manage renal inpatient care depend on the levels of dependency of patients and their nursing needs.

The majority of patients wish to dialyse close to their homes and most (greater than 80%) are now considered suitable for satellite dialysis such that the staffing levels and skill mix should reflect the patient case mix. Most patients commence dialysis in central units and a proportion of stable patients are subsequently transferred to satellite units without resident medical staff or co-located renal inpatient services.

Satellite staffing levels have been based on the traditional satellite patient population that presupposes that the majority of these patients are independently mobile, haemodynamically stable and able to participate in their care eg setting up the dialysis machine. The reality of satellite dialysis now is that an increasing proportion of the patients are elderly, poorly mobile and increasingly dependent on nursing staff for all aspects of their care. In order to accommodate these patients in the satellite setting it is imperative that sufficient non-nursing staff is employed additional to nursing staff to manage the manual handling requirements without the need for increased nursing numbers.

The ratio of patients per nurse for in-centre services is higher than the ratio for satellite services. Based on the Nursing Hours per Patient Day (NHpPD) model, workforce requirements need to be estimated on 3.02 nursing hours per session for in-centre and 2.18 hours per session for satellites.

In WA, care of dialysis patients has generally been the province of registered nurses. There are smaller numbers of Enrolled Nurses and Aboriginal Health Care Workers currently employed in dialysis units. Given the current and predicted shortage of nurses across all areas, it is recommended that alternative workforce measures be examined and employed. In order to facilitate the use of

Enrolled Nurses in dialysis, it is necessary to re-establish a renal course for Enrolled Nurses.

Table 26. Haemodialysis nursing staffing level to provide for a 12-station unit with 2 patient shifts (=48 ESKD patients) for tertiary and satellite units

Tertiary

Calculation		
Nursing Hours - Ratio 1:2	360.00	/wk
Admission Nurse 1:30	38.40	/wk
Co-ord Nurse 1:0	0.00	/wk
Renal Assessment (0.25hr/pt)	36.00	/wk
Total Nursing Hours	434.40	/wk
Cover	10.86	FTE

Satellite

Calculation		
Nursing Hours - Ratio 1:3	240.00	/wk
Admission Nurse 1:30	38.40	/wk
Co-ord Nurse 1:0	0.00	/wk
Renal Assessment (0.25hr/pt)	36.00	/wk
Total Nursing Hours	314.40	/wk
Cover	7.86	FTE

Total establishment* **= 13.4 FTE** **= 9.7 FTE**
(*includes sick leave, annual leave)

The use of non-nursing staff is common in other countries. A skill mix of between 70% qualified:30% unqualified and 50% qualified:50% unqualified is used in the NHS system (National Renal Workforce Planning Group, 2002) for both in-centre maintenance haemodialysis units and satellite maintenance haemodialysis units. In Western Australia, the shortage of nurses is critical particularly in rural and remote areas. This must be considered in the planning of new services with emphasis put on expanding the renal workforce. Future planning should include the establishment of the *dialysis care assistant* role in order to devolve routine tasks onto less skilled personnel and allow registered nurses to concentrate on those areas that require the skill and expertise of the nursing staff.

Recommendation 15

That the dialysis care assistant role be established in order to devolve non-nursing tasks onto less skilled personnel to overcome the critical shortage of nurses particularly in rural and remote areas.

11.3. Allied Health Professionals

The importance of specialised allied health professionals (AHP) in improving outcomes for renal dialysis patients is well documented (National Renal Workforce Planning Group, 2002). It is also evident when examining the current state of play in WA that AHP is insufficiently and unevenly resourced, partially due to the absence of agreed staffing levels.

Renal dietitians provide individualised dietary advice, in the context of the home environment. Patients with renal disease have complex and changing dietary requirements depending on the degree of renal impairment, co-morbidity, modality of treatment, medications and inter-current events. Dietary modification can assist in management of hypertension and

cardiovascular risk factors, improving phosphate control and optimising nutrition.

Renal social workers care for the needs of patients at the interface of health and Social Service, addressing the practical, economic, social and psychological problems of patients and carers helping those with end stage renal disease to cope with chronic disease, disability and eventually death and bereavement.

Renal pharmacists provide medicines management as a core function of renal healthcare. Patients with renal disease or on renal replacement therapy require a large number of medications. The alteration in drug excretion (as a consequence of renal failure) and the complexity of therapeutic regimens increases the risk associated with these medicines.

Table 27. Recommended Allied Health Professionals staff/ESKD patient ratio, current and required staffing numbers based on 1,535 ESKD patients

	Proposed ratio	2007 Actual	2007 Required
Social worker	1 : 140	3.0	11.0
Dietitian	1 : 160	3.2	9.6
Pharmacist	1 : 250	1.0	6.1

In the UK, recommendations for AHP : ESKD patient ratios have been proposed based on the assumption that a unit with 200 dialysis patients will have an additional 600 transplant and pre-dialysis patients also requiring input (Kidney Alliance ESRF Framework 2001). These figures are based on the NHS, a system with far less geographical diversity than WA, and would need reviewing in the future. There also needs to be provision for Aboriginal welfare officers in areas with a high indigenous population in addition to these ratios.

Recommendation 16

That appropriate staffing and service levels be funded, achieved and maintained to ensure that all patients have access to renal services that are recognised as necessary for optimal patient management, in the appropriate location.

Finally, it is crucial that staffing implications for technicians, business managers, and secretaries, Information Technology (IT) support and transplant co-ordination are also taken into consideration.

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APPENDICES

Appendix 1: CKD Model of Care Working Group Members

Prof Paolo Ferrari - (Chair)	Clinical Lead RDHN
Dr Ashley Irish	Co- Lead RDHN; WACHS Pilbara region VMP
Ms Pam Deans	Clinical Nurse Specialist NMAHS
Ms Ruth Dumont	Renal Dietitian RPH
Mrs Julie Edmonds	Kidney Health Australia (NGO)
Debbie Fortnum	Renal Nurse Specialist, Manager Fresenius
Mr Graham Herbert	Chairperson, WACPAC Kidney Health Australia
Dr Steven Kan	General Practitioner
Ms Amanda Leigh	Fmr Director, Integrated Health Care
Ms Casey Light	Nurse Practitioner, Armadale Health Service
Ms Joan Loud	Manager, Fremantle Community Health
Ms Mern Low	Renal Pharmacist RPH
Ms Janet Mac Millan	Clinical Nurse Manager, Renal Unit, Fremantle Hospital
Ms Tricia Rose	CNS, Renal Transplant RPH
Ms Beverley Stone	Program Officer, OAH
Ms Monique Sandford	CNS, Renal Access RPH
Mr Brian Stafford	Consumer Representative
Dr Kevin Warr	Head of Dept, Renal Medicine RPH; WACHS Kimberley region VMP
Ms Jane York	CNS, Renal Anaemia RPH

Executive Advisory Group Members

Prof Paolo Ferrari (Chair)	Clinical Lead; Head of Dept Nephrology Medical Specialities, Fremantle Hospital
Dr Ashley Irish (Deputy Chair)	Clinical Co-Lead; Renal Physician RPH
Mrs Kay Atfield	Regional Director WACHS Kimberley region
Dr Neil Boudville	Renal Physician, SCGH
Mrs Julie Edmonds	Kidney Health Australia Representative
Ms Debbie Fortnum	Renal Nurse Specialist & Manager, Fresenius
Dr Steven Kan	General Practitioner
Dr Harry Moody	Head of Dept Renal Medicine SCGH
Mr Brian Stafford	Health Consumers Council Representative
Ms Jane York	CNS, Renal Anaemia RPH

Health Networks Branch officers:

Ms Zai Scarff	Senior Policy Officer
Ms Judi Gibbs	Development Officer

Appendix 2: Guidelines to detect, monitor and treat early stage CKD

Estimating CKD risk in patients with hypertension

- Test for the presence of protein in the patient's urine
- Take a blood sample to assess plasma glucose (early detection of diabetes), electrolytes, creatinine, blood lipids
- Consider the need for specialist investigation of patients with signs and symptoms suggesting a secondary cause of hypertension. Malignant hypertension requires immediate referral.

Estimating CKD risk in patients with diabetes

- Test for the presence of microalbuminuria in the patient's urine
- Take a blood sample to assess serum electrolytes and creatinine
- Consider referral to renal specialist if symptoms and findings suggest non-diabetic CKD.
- Consider sub-specialist consultation and/or co-management in younger diabetics and in indigenous patients with Stage 3 CKD
- Refer to nephrologist when GFR <30mL/min/1.73 m^2.

Using eGFR to detect CKD

- eGFR using the MDRD formula is the recommended method of measuring kidney function (Australasian Creatinine Consensus Working Group, 2005)
- eGFR may be markedly reduced while the serum creatinine is still in the normal range
- Knowledge of eGFR between 60-90mL/min/1.73m2 may be of assistance in providing an earlier warning of eGFR reduction and allowing monitoring of trends over time
- Further investigation of eGFR is only required if the eGFR is <60mL/min/1.73m2

Monitoring early stage CKD

- 3-6 monthly clinical review
  - clinical assessment (BP, weight)
  - serum creatinine (eGFR) and electrolytes, urine dipstick,
  - fasting glucose and lipids (yearly if normal at screening)

Treatment of early stage CKD

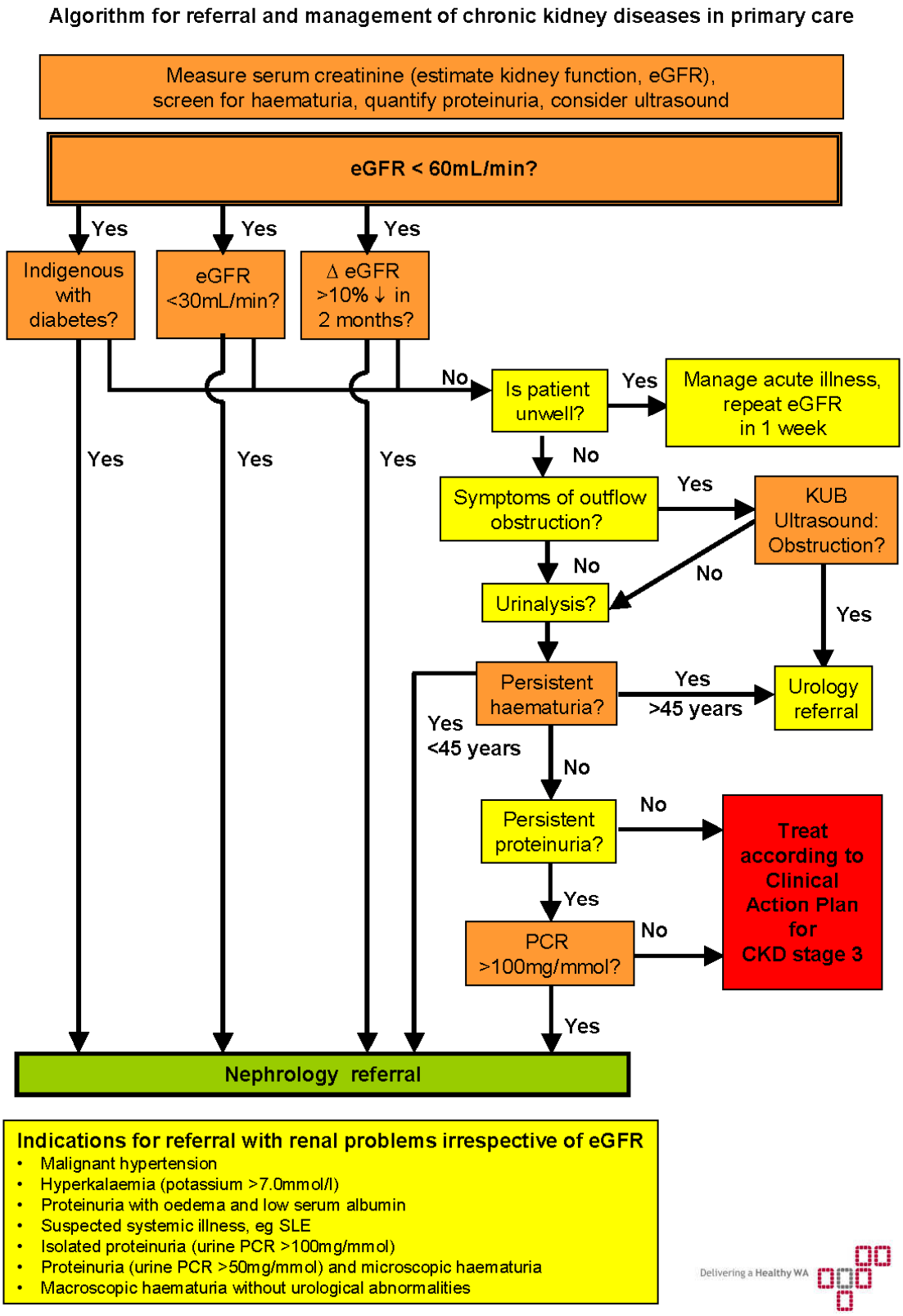
- Reducing BP to target levels is one of the most important goals in management of CKD.
- Blood pressure targets are:
  - for uncomplicated hypertension <140/90mmHg
  - for hypertension in diabetes <130/80mmHg

- ACE inhibitors are recommended as first line therapy. ARBs may provide similar kidney protection (Ferrari, 2007).
- Maximal tolerable doses of ACE inhibitors and/or ARBs are recommended (Ferrari, 2007).

Renal care for all people with type 2 diabetes

- Maintain good blood glucose control (HbA1c < 6.5–7.5%, according to the individual's target)
- Maintain BP target ≤140/90mmHg in all patients and ≤130/80mmHg for people with higher-risk urine albumin excretion
- ARB or ACE inhibitors are the drug class of first choice. To achieve target BP combination therapy is likely to be necessary for most patients
- Measure, assess and manage cardiovascular risk factors aggressively
- Arrange recall and annual review for people with type 2 diabetes
- Review complications and risk factors at diagnosis and annually thereafter
- Measure serum creatinine & urinary albumin annually
- Refer for specialist/nephrological opinion if eGFR <30mL/min in Caucasians and <60mL/min in Indigenous patients.

Appendix 3: Algorithm for referral and management of CKD



Clinical Action Plan for CKD Stage 3 (GFR 30-59)

Many complications begin to occur at GFR <60mL/min/1.73m^2.
Sub-specialist consultation and/or co-management is advisable during Stage 3 in specific cases.
Refer to nephrologist when GFR <30mL/min/1.73m^2.

1. Diagnose and treat specific cause of CKD:

- The specific cause of CKD may have systemic or other-organ effects or require disease-specific treatments, or affect pre- and post-kidney transplant management.
- Diabetes mellitus may not necessarily be the cause of CKD in a diabetic patient. The specific cause of CKD should be investigated fully. Patients with reduced GFR without retinopathy should be investigated (specialist consultation is advisable).
- If required, consult with nephrologist to establish a diagnosis & implement action plan.

2. Estimate progression:

Assess GFR decline based on annual estimates of GFR and predict interval until onset of kidney failure

Attempt to prevent/correct acute decline in GFR

- Volume depletion;
- Intravenous radiographic contrast;
- Non-steroidal anti-inflammatory agents, including COX 2 inhibitors;
- Obstruction of the urinary tract.

If the GFR is declining >10% over 2 months, consider early referral to a nephrologist for consultation and co-management.

3. Slow progression:

Use **ACE-I or ARB** to slow CKD progression in diabetic patients with or without hypertension (can cause acute decline in GFR).

Monitor proteinuria/albuminuria to evaluate response to treatment.

4. Reduce CVD risk:

- Consider CKD patients to be at highest risk for CVD
- BP goal is <130/80 mmHg*
  * Consider lower BP target (<125/75mmHg) if spot urine protein/creatinine ratio >100mg/mmol
- Treat with preferred agents and other agents if necessary:
  1st line: ACE-I or ARB, ***2nd line***: Thiazide diuretic, ***3rd line***: CCB or BB
- Assess "traditional" and "CKD-related" CVD risk factors
- Assess and treat dyslipidaemias

5. Treat co-morbidities:

- May need multiple agents to reach BP goal.
- For diabetic patients: strict glucose control. Target HbA1c <7.0%
- Patients with diabetic nephropathy have an increased risk of developing diabetic complications

6. Referral to nephrologist is necessary to evaluate and treat complications:

In general, referral to a nephrologist is recommended at GFR <30mL/min/1.73m^2 for patients to:

- Provide pre-dialysis education and plan for kidney replacement therapy
- Plan for dialysis access and pre-emptive protection of arm veins in case fistula surgery is planned
- Assess and treat anaemia
- Assess and treat bone metabolism and disease
- Assess and treat nutritional status

Reference: Chronic Kidney Disease (CKD): Management in General Practice. Kidney Health Australia

Department of Health

Delivering a Healthy WA

Appendix 4: Request for Nephrology Specialist Outpatient Appointment

Nephrology Specialist Outpatient Services July 2007

Request for Nephrology Specialist Outpatient Appointment

HOSPITAL .....

SPECIALTY/CLINIC .....

NAME OF SPECIALIST PREFERRED .....

Has the patient previously been seen by this hospital? YES ☐ NO ☐ Year .....

Has the patient previously been referred to this clinic/specialty for the same condition? YES ☐ NO ☐

Is the patient suitable for Telehealth consultation (rural only)? YES ☐ NO ☐

PATIENT DETAILS

Medical Record Number (If known)

☐☐☐☐☐☐☐☐

Please circle if applicable for this referral:

DVA White / DVA Gold: Number: .....

M.V.I.T / Workers Compensation

Medicare Number: ☐☐☐☐☐☐☐☐☐☐ **Ref No:** ☐

Date of Birth..... Male/Female Marital Status M / S / W / D / Sep / Defacto

Country of Birth ..... Aboriginal/Torres Strait Islander/Neither

Surname ..... Previous Surname ..... (eg. Maiden Name)

First Names ..... Preferred Name/Title .....

Address .....

Mailing Address (*if different*) .....

Phone: Home..... Work..... Mobile.....

Next of Kin
(Essential if under 18 years/guardian)

Relationship .....

First Name .....

Surname .....

Phone .....

REFERRING DOCTOR

Name .....

Address .....

.....

Postcode .....

Phone .....

Fax .....

Usual GP: As above ☐ Other (see below) ☐

Name (if known): .....

Suburb: .....

SPECIAL NEEDS
If interpreter required please specify language and dialect

.....

Other special needs .....

.....

LENGTH OF REFERRAL

☐ 12 months ☐ Other (*please specify*) .....

REFERRAL RECOMMENDATION

This patient needs to be seen (*please tick*)

- ☐ Routine
- ☐ Urgent
- ☐ **or** CPAC category 1, 2, 3, 4, 5 (*please circle*)
- ☐ Have discussed with Registrar/Consultant

Name .....

Appointment date given .....

(*if applicable*)

1

REFERRAL LETTER FOR RENAL DISEASE

REASON FOR REFERRING (please tick more than one if applicable)

Dear Dr ..... Re: (*Patient Name*).....

Immediate referral (Contact Renal Service by phone)

- ☐ Malignant hypertension
- ☐ Hyperkalaemia (K >7.0mmol/l)
- ☐ eGFR <15ml/min

Urgent referral (Category 1 <30 days)

- ☐ Proteinuria, oedema and low serum albumin
- ☐ Suspected systemic illness, eg SLE
- ☐ eGFR 15-29ml/min

Routine referral (Category 2 = 30-90 days)

- ☐ Proteinuria (urine PCR >100mg/mmol)
- ☐ Proteinuria (urine PCR >50mg/mmol) and microscopic haematuria
- ☐ Macroscopic haematuria without urological abnormalities
- ☐ eGFR 30-59ml/min and:
  - ☐ Indigenous with diabetes*
  - ☐ Microscopic haematuria*
  - ☐ Anaemia (Hb <100g/l)*
  - ☐ Progressive fall in GFR*
  - ☐ Urinary PCR >50mg/mmol*
  - ☐ Abnormal potassium, calcium or phosphate*
  - ☐ Uncontrolled hypertension on 3 agents including a diuretic*

Other referral (Category 3 = 90-365 days)

- ☐ eGFR 30-59ml/min without criteria for category 2 (*)
- ☐ Other: .....

Other medical problems

- Diabetes mellitus: no ☐, yes ☐, comments .....
- Hypertension: no ☐, yes ☐, comments .....
- Cardiac disease: no ☐, yes ☐, comments .....
- Peripheral vascular disease: no ☐, yes ☐, comments .....

Current medications

.....
.....
.....

Current results:

Mandatory

Serum

- Creatinine _____ µmol/l
- Urea _____ mmol/l
- Potassium _____ mmol/l
- Sodium _____ mmol/l
- Albumin _____ g/l
- Calcium _____ mmol/l
- Phosphate _____ mmol/l

Other

- Haemoglobin _____ g/l
- Blood glucose _____ mmol/l
- HbA1c (if diabetes) _____ %

Urine

- protein/creatinine ratio _____ mg/mmol
- dipstick blood ☐ neg ☐ pos
- dipstick protein ☐ neg ☐ pos

Desirable

Previous serum creatinine values _____ µmol/l (__/__/__/), _____ µmol/l (__/__/__/)
Result of renal ultrasound ☐ attached ☐ not available
Report of urology consult ☐ attached ☐ not available

PLEASE ATTACH COPIES OF ANY RELEVANT INVESTIGATIONS / REPORTS / LETTERS

....
Doctor's Signature Provider Number Date

Template for GP software applications available on Division of General Practice website: www.gpcoastal.com.au

Delivering a **Healthy WA**

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Department of Health