WACHS RENAL DIALYSIS PLAN 2010 to 2021

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ABBREVIATIONS

AKI	Acute kidney injury
AMS	Aboriginal Medical Service
ANZDATA	Australian New Zealand Dialysis and Transplant Registry
APD	Automated peritoneal dialysis
BRAMS	Broome Regional Aboriginal Medical Service
CAPD	Continuous Ambulatory Peritoneal Dialysis
CARI	Caring for Australians with Renal Impairment
CKD	Chronic Kidney Disease
CSHD	Community Supported Hone Haemodialysis
DAHS	Derby Aboriginal Health Service
eGFR	Estimated Glomerular Filtration Rate (measure of renal function)
ESKD	End stage kidney disease
HD	Haemodialysis
HHD	Home haemodialysis
HIN	Health Information Network
KAMSC	Kimberley Aboriginal Medical Services Council
KSDC	Kimberley Satellite Dialysis Centre
NMAHS	North Metropolitan Area Health Service
NT DFH	Northern Territory Department of Families and Health
PD	Peritoneal dialysis
Pmp	per million population
RPH	Royal Perth Hospital
RRT	Renal Replacement Therapy
SOS	Satellite Outreach Service
SJOG	St John of God
SMAHS	South Metropolitan Area Health Service
WACHS	WA Country Health Service
WAHDiP	WA Home Dialysis Program

1. EXECUTIVE SUMMARY

The WA Country Health Service (WACHS) renal dialysis plan provides agreed strategies for both meeting the need for dialysis services across WACHS for the next ten years, and for enabling dialysis clients to live as close to home as possible. The Plan has been developed by the WACHS Renal Dialysis Reference Group in conjunction with clinicians and renal physicians across WACHS and metropolitan tertiary providers. The WACHS Renal Dialysis Plan is consistent with the WA Chronic Kidney Disease Model of Care developed by the Renal Diseases Health Network in December 2007.

The WACHS Renal Dialysis Plan is limited to addressing the need for ESKD dialysis services in WACHS. Planning for the management of chronic kidney disease will occur as part of an overall chronic disease management strategy.

The Plan is divided into six sections, with this executive summary forming the first section. The remaining sections are:

2. Renal model of care (taken from the WA Chronic Kidney Disease Model of Care)
3. Planning context (including National, State and WACHS planning frameworks)
4. Needs Assessment – the current dialysis numbers and projections over the next 10 years.
5. Options analysis
6. Appendices

The number of dialysis clients from WACHS regions is projected to grow from 330 in 2010 to approximately 670 in 2021. These figures exclude transplants and assume that transplant rates will remain steady. The prevalence rate for the whole of WA is 45 per 100,000 people (2008). The WACHS prevalence rate exceeds the State average in the Kimberley, Pilbara, Goldfields and Midwest, with the Kimberley having a prevalence rate of 272 per 100,000.

WACHS is progressively introducing chronic disease management strategies. The modelling for the need of dialysis has anticipated that these strategies will begin to impact on the prevalence of ESKD from 2016 by 1% per annum rising to 5% by 2021. This has reduced the overall projections by approximately 30 clients.

Strategies for managing the future demand for home dialysis have been based on the principle of providing care as close to home as possible taking into account:

- Safety and quality
- Sustainability
- Viability
- Cost effectiveness

Home dialysis is the preferred treatment modality, and this plan sets a prevalence target of 35% of clients on home therapies. In view of home treatment failure rates (higher for PD than HD), achieving this target will require the number of patients commencing home therapies to be higher than 35%. A further 5% of clients are anticipated to require tertiary level care.

Two new dialysis options are proposed

- satellite outreach services (SOS), whereby small numbers of relatively stable clients can receive dialysis treatment in some smaller hospitals under the umbrella of the regional satellite
- community supported home haemodialysis (CSHD), whereby home dialysis clients who do not have a suitable home or dependable carer, can set up their dialysis machine in a community facility with the support of paid staff.

The proposed distribution of clients across dialysis modalities is as follows:

Modality	2010 clients	2021 projections
Perth	47	32
Supported dialysis: (Satellite and satellite outreach service)	155	382
Independent dialysis (HHD, PD, CSHD)	84	223

The current capacity of WACHS satellite services (including new services under construction in the Kimberley) is 280 clients. Therefore additional capacity for a further approximate 100 clients is required. Additional strategies are also required in order to meet the target for expansion of home dialysis.

The distribution of dialysis clients across regions is as follows:

Table 1: WACHS Dialysis projections by treatment modality

Region	2010 Clients	2021 Projections (CI)	CKD reduction	Tertiary	Independent (home) dialysis mode	Supported (satellite/ SOS) dialysis mode
Kimberley	96	199	10	9	66	114
Pilbara*	41	59	3	3	20	34
Midwest	38	48	2	2	16	27
Goldfields	49	71	3	3	24	41
South West	48	184	9	9	61	105
Great Southern	18	51	2	2	17	29
Wheatbelt**	34	57	3	3	19	33
TOTAL	324	669	33	32	223	382

Increasing the dialysis options available across WACHS presents a number of risks, the most significant being workforce and managing community expectations. Implementation of the plan will require significant resources, an innovative workforce plan and carefully developed policy and guidelines.

RECOMMENDATIONS

It is recommended that:

Monitoring growth

1. Given the difficulty in making accurate projections at a regional level due to low client numbers, the regional dialysis population is monitored annually against projections and the projections are reviewed every three years.

Satellite services

2. WACHS satellite services review and expand their capacity in order to provide an intermediate level of dialysis care, and the ability to support dialysis services and pre-dialysis clients across the region. This will include strengthening the workforce (see workforce section below), having spare dialysis capacity to accept referrals from dialysis clients who may require temporarily require additional support, and potentially, the ability to train new dialysis clients.

Satellite Outreach Services

3. WACHS consider establishing satellite outreach services at district and some small hospitals to enable more stable clients to return closer to home where:
    - the nearest satellite is not within commutable distance

- there is the physical capacity to accommodate the service
- there are a minimum of two clients who would be appropriate for a local service
- nursing staff attraction and retention issues could be managed
- local primary care services are accessible.

Expanding home dialysis

4. WACHS aims to achieve a prevalence target of 35% of clients on home dialysis.

It is recognized that reaching and maintaining the target for independent dialysis will require some additional strategies. These will include:

5. Working with renal physicians and WAHDiP to ensure that where appropriate clients are encouraged to commence home therapies as the initial treatment,
6. WACHS work with WAHDiP to explore the options to increase home dialysis training, monitoring and support from within the region, and increasing the capacity to provide home visits as required.
7. WACHS aims to expand the proportion of clients on HHD by increasing the opportunity for HHD to be provided in a community setting where the client's home environment is not suitable.
8. WACHS works with WAHDiP and the WA Health licensing branch to explore the option of providing a paid carer where home dialysis is in a community setting and the client is unable to provide a carer (CSHD).

Service Locations

9. Dialysis services are expanded or new services developed as follows. There is some existing capacity at satellite services in Port Hedland, Geraldton, Albany and Busselton. Services for Aboriginal clients should be developed in consultation with the local community, including the clients themselves.

Table 2: Proposed distribution of dialysis services

Region	Location
Kimberley:	
Continue services in Kimberley Satellite Dialysis Centre (KSDC)	Broome
Increase the planned Derby SOS from 10 to 12 chairs	Derby
Increase SOS from 4 to 6 chair	Kununurra
Provide SOS 4 chairs	Fitzroy Crossing
Provide CSHD 2 chairs	Halls Creek
Pilbara:	
Increase satellite from 8 to 11 chairs.	Port Hedland
Provide SOS for 4 chairs	Roebourne
Develop SOS/CSHD for 4 chairs	Newman
Midwest:	
Increase the capacity of satellite by expanding the number of sessions	Geraldton
Develop SOS (4 chairs)	Carnarvon
Develop CSHD (2 chairs)	Wiluna
Develop CSHD (2 chairs)	Meekatharra
Goldfields:	
Increase satellite from 7 to 12 chairs	Kalgoorlie
Provide CSHD in BEGA AMS (2 chairs)	Kalgoorlie
Provide SOS in Laverton/Leonora up to 4 chairs	Laverton or Leonora
CSHD/ SOS in Esperance (4 chairs)	Esperance

CSHD Warburton (2 chairs)	Warburton
South West	
Increase the capacity of satellite from 6 to 12 chairs	Bunbury
Develop a 'shop front' SOS service in Bunbury (12 chairs)	Bunbury
Continue services at Busselton as an outreach of Bunbury	Busselton
Great Southern	
Increase the capacity of satellite centre from 6 to 8 chairs.	Albany
Wheatbelt	
Provide SOS dialysis (4 chairs)	Northam
Provide SOS dialysis (4 chairs)	Narrogin
Provide CSHD dialysis (2 chairs)	Moora
Provide SOS dialysis (2 chairs)	Merredin

Workforce

10. WACHS develop a renal workforce strategy which includes:
    - the introduction of alternative workforce models such as renal dialysis trained ENs and AHWs
    - a program to train, assess and support nursing staff in SOSs to undertake dialysis
    - the capacity of regional satellite services to support outreach services across the region
    - specialist support services.
11. as ESKD patient numbers increase, WACHS regions increase the specialist support available. This can be achieved by a combination of resident and/or visiting nephrologists and advanced trainee registrars, renal GPs and renal Nurse Practitioners, depending on regional needs.
12. WACHS review the alignment between regional and metropolitan hospitals taking into account the new services from the Fiona Stanley Hospital and works towards more formal arrangements with metropolitan area health services rather than individual consultants, for the provision of specialist support. It is proposed that this occur over time and without disruption to existing arrangements where these are working well.
13. each region establish a multi-disciplinary care team to support dialysis and CKD clients from across the region in coordination with other providers. Such a team may include:
    - Renal GP and/or Renal Nurse Practitioner
    - Visiting renal physician
    - Renal educator
    - Social worker
    - Dietician, pharmacist
    - Aboriginal health worker
14. WACHS establish a nursing and medical renal clinical network to link and support the dialysis workforce across WACHS.

Transport and Accommodation

15. WACHS, in consultation with local Aboriginal organisations, works with the Department of Housing and Works to ensure that housing needs for dialysis clients from remote locations are addressed.
16. Supported dialysis services include provision for client transport where a need is indicated.

17. Note the potential impact of expanding dialysis on the RFDS and ambulance services.

Information systems

18. WACHS work with the WA Renal Reference Group and HIN to meet the need for a coordinated, secure information system to monitor and manage CKD and ESKD across the continuum of care and across providers.

IMPLEMENTATION

Implementation of the WACHS dialysis plan will require significant resources. An estimate for the capital requirements has been provided for the ten year State Health Infrastructure Plan.

It is proposed that the implementation plan address the immediate and medium term needs for expanded dialysis services in WACHS. Implementation will require more detailed consultation at the local level with the range of service providers involved in caring for dialysis clients, and with the clients themselves.

The long term need should be monitored annually and reviewed again in 2-3 years to assess whether:

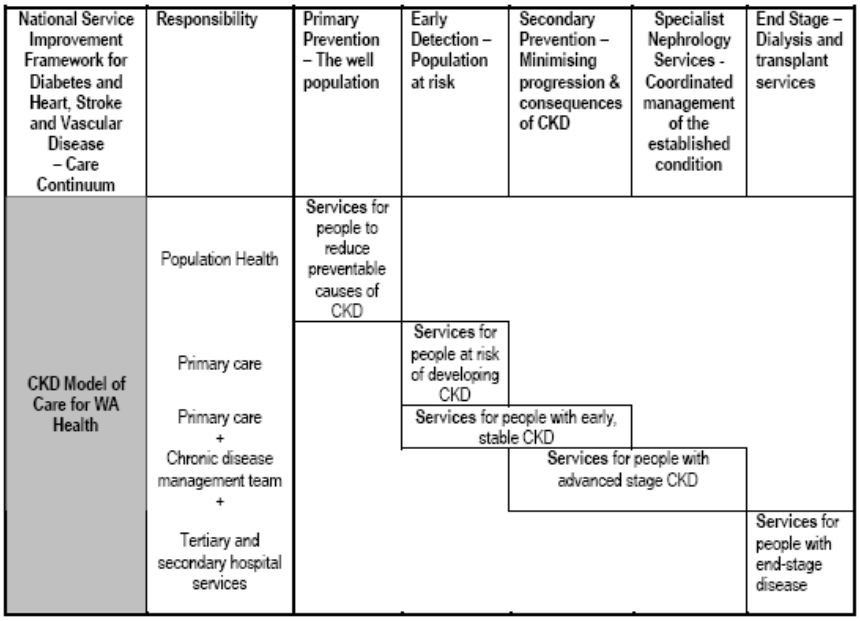
- the projections require adjustment
- the new models of dialysis introduced in priority locations are robust
- any new models of service have been developed.

It is anticipated that the current study into renal services in Central Australia will provide a detailed analysis of viable and sustainable models for renal services in remote areas. The findings of this study will assist WACHS to further develop renal service models for clients from remote locations.

2. RENAL MODEL OF CARE[1]

The WA Health Chronic Kidney Disease Model of Care developed by the WA Renal Disease Health Network was endorsed in December 2007. This Model of Care includes strategies and recommendations across the spectrum of primary prevention, early detection, specialist nephrology services and dialysis and transplantation services. The continuum of care for renal disease is shown in Figure 1 below.

Figure 1: Continuum of Care for Renal Disease



WACHS will implement strategies relating to the primary prevention and early detection of chronic kidney disease as part of an overall chronic disease management strategy.

The following information on kidney diseases, dialysis modalities and client care pathways has been taken from the WA Health Chronic Kidney Disease Model of Care and the WA Plan for Renal Dialysis.

Kidney Diseases

Kidney failure can be either acute or chronic. Acute Kidney Injury (AKI) occurs suddenly and is often reversible. Chronic Kidney Disease (CKD) is irreversible. There are five stages of CKD, which are defined by the estimated renal function of glomerular filtration rate (GFR). End Stage Kidney Disease (ESKD), or stage 5CKD, is defined as an irreversible condition with >85% deterioration of renal function. Clients with ESKD in Australia usually commence dialysis when GFR is around 7% of normal, or earlier if symptoms require.

Depending on the progression of their disease, clients with an eGFR between 0-15 may require some form of renal replacement therapy within the next 12 months.

There are various causes of ESKD, with glomerulonephritis, diabetic nephropathy, and hypertension, accounting for 80% of all cases. CKD resulting from diabetes or hypertension is potentially preventable and future efforts should focus on strategies to prevent or postpone ESKD due to diabetes and hypertension.

[1] This section is taken from the Renal Diseases Health Network, Chronic Kidney Disease Model of Care, Health Networks Branch, WA Health 2007.

The only treatments currently available for ESKD are renal dialysis or kidney transplantation. Kidney transplantation is considered the optimal therapy for client outcomes, but only 25% of ESKD clients are eligible. The majority of clients with ESKD will require dialysis.

Renal dialysis is the process of diffusing blood across a semi-permeable membrane to remove substances that a normal kidney would eliminate and to maintain the body's chemical and fluid balance. There are several different methods or 'modalities' of dialysis and means of delivering these therapies.

Dialysis Modalities

The choice of dialysis modality is made after consultation between the clinician and the client and depends on many factors including availability of resources, place of residence, age, family support, overall health and lifestyle.

There are two renal dialysis treatment modalities: haemodialysis and peritoneal dialysis. These therapies can be delivered by different methods and locations, ranging from high dependency teaching hospital care to independent home self-care. The treatment modalities are:

- In-centre (Hospital) Haemodialysis (HD)
- Satellite Haemodialysis (SHD)
- Home Haemodialysis (HHD)
- Home Peritoneal Dialysis (PD) either Continuous Ambulatory Peritoneal Dialysis (CAPD) or Automated Peritoneal Dialysis (APD).

Haemodialysis requires a dialysis machine to circulate blood from the client's body through an artificial kidney or dialyser for purification and then return it to the client. Generally HD is performed three times a week for 4-5 hours, although in some cases it can be performed daily or overnight for extended hours to improve efficiency.

In-Centre (Hospital) Haemodialysis

In-centre haemodialysis refers to haemodialysis (HD) delivered in a tertiary hospital setting in the metropolitan area. There are two levels of service delivery:

1. In-centre high dependency HD units are for clients that are acutely ill and require high-level specialised care.

2. In-centre intermediate care or step-down HD units are for chronic medically unstable HD clients and HD clients with temporary increased levels of dependence due to illness. These units are also used for new ESKD clients commencing therapy prior to transfer to satellite units. It requires an intermediate level of HD nurses, technicians and proximity to hospital facilities.

Satellite Haemodialysis

Satellite haemodialysis (SHD) can be provided in a non-teaching hospital or a community setting and is supported by a teaching hospital to ensure appropriate and continuous management of clients. This treatment is utilised for medically stable, self-care or relatively independent ESKD clients on haemodialysis.

Home Haemodialysis

Home haemodialysis (HHD) is preferred for independent medically stable and motivated clients with adequate social support and suitable accommodation (ie power, water, sewage and security). Some support is required from HD trained nurses and technicians.

Home Peritoneal Dialysis

Peritoneal dialysis uses the body's own natural lining of the abdominal cavity, the peritoneal membrane, as a filter. It involves filling the peritoneal cavity with dialysis solution through a catheter. Waste and extra fluid are exchanged across the membrane and then transferred to the dialysis solution. After a predetermined period, the solution is drained out of the body and replaced with a fresh solution. Each repetition of this cycle is called an exchange.

Forms of peritoneal dialysis include CAPD and APD. CAPD is usually performed four times a day taking about 30 minutes to complete each exchange. APD involves the use of an automated cycler to perform fluid exchanges. The client is attached to the machine at night before going to sleep, and while they sleep the machine performs 6-8 exchanges. During the day, dialysis solution can be left in the peritoneal cavity to optimise dialysis.

Client Care Pathway

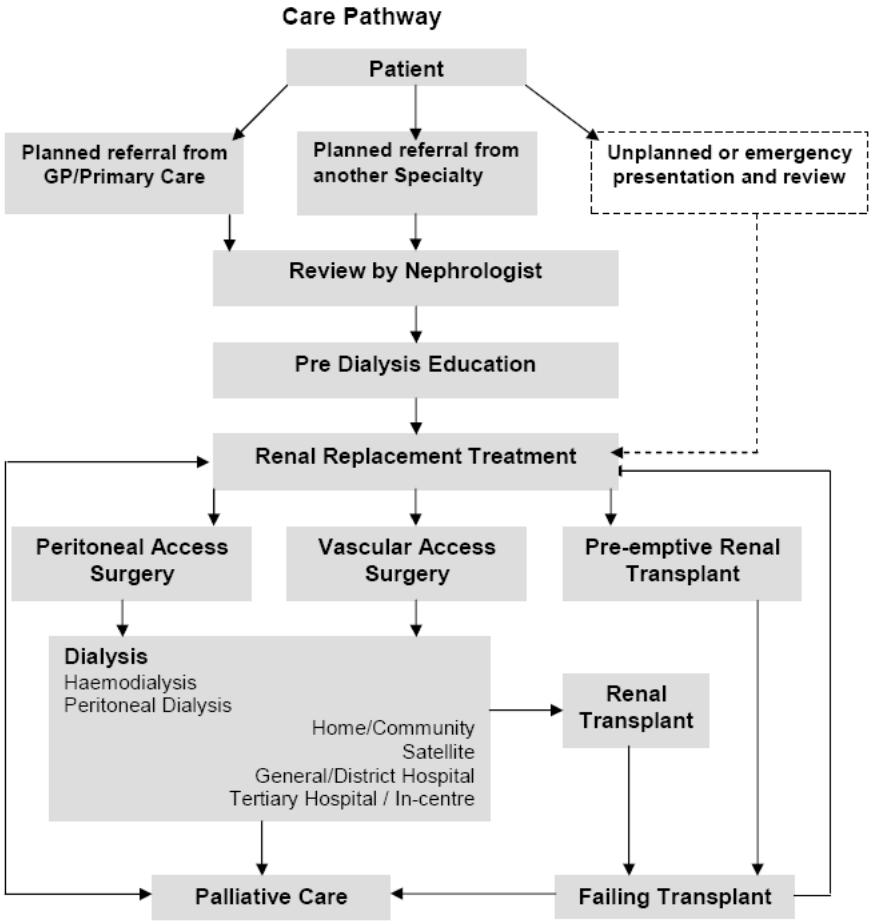
The care pathway highlights some critical elements in ensuring the most effective outcomes for renal disease patients. These include:

- Early detection and referral to specialist care to potentially delay the commencement of dialysis and reduce the number of unplanned and emergency presentations
- Patient education and informed decision making regarding treatment options
- Availability of timely peritoneal or vascular access surgery
- Access to specialty staff with relevant expertise
- Options to commence dialysis care closer to home, and
- Adequate service provision.

Currently, patients diagnosed with ESKD begin dialysis treatment at in-centre units. Once the patient is stabilised and identified as capable of more independent care, they may be transferred to a satellite service closer to home. If the patient demonstrates increased independence, they may be trained to dialyse themselves at home using either HD or PD.

However, if the patient develops a co-morbidity, which affects their ability to self-care, they could return to either an in-centre or satellite location. Anecdotal information suggests that some patients may move across the modality pathway between three to six times in any given year.

The care pathway for a patient with kidney disease is shown below:



3. PLANNING CONTEXT

The WA Plan for Renal Dialysis Services 2008-2013

The WA Plan for Renal Dialysis (2008 - 2013) developed by the Renal Disease Health Network provides a response to the projected increase in prevalence and incidence of renal disease, and the resulting demand for renal dialysis services across WA. Whilst this Plan makes a number of recommendations in relation to country services and provides statistical data on the incidence, prevalence and distribution of dialysis services across WA, it does not identify projected dialysis numbers by WACHS region.

The WA Plan for Renal Dialysis Services 2008-2013 makes a number of recommendations in relation to country dialysis services. These are:

- Recommendation 6: that the expansion of home based renal dialysis services and novel community based dialysis facilities in rural and remote regions are integrated with regional satellite services to benefit Aboriginal and remote clients.

- Recommendation 7: that resources for remote and rural regions be supported by a formal funded arrangement between metropolitan AHS and WACHS in line with other clinical services and according to needs.

- Recommendation 8: that the SMAHS take responsibility for the Kimberley and southern regions and that NMAHS support the Goldfields, Pilbara and the Midwest to equalise services. Immediate planning and recruitment at an area level for additional medical and nursing workforce to be undertaken in line with the redistribution of their clinical responsibility for rural dialysis services.

- Recommendation 10: that WA develop partnerships with the Northern Territory to collaboratively support the East Kimberley and Central Desert communities.

- Recommendation 11: that expansion of services in Derby be considered as immediate priority for development.

Recommendation 11 has been completed. Other recommendations are considered throughout this dialysis plan.

Revitalising Country Health Services 2009-2012

Revitalising country health services includes two strategic directions relevant to dialysis services:

- Service delivery according to need: work with communities so that health and hospital services match health needs
- Closing the gap to improve Aboriginal health: improve services to Aboriginal communities (and boost Aboriginal employment opportunities).

These strategic directions support the aims of providing dialysis services that are culturally safe and as close to home as possible.

The impacts of relocation on Aboriginal people and the health system are well documented. The need to relocate to access renal treatment fractures families and communities, takes clients away from their support networks, and sometimes also removes Elders from communities. Health services often are faced with the need to address the housing, income and family issues for the client many of whom speak English as a second language and are frightened and lonely away from their community.

Renal clients themselves suffer reduced disposable income, decreased quality of life and decreased life expectancy. As a consequence clients may delay seeking treatment, choose not to start treatment or regularly miss treatments.

The Kimberley renal plan has addressed the need to increase care closer to home by maintaining high numbers of clients on home dialysis, and establishing new satellite outreach services in Derby and Kununurra. The SW region has established a satellite outreach service in Busselton.

Quality standards

The key standards relevant to rural and remote dialysis are:

- WA CKD Model of Care
- National Service Standards for the Management of Dialysis and Kidney Transplantation in Remote Australia
- WA Licensing standards

CKD Model of Care

The WA CKD Model of Care describes the elements of best practice that should be provided in a dialysis service. These include audit against standards set by the Australian and New Zealand Society of Nephrology (ANZSN) and by the Caring for Australasian with Renal Impairment (CARI).

National Service Standards for the Management of Dialysis and Kidney Transplantation in Remote Australia

The national service guidelines for the management of dialysis and kidney transplantation in remote Australia were endorsed by AHMC in July 2006. Central to these guidelines is that regional satellite units provide a service across the continuum of care:

- *Dialysis facilities in rural and remote locations embrace the activities and functions necessary for the provision of high quality dialysis treatments including the support and monitoring of clients undertaking home-based therapies.*
- *Regional dialysis units are established in areas where the need for local people to relocate to the urban areas for treatment is significant. Regional dialysis units are aware of and strive to develop the activities and infrastructure necessary to offer a more comprehensive service to the local community that moves beyond maintenance dialysis. Services will include renal replacement therapy education and training and support for the primary care area in chronic kidney disease management.*

These standards are difficult to implement in WA as the current WA Health contractual arrangements for WAHDiP provide training, monitoring and support to home dialysis clients centrally from Perth, rather than from regional satellites. The Kimberley is the only region where the client numbers are sufficient for the WAHDiP provider to employ a full-time PD dialysis nurse attached to the Kimberley Renal Support Service.

Licensing standards

Facilities that provide peritoneal dialysis and haemodialysis for the treatment of ESKD that are not attached to hospital premises, are required to be licensed as a Day Hospital – C Class under the WA Hospitals and Health Services Act 1927.

The licensing standards require compliance with minimum criteria for governance, staffing, information management, facility function and use, equipment and infrastructure, medications, infection control, sterile supply, food safety, laundry, fire and security and facility maintenance.

Whilst it is clear that these standards apply to facilities whose primary function is the provision of dialysis, the extension of these guidelines to other community facilities that may accommodate one or more dialysis chairs is not so clear. In 2009 clarification was provided that the Day Hospital C Class licensing requirements do not apply to community facilities that are being used for home dialysis as part of the WA Statewide Home Dialysis Program (WAHDiP).

Further clarification is required in regard to licensing implications for any new models such as Community Supported Haemodialysis (CSHD) model and community supported peritoneal dialysis model (CSPD) which are described later in this document.

4. NEEDS ASSESSMENT

Introduction

This section of the WACHS Renal Dialysis Plan describes:

- the current capacity and level of service of existing regional dialysis services
- the current number of dialysis clients for each WA Country Health Service (WACHS) region (January 2010) by
- the treatment modality
- the most common causes of renal disease
- the estimated projected numbers requiring dialysis over the next ten years based on historical data trends and population projections.

Current WACHS Services

WA Health Clinical Services Framework 2010-2020

The WA Health Clinical Services Framework identifies the current and indicative future levels of service to be provided in WACHS hospitals for renal medicine and renal dialysis.

The current level and type of renal dialysis service in each WACHS region is shown in table 3 below. Clinical capability 1 refers to self care, level 2 indicates community supported self care, level 3 indicates a satellite with predominately self care clients, level 4 indicates a hospital satellite with some more complicated cases, and level 5 indicates more complex cases and presence of a resident specialist. The full definitions for the different levels is included in appendix 10.

Table 3: WACHS renal services regional snapshot

Region	Location	Access surgery	SDU	Satellite outreach	HHD in community setting	Clinical capability level
Kimberley	Broome	√	√			4
	Derby			√		3
	Kununurra				√	3
	Fitzroy Crossing				√	1
	Kalumburu				√	1
Pilbara	Port Hedland		√			4
	Roebourne				√	1
Goldfields	Kalgoorlie	√	√			4/5
Midwest	Geraldton	√	√			4
	Meekatharra				√	1
South West	Bunbury		√			4
	Busselton			√		3
Great Southern	Albany		√			4
	Katanning				√	1
Wheatbelt	Boddington				√	1

The WA Clinical Services Framework suggests that WACHS regional hospitals continue to provide a level 4 renal medicine and renal dialysis service over the next 10 years, with the exception of Broome that will move to a level 5 service. It is also proposed that Derby and Kununurra will have a level 3 service, and level 2 services will be available from Esperance, Newman, Nickol Bay, Katanning, Carnarvon, Busselton, Margaret River, Collie and Manjimup. A level 4 service is proposed for Narrogin.

This framework is indicative only, and does not pre-determine the future service configuration.

Note: In line with current service model, the Kimberley dialysis services are provided from an Aboriginal Medical Service rather than a WACHS hospital.

Satellite Dialysis

There are currently seven satellite dialysis units operating in country WA. The four units situated at Albany, Kalgoorlie, Geraldton and Port Hedland are managed by WACHS.

St John of God Health Care provides a contracted service to the South West for the Bunbury satellite unit and the outreach service in Busselton. The Kimberley Satellite Dialysis Unit in Broome and outreach at Derby are managed by the Kimberley Aboriginal Medical Services Council. Outreach dialysis services in Derby (10 chairs) and Kununurra (4 chairs) are under construction.

Table 4: Overview of country satellite dialysis provision by region January 2010

Region	Service	Provider	Number dialysis chairs	Number shifts/day x days	Current Number clients	Maximum Capacity**
Kimberley	Broome	KAMSC	10	2x6	40	40
	Derby	KAMSC/DAHS	2	2x3	4	8
Pilbara	Port Hedland	WACHS	7+1*	2x3 1x3	24	32
Midwest	Geraldton	WACHS	9	1x5 2x2	26	36
Goldfields	Kalgoorlie	WACHS	7+1*	2x6	29	28
South West	Bunbury	SJOG	6+1*	2x6	27	28
	Busselton	SJOG	6	1x6	11	24
Great Southern	Albany	WACHS	6	1x6	11	24

Source: Regional satellite centres, January 2010
*Chair in an isolation room for sick clients
** capacity is based on a ratio of 4 clients per chair (centre operating12 dialysis sessions per week)

Home Haemodialysis and Peritoneal Dialysis

There is a statewide contract for the provision of home dialysis across WA. The WA Home Dialysis Program (WAHDiP) contract was awarded to Fresenius Medical Care Australia in 2007. Clients are referred to WAHDiP by their nephrologist. Fresenius provides training to the client and their carer, sets up dialysis in the client's home or community setting, supplies consumables and technical support and provides a telephone support service for ongoing support.

Where the home environment is not suitable (eg no reliable treated water supply), home haemodialysis is sometimes provided in a community setting. Machines are currently located in Boddington, Katanning, Meekatharra, Fitzroy Crossing Kununurra, Roebourne and Kalumburu. These machines are located in either the hospital or Aboriginal Medical Service (AMS).

As of January 2010, there were over 80 country clients undergoing home dialysis. These include approximately 70 on PD and 15 on HHD. (See table 6 below).

Metropolitan Dialysis Services for Country Clients

Some country clients require haemodialysis treatment in the Perth metropolitan area either in an in-centre or satellite unit. In some cases the level of acuity and dependency of these clients does not allow them to be treated in a country SDU with limited medical supervision, in other cases treatment in the metropolitan area is their only option due to capacity issues in their region of origin. Table 4 below indicates the current number of country clients receiving dialysis in the metropolitan area.

Table 5: Country HD Clients Treated in Perth by Region of Origin (January 2010)

Origin of clients	No of clients requiring tertiary level care	No of clients waiting for a place at the regional service	Total number of clients in Perth
Kimberley	6*	22	28
Pilbara	0	5	5
Midwest	1	1	2
Goldfields	1	9	10
Southwest	0	0	0
Great Southern	2	0	2
Wheatbelt**			n/k

* 6 are non-compliant with their treatment.
** numbers of Wheatbelt clients who have relocated to Perth for treatment are not known

Dialysis Demand

Current dialysis clients

The following table provides a snapshot picture of the total numbers of clients receiving dialysis by region as at January 2010.

Table 6: Current dialysis clients by region of origin and modality January 2010

Region	Regional satellite dialysis	Home dialysis (PD & HHD)	Satellite outreach	In Perth	Total
Kimberley	38	26	4	28	96
Pilbara	24	10	0	5	39
Midwest	26	13	0	2	41
Goldfields	29	6	0	10	45
South West	27	10	11	0	48
Great Southern	11	5	0	2	18
Wheatbelt	n/a	14	0	n/k	14+
Total	155	84	15	47	301+

The following table provides an indication of the current shortfall and projected numbers of clients expected to require dialysis within the next 12 months for each WACHS region. It is based on the information provided by the nephrologists, Directors of Nursing or clinical nurses at the SDUs. As the majority of CKD remains undiagnosed in the early stages, and many ESKD clients die from other conditions before needing dialysis, it is difficult to make projections on the need for dialysis based on current ESKD client numbers.

Table 7: Current and Projected Satellite and SCHD Dialysis Client Numbers by Region

Region	Current physical capacity	Current occupancy	Current waiting list for regional satellite	ESKD Stage 5 (pre-dialysis)
Kimberley	48	42	22	13
Pilbara	32	24	5	16
Midwest	36	26	1	5
Goldfields	28	29	9	11
South West	52	38	0	?
Great Southern	24	12	0	4
Wheatbelt	n/a	n/a	n/a	n/k

Renal replacement therapy analysis

Nationally in 2008 22% of dialysis clients were using peritoneal dialysis, 23 % hospital based haemodialysis, 45% satellite haemodialysis and 10% home haemodialysis.

Analysis of the type of renal replacement therapy by area health service over the last four years indicates that WACHS has a slightly higher percentage of clients on home dialysis than metropolitan area health services.

Table 8: WA Country Health Service

Year	Home PD	Home HD	Hospital or Satellite
2005	**27.34%**	**3.13%**	**69.53%**
2006	**25.44%**	**3.89%**	**70.67%**
2007	**24.92%**	**3.99%**	**71.10%**
2008	**24.59%**	**2.95%**	**72.46%**

Table 9: Combined North and South Metro Area Health Services

Year	Home PD	Home HD	Hospital or Satellite
2005	18.41%	2.03%	79.56%
2006	19.76%	2.03%	78.21%
2007	21.97%	1.91%	76.11%
2008	21.99%	2.67%	75.33%

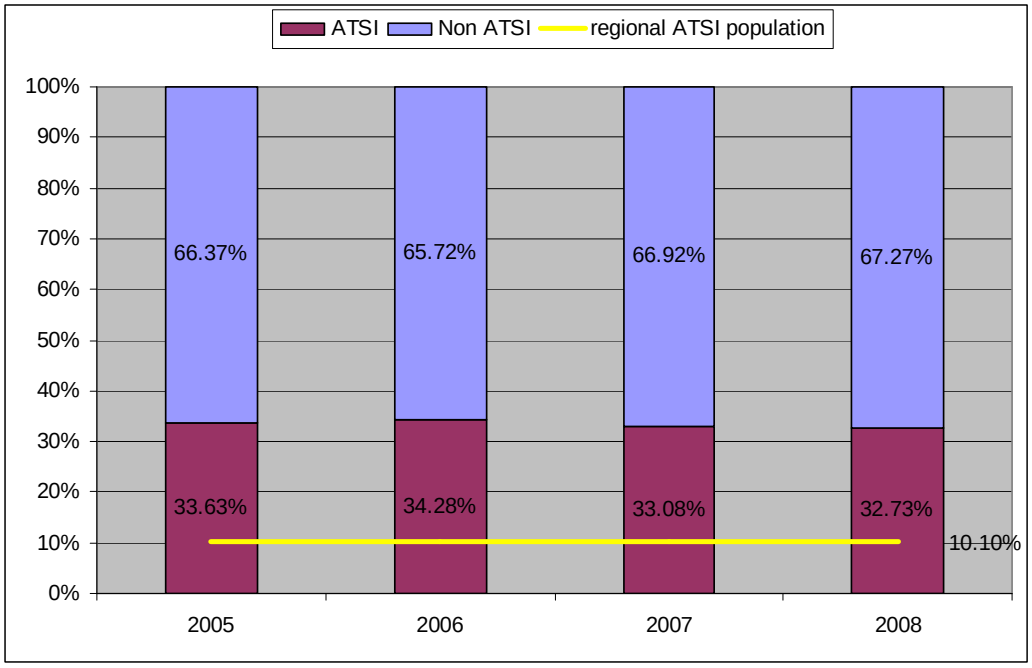
Note: Source ANZDATA 2009.

- Hospital or Satellite refers to Satellite HD or Hospital HD clients.
- Home PD refers to clients that were classed at Home CAPD, Home APD, Hospital CAPD or Hospital APD.

Client Profile Analysis

As demonstrated by the chart below the proportion of WACHS dialysis clients who are Aboriginal are far higher than their population percentage. This is consistent across all years analysed. A regional breakdown is included in the appendices.

Figure 2: Dialysis by Aboriginality in WACHS



Primary Renal Diagnosis[2]

The most common causes of renal disease in Australia in 2005-2008 were as follows:

Diabetic nephropathy*	34%
Glomerulonephritis	22%
Hypertension	15%
Polycystic kidney disease	6%
Reflux nephropathy	3%
Analgesic nephropathy	2%

*91% of diabetic nephropathy clients have type II diabetes (non-insulin and insulin requiring).

Diabetes is leading primary renal disease in WACHS, Goldfields, Kimberley, Pilbara and the Midwest health regions. In all other regions and the state as a whole it is Glomerulonephritis. Regional breakdowns are included in the figures and table below and the appendices.

[2] S. McDonald, L. Excell, H. Dent, ANZDATA Registry 2009 Report, Chapter 2, New Clients Commencing Treatment in 2008.

Figure 3: Primary Renal Diagnosis WA 2005-2008

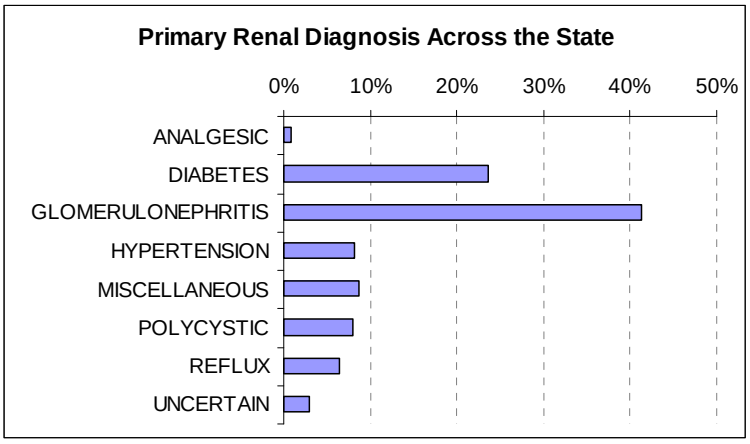


Figure 4: Primary Renal Diagnosis WACHS 2005-2008

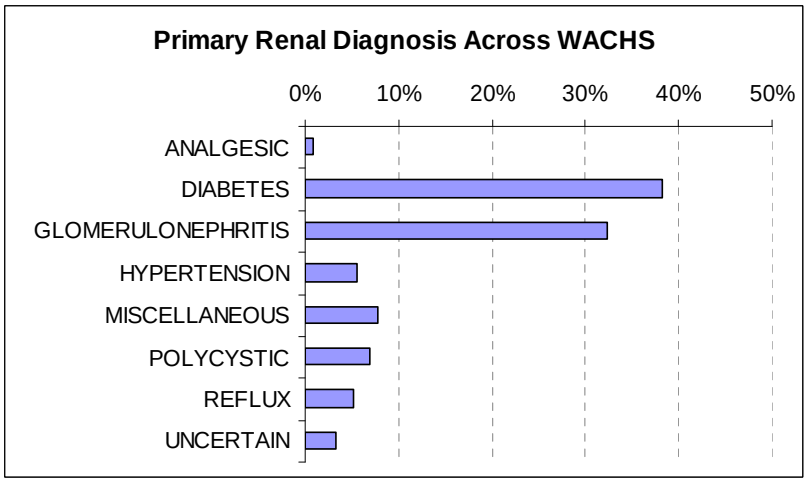


Table 10: Primary Renal Diagnosis by Health Region 2005-2008

	Analgesic	Diabetes	Glomerulo-nephritis	Hypertension	Miscellaneous	Polycystic	Reflux	Uncertain	Total
Goldfields	0	91	71	14	19	7	11	4	
Great Southern	0	8	41	15	18	27	4	8	121
Kimberley	0	221	116	4	11	0	16	16	384
Midwest	4	86	70	15	14	44	7	7	247
North Metro	23	462	1138	214	224	243	152	70	2526
Pilbara	0	121	74	5	4	11	5	4	224
South Metro	23	414	965	222	202	153	171	63	2213
South West	2	61	118	29	31	12	19	4	276
Wheatbelt	8	40	42	8	30	12	23	11	174
WACHS	14	628	532	90	127	113	85	54	1643
Total	60	1504	2635	526	553	509	408	187	6382

Kidney Transplants[3]

The numbers of people with a functioning transplant by WACHS region and the percentage of those who are Aboriginal are as follows:

Table 11: Kidney Transplant Prevalence by Region

	2005	2006	2007	2008	%ATSI
Goldfields	14	17	14	15	8.3%
Great Southern	9	10	13	17	4.1%
Kimberley	6	7	7	11	45.2%
Midwest	24	23	24	26	8.2%
Pilbara	13	16	18	21	36.8%
South West	26	29	31	33	3.4%
Wheatbelt	18	18	19	19	0.0%
Total	110	120	126	142	11.6%

The percentage of Aboriginal people who have a functioning transplant is lower than the percentage of people on dialysis in WACHS who are Aboriginal (60+%). There are a number of reasons for this: It is more difficult to find a good match of donor kidney for Aboriginal people; delayed diagnosis can reduce treatment options; and Aboriginal people tend to have greater co-morbidities meaning that they may be less suitable for a transplant. The transplant success rate is lower for similar reasons.

Population projections

The overall population in WACHS regions is predicted to increase from 2006 levels by over 110,000 people or 24% by 2021.

Table 12: Population Projections by Region

	2006	2011	2016	2021	% 2006-2021
Goldfields	55,333	60,430	62,459	64,510	16.6%
Great Southern	55,769	58,907	61,830	64,310	15.3%
Kimberley	31,928	46,079	52,714	59,199	85.4%
MidWest	61,364	66,375	68,629	70,628	15.1%
Pilbara	44,089	45,558	47,790	49,231	11.7%
South West	142,999	157,960	170,593	181,286	26.8%
Wheatbelt	73,590	78,016	83,059	87,944	19.5%
Total	467,078	515,336	549,090	579,129	24.0%

Source: WA Department of Health Epidemiology Branch via Rates Calculator based on ABS series C

[3] Data obtained from S. McDonald, L. Excell, H. Dent, ANZDATA Registry 2009 Report, Chapter 8, Transplantation.

The aged 65+ population in the country regions of WA is expected to grow to over 2.5 times its current size by 2031 – making it the fastest growing age group. Chronic kidney disease prevalence increases with age.

The table below is derived by the Department of Health's Epidemiology Branch and shows the current and projected distribution of the Aboriginal population of Western Australia. The largest Aboriginal community is in the Kimberley, accounting for 46% of the population followed by the Pilbara at over 16% and the Goldfields where over 10% of the population is Aboriginal. Compared to the Perth metropolitan area, WACHS has a much larger Aboriginal population at 9.3% compared with 1.6%.

Table 13: Aboriginal Population Projections

Health Region	2008	2011	2016	2021
Goldfields	5,920	6,400	6,734	7,068
Great Southern	2,129	2,190	2,277	2,348
Kimberley	15,632	22,209	25,998	29,849
Mid West	7,327	8,391	8,731	8,975
Pilbara	7,611	7,992	8,606	9,135
South West	3,173	3,331	3,542	3,700
Wheatbelt	3,658	3,880	4,102	4,349
Metro WA	27,585	29,011	31,533	34,079
Total	73,035	87,160	95,758	109,373

Note: 2006 Aboriginal population from ABS census, projections based on 2008 proportions applied to total population estimates derived by the WA Department of Health Epidemiology Branch.

There are approximately 330 remote Aboriginal communities in WA. 17% of WA's Aboriginal people reside in the bottom 10% of ranked socio-economic areas.

Dialysis activity data and projections

There are combinations of factors including changes in the underlying disease incidence, changes in rates of chronic disease progression due to treatment changes, changes in survival from competing mortality risks, all of which have been shown to contribute to the change in rates of treated end stage kidney disease in Australia[4].

Previous planning demonstrates the difficulty in predicting future dialysis numbers. The dialysis numbers for WACHS are statistically small, making projections difficult and having a large confidence interval (CI). The confidence interval provides a range within which it is expected (with 95% confidence) that the actual value will lie.

Service reviews

Previous reviews of renal disease in WACHS include:

- The Review of Renal Disease in the Kimberley (2004)
- The Review of Renal Disease in the Pilbara (2005)
- The Review of Renal Disease in the Midwest (2005)
- The Review of Renal Disease in the Goldfields (2005)

These reviews indicated that dialysis prevalence in each of these areas will increase over the next decade to 2014 by 89% in the Kimberley (to 134 clients), by 39% in the Pilbara (to 62 clients), 47% in the Midwest (to 45 clients) and 41% in the Goldfields (to 95 clients).

[4] Stewart J, McCredie MR, Williams SM, McDonald Sp 2004, Interpreting Incidence Trends for treated End-stage Renal Disease: Implications for Evaluating Disease Control in Australia, nephrology Vol 9, no 238-246.

Based on the 2010 client numbers, these estimates appear to be reasonably accurate for the Kimberley and Midwest regions, but high for the Pilbara and Goldfields.

The WA Plan for Renal Dialysis Services 2008-2013 projected that the number of dialysis clients in country WA would be 264 in 2010 (CI 224-293) and 287 by 2013 (CI 250-325). The actual numbers in 2010 (approx 300) have exceeded the prediction and are consistent with the upper end of the confidence interval.

The following information and data on WA dialysis prevalence and ESKD incidence is provided by the ANZDATA Registry either in the 2009 Report or by a special data extract in February 2010.

End stage kidney disease incidence

The ANZDATA Registry reported that 2476 new clients commenced treatment for end-stage renal disease in Australia in 2008, a rate of 116 per million population (pmp) per year. Western Australia with 261 new clients had the second highest rate in incidence in Australia with 121 pmp after 405 pmp in the Northern Territory.

Aboriginal and Torres Straight Islander incidence rates

The incidence rate for the ATSI population in WA for 2007 was 630 pmp[5] compared to 261 pmp for the whole WA population. End stage kidney disease typically occurs 10 to 15 years earlier in Aboriginal and Torres Strait Islander peoples compared to non-Aboriginal peoples. Clients from remote areas are more likely to experience an accelerated development of chronic kidney disease. Kidney Health Australia suggests that there are groups who are at high risk of developing chronic kidney disease and of disease progression. These include people aged 50 years and over, people with diabetes or hypertension, smokers, people with a family history of kidney disease and Aboriginal and Torres Strait Islander peoples.[6]

Late referrals

Late referrals (less than three months before treatment) accounted for 24% of all new WA clients in 2008[7]. 'Late referral', as defined by the ANZDATA Registry, occurs when a client is referred for nephrology less than three months before beginning their first renal replacement therapy treatment. Late referrals can have a significant impact on the choice of dialysis modality, timeliness of access surgery and therapy commencement.

Dialysis prevalence

Between 2004 and 2008, the number of dialysis dependent people in WA has increased by 17.8% from 830 (419pmp) to 978 (452 pmp). Nationally the increase has been 25.6% from a prevalence rate of 398 pmp in 2004 to 471 pmp in 2008[8].

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[5] Jose M, Livingston B, McDonald S, Gorham G, ANZDATA Registry Report 2008, Chapter 12 End-Stage Kidney Disease Among Aboriginal Peoples of Australia and New Zealand, p12-5.

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[6] Queensland Government (2007) Queensland Statewide Renal Health Services Plan, 2008-2017, Part Two: Current Service Analysis and Future Demand Predictions, p93. Queensland Government, Brisbane.

[7] McDonald s, Excell L, Dent H, ANZDATA Registry 2009 Report, Chapter 2, New Clients Commencing Treatment in 2008.

[8] S. McDonald, L. Excell, H. Dent, ANZDATA Registry 2009 Report, Chapter 4-2, Method and Location of Dialysis

Table 14: Dialysis Prevalence in Western Australia in 2008 excluding transplants.

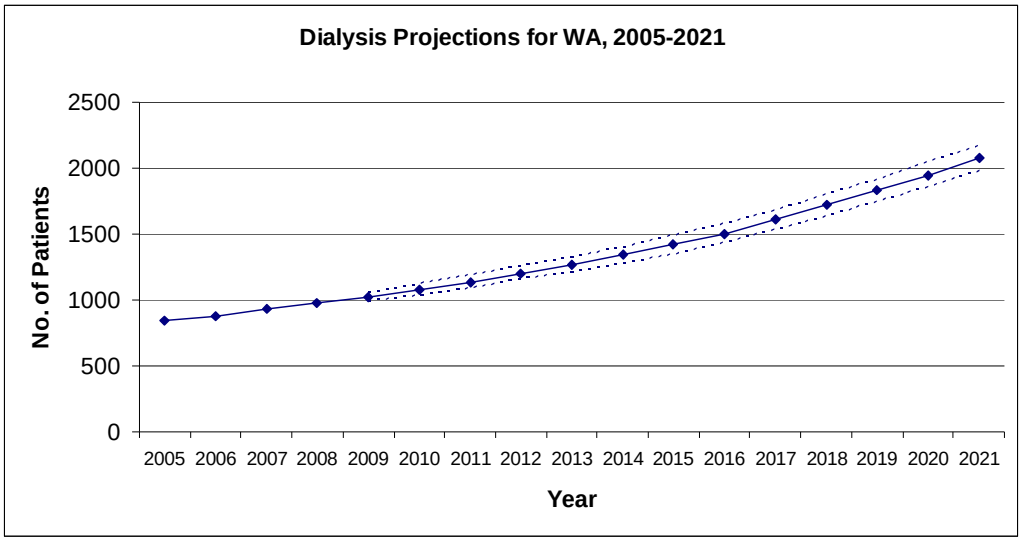
Division	Number	Age Standardised Rate
North metropolitan AHS	355	37.7
South metropolitan AHS	318	40.4
WACHS:	305	62.7+
Kimberley	99	272.2+
Goldfields	39	69.7+
Pilbara	32	68.8+
South West	51	34.1
Midwest	39	61.5+
Great Southern	20	35.9
Wheatbelt	25	33.3
Western Australia	**978**	**45.0**

(Source: ANZDATA Registry February 2010)
Age standardised rate per 100,000 person years.
+ Denotes a region or area where the age standardised rate is higher than the rate of WA for 2008.

The prevalence of dialysis across WA over the next ten years is projected to grow by an annual average of 3%. Across WACHS, an annual average increase of 4.6% is predicted. The detailed prevalence and incidence rates by region are provided in the appendices.

WA PROJECTIONS

Figure 5: Dialysis projections for WA excluding transplants by place of initial treatment.



WACHS PROJECTIONS

Figure 6: Dialysis projections for WACHS excluding transplants by place of initial treatment.

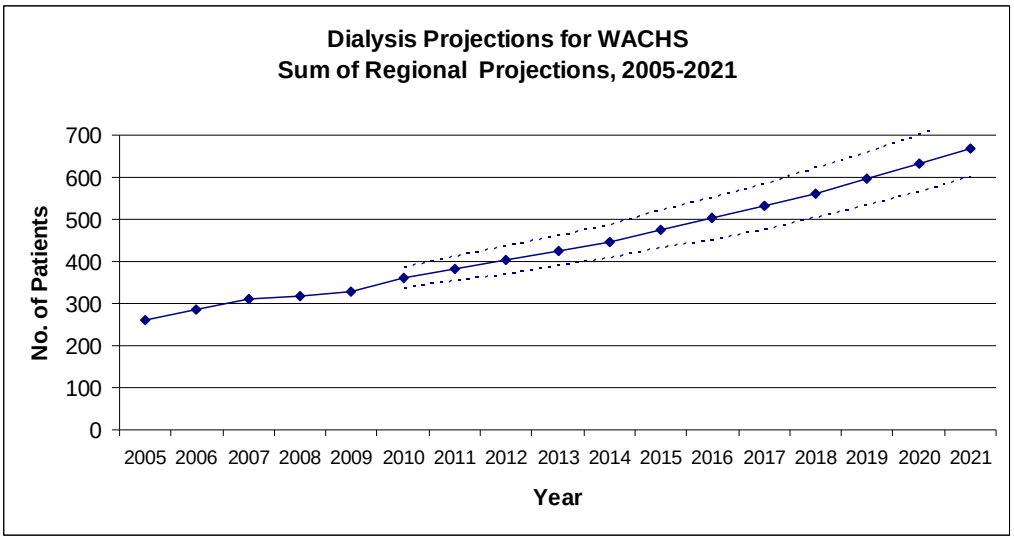


Table 14 below shows the approximate distribution of the projected WACHS dialysis population by region.

Table 15: Distribution of dialysis clients by region

Region	2010 Clients	2021 Projections (LCI-UCI)
Kimberley	96	199 (198-201)
Pilbara	41*	59 (45-73)
Midwest	38	48 (40-57)
Goldfields	49	71 (62-80)
South West	48	184 (165-203)
Great Southern	18	51 (42-60)
Wheatbelt**	34	57 (47-68)
TOTAL	**324**	**669 (599-742)**

*46 was used in the projection due to unusually large number of transplants in 2008
** Wheatbelt dialysis clients are estimated based on the metropolitan prevalence rates.
LCI-UCI - the lower and upper confidence interval.

5. OPTIONS ANALYSIS

Section 5 of the WACHS Dialysis Plan is an analysis of the options. This section has been divided into the following parts:

- Service Models
- Workforce
- Plans for Additional Dialysis Capacity.

The options proposed meet the principles of:

- Maximising independence
- Cost effectiveness
- Care closer to home.

Service Models

Current options for care closer to home

Current renal replacement therapy options are limited to:

Dependent modalities – those where most or all of the dialysis procedure is performed for the client by a qualified nurse or health worker:

- satellite dialysis

Independent modalities – where the dialysis procedure is performed by the client, or they have a family member that supports the procedure:

- Home HD or PD

Transplant and palliative care

Alternative models

In line with WACHS Revitalising key directions, the draft dialysis plan includes an exploration of models of care that enable clients to return as close to home as possible. A literature review was undertaken to identify alternative models from other jurisdictions or internationally, that are suitable for clients from remote areas. An extensive literature review was undertaken by the Victorian Department of Human Services in the development of the 2004 report, Renal Dialysis, a revised service model for Victoria. This provides a concise comparison of service models across Australia. Models are generally similar and based on informal hub and spoke networks, similar to those in Western Australia.

WACHS is currently participating into Renal Study in Central Australia. This study has been commissioned by the Australian Government, which while focussing on central Australia, is expected to provide recommendations for viable and sustainable renal services for other remote areas of Australia.

There is a community demand for a service option which allows clients who may not have a suitable home or carer to return close to home as evidenced by a number of inquiries to the Minister and reports from nephrologists. The literature review has not identified an option that would meet this need (other than the respite pilots that enable clients to return home for short periods).

Discussion with key stakeholders has identified two possibilities that require further investigation:

1. Providing dialysis in small WACHS hospitals as an outreach from the regional satellite service. This option will be referred to as Satellite Outreach Services.
2. Building on the current home dialysis model to provide a trained worker to support home dialysis clients who are dialysing in a community facility.. This is aimed at overcoming the current requirement for clients to provide a trained carer when

dialysing in a community facility. This option will be referred to as Community Supported Home Haemodialysis

Current and proposed alternative models for dialysis are discussed below.

Dependent dialysis

Satellite dialysis

Satellite dialysis services requires a minimum number of clients, and availability of a skilled workforce in order to be sustainable. Current WACHS satellites have between 6 and 10 chairs with a capacity of between 24 and 40 clients respectively. If clients live too far from the satellite service to travel to and fro, and need to relocate, then accommodation is an issue.

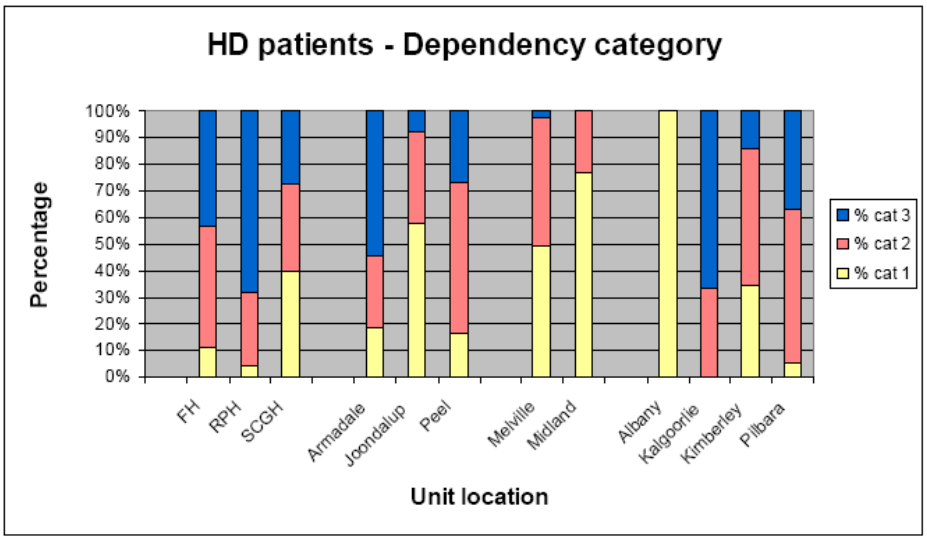
Current and planned satellites are:

- Broome (with an outreach at Derby* and Kununurra not yet established)
- Derby
- Port Hedland*
- Geraldton*
- Kalgoorlie
- Bunbury (with an outreach at Busselton*)
- Albany*

*There is some capacity to expand by adding chairs or staffing additional shifts in these services.

There has been some attempt to define dependency criteria for satellite clients[9]. Based on a series of quantitative criteria developed by SMAHS (see appendix 9) the level of dependency for clients in the in-centre and some satellite units was analysed as shown in the table below. Category 1 denotes independent, self-care clients, category 2 denotes intermediate clients and category 3 indicates highly dependent clients.

Figure 7: HD clients dependency category December 2007



This analysis shows that the Kalgoorlie, Kimberley and Pilbara satellite services are more likely to manage clients requiring a higher level of care, than the free standing metropolitan satellite services.

[9] WA Plan for Renal Dialysis 2009-2013, Renal Diseases Health Network, December 2007.

Satellite services are designed to take medically stable clients. 'Medically stable' is described as *"those clients in whom blood pressure and pulse rate can be maintained within an optimal range during a routine haemodialysis procedure, given the variables involved in fluid and solute removal" (Noble 1996). Most Aboriginal clients have difficulty managing a restricted fluid intake and tend to have large volume increases between dialysis. Where their condition is accompanied by poor cardiac function, their ability to maintain their pulse and blood pressure is severely compromised.* [10]

In reality, many of the dialysis clients at most of the WACHS regional satellite services are chronically unstable and these services are more akin to intermediate care units than satellite units. It is understood that the Office of Chief Nurse and Midwifery is developing an acuity tool to assess client acuity with a view to reviewing the impact on the NHPpD model.

Satellite Outreach Service

Victoria is unique in having a formalised hub and spoke model where teaching hospitals perform a hub function for maintenance dialysis services, and are the fund holders for their satellite hospitals or 'spokes'. Funding arrangements use a combination of DRG case payments, and an annual capitation grant that covers costs not met under the casemix model. Hubs support up to 22 satellite services, with most supporting 3-8 satellites. There are 66 satellite services each with between one and fifteen chairs. Some satellites have become 'nodes' providing a broader range of services than the smaller satellites.

In the WA context, regional satellite services have the potential to become 'nodes' for smaller satellites within the region (similar to the model being developed in the Kimberley). The key issues for this model include identifying appropriate client acuity for smaller satellite services, and ensuring continuity of trained staff.

This option would be similar to the Victorian small satellite option, enabling small number of clients to receive dialysis from WACHS district and some small hospitals under the umbrella of the regional satellite service (node), and supported by the metropolitan hub service. This option would be suitable for stable and relatively low care haemodialysis clients. As dialysis was being provided from an existing state government hospital, licensing would not be an issue. Clinical governance would be provided through the regional satellite service. For this to be a viable option, the following would be required:

- Clear delineation of the client acuity suitable for the service, and acceptance that if client acuity increases, the dialysis cannot be provided locally.
- Staff training and support provided by the regional satellite 'node' service, and the tertiary hub. Telehealth will be an important communication tool for both staff training and support, and potentially to monitor dialysis sessions.
- Appropriately trained staff need to be available continuously as required.

Community supported haemodialysis (CSHD) has up to now, been the name given to the service model in Derby intended for home dialysis type clients who do not have a suitable home and/or reliable carer. The intent was that the client's dialysis machine would be set up in the Aboriginal Medical Service and that Aboriginal Health Workers would be trained to replace the role normally provided by the client's carer.

Currently WA doesn't have the funding, licensing or governance frameworks to support this option. As the clients are assisted by paid staff they do not fit with the criteria for home dialysis and are not funded or supported through this program. Furthermore, the level of client acuity in Derby is reportedly more akin to a satellite client rather than a home dialysis client. In reality, the Derby model is an extension of the Broome satellite service. It is suggested that in future, the Derby model (and future Kununurra model) be referred to as 'satellite outreach services'.

[10] Gorham G, Prevention and Treatment Options for Renal Disease in the Northern Territory, The Cooperative Research Centre for Aboriginal and Tropical Health, Department of Health and Community Services, March 2001.

Reverse respite dialysis

A pilot reverse respite dialysis program has been established in Jigalong in partnership with local industry who have funded the infrastructure and committed $80,000 per annum recurrent costs for 3 years. The pilot is managed by a local steering group involving contracted technical, medical and visiting nursing services with local community support. Clients who have had to relocate to Perth for dialysis are enabled to return home to Jigalong for periods of up to 2 weeks up to four times per annum with the support of renal trained nurses. This enables clients to re-establish and maintain family and community networks. WA Health expressed concern that the model was not sustainable once industry support for the 3 year pilot phase concluded, and has not so far been supportive of this model.

The Northern Territory (NT) has established a pilot "Going Home' program in partnership with the Western Desert Aboriginal community to enable small numbers of dialysis clients to return home to their community for short periods. Clients receive short bursts of PD or HD support and training in an Alice Springs facility, followed by a 2-3 week return home in Kintore where they are clinically assisted with their treatment by two RNs from Alice Springs. The infrastructure costs for this service model are expensive, as a duplicate dialysis facility and staff accommodation are required but only used for a small part of the year.

As a more cost effective alternative, the NT is investigating the option of a mobile service which can travel around communities to offer respite. Provision for staff accommodation is included within the mobile unit. The approximate costs are $240,000 capital, and $77,000 annual recurrent costs (based on 30 days per annum, excluding dialysis consumables). Further exploration of cost effective services models for remote locations, including reverse respite, will occur as part of the Central Australian renal study.

Independent Dialysis

Home dialysis

As noted in the WA Plan for Renal Dialysis Services 2008 – 2013, there are various advantages associated with home dialysis, both from a patient and program management perspective (ie it is a less expensive treatment modality and requires minimal infrastructure development). From a patient perspective some of the advantages are;

Ability to dialyse for longer periods leading to improved clinical outcomes
Freedom and flexibility to fit into family commitments
Saving the time and costs of travel.

Nationally and internationally there is a move to try to increase the numbers of self caring/home dialysis clients in order to meet the escalating demand for dialysis care.

Queensland has set a target of 50% clients to be on home dialysis (40% for clients from rural areas). The WA dialysis plan sets a target to increase the number of patients on home dialysis (HD and PD combined) from 23% to 33% (2% per annum) by 2012.

The percentage of WACHS patients on home dialysis is currently close to that target (approximately 28% on average). Increasing this figure to 35% is considered by the WACHS Renal Reference group to be a reasonable target.

The proportion of WA country clients referred for home dialysis differs from region to region. There is some debate regarding the suitability of PD for remote clients where the social and environmental conditions may lead to less than optimal health outcomes. The resulting impact on the client, their family and costs to the health system need to be balanced against client's preference to live as close to home as possible.

Whilst home HD is a cost effective renal service modality and encourages client autonomy, it does require specific conditions such as access to good, safe and reliable water and electricity supplies. The following barriers to the uptake of home haemodialysis have been identified:

- Access to training closer to home, and subsequent access to clinical support to manage the clients' co-morbidity

- Suitability of home environment
- Availability of carer.

Strategies for addressing these barriers are discussed under service models below.

In instances when the home environment is not suitable, the client's dialysis machine may be set up in a community facility such as a health centre. Use of a hospital is not the preferred option as this may raise expectations about the provision of clinical care, and may lead the client to become less confident in managing their own care.

WACHS clients on home dialysis receive limited numbers of home visits (2 per annum), and this can be a barrier to successfully maintaining them on this modality.

Carer respite
Where clients who dialyse at home are reliant on assistance from their carer, it is important to be able to provide respite for the carer. This might require the client to move to a satellite or CSHD service for a short period. This would also allow the service to review the client.

The experience in a number of jurisdictions has been that the availability of a trained carer cannot always be relied upon, and in order to be safe, the client must be self-managing.

Community Supported Home Haemodialysis (CSHD)
Under a CSHD program, clients who are assessed as otherwise suitable for home dialysis but don't have a suitable home or access to a reliable carer, could have their dialysis machine set up in a community facility such as an Aboriginal Medical Service. The necessity for the client to provide a paid carer would be overcome by funding the facility to provide trained staff to support those home dialysis clients utilising their facility who do not have a carer. This option would be suitable for stable, self-caring home haemodialysis clients.

The role of the trained staff would be the same as that of the client's volunteer carer if they had one - i.e. a support person to provide company, refreshments, call the home dialysis provider if necessary, help administer saline if necessary. This is not a clinical role.

Under the current options, home dialysis clients dialysing at home are not required to have a carer, but clients dialysing in a community facility are. However, once a paid carer is provided, the client is no longer eligible to be part of the WA home dialysis program. This means that the organisation providing the service would become responsible for full funding and clinical governance, and the facility from which the service is provided may need to be licensed. In order to overcome governance and licensing issues and for this to be a viable option the following would be necessary:

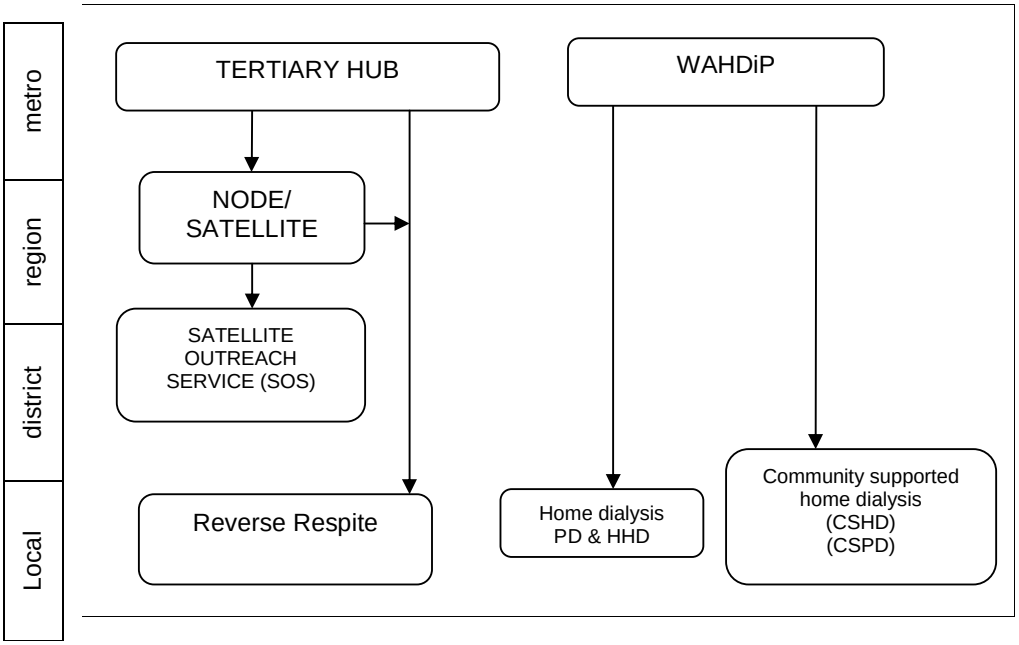
- Agreement would need to be reached that this service could form an extension to the current home dialysis (WAHDiP) program.
- Clients would need to meet the WAHDiP criteria.
- Trained staff would need to be trained by and operate under the WAHDiP protocols and guidelines.
- The facility would need to guarantee availability of the facility and suitable trained staff on the required days for 52 weeks per annum.

Community Supported Peritoneal Dialysis (CSPD)
This is an option in cases where there are sufficient numbers of dialysis clients requiring hostel type accommodation. The Northern Territory are seeking to establish a CSPD service in Alice Springs. This involves leasing a hostel facility where dialysis clients will live and can be assisted to connect and disconnect to overnight automated peritoneal dialysis (APD) by a trained PCA or AHW. This model is referred to as CSPD.

A precedent already exists in WA in residential aged care services where aged care staff assist residents on PD.

The relationships between different service options is shown below.

Figure 8: Renal Dialysis Hub and Spoke Model



Emergency service planning

All dialysis sites are required to have an emergency plan which outlines how clients will access dialysis in the event that the local service is not available. Options include temporarily increasing dialysis shifts at the next nearest centre. This is made much easier if the staff and clients are familiar with the equipment and consumables and is an important consideration in planning for new services and procurement of machines and consumables.

Transplant[11]

Kidney transplantation is considered the optimal therapy for client outcomes, but only 25% of ESKD clients are eligible. Kidneys for transplantation come from either deceased or living donors. Those people unable to find a healthy, willing and compatible living donor are allocated to a waiting list for cadaver kidneys. The average wait on this list is three years in WA.. In general, Aboriginal people are less likely to receive a transplant and success rates are poorer than in non-Aboriginal people. Aboriginal people also suffer increased mortality rates post transplant when compared with non-Aboriginal people.

The proportion of renal replacement therapy clients in WACHS who have a functioning transplant has remained steady at around 35% over the last 4 years, and future dialysis projections are based on this proportion remaining steady.

Palliative care

Some ESRF clients decide not to undergo dialysis. Others choose to withdraw. The death rate for people on dialysis in WA in 2008 was 15.5 per 100 people. Across Australia the most common reason for death was attributed to withdrawal from dialysis for 'social' reasons (37%), predominately psychosocial stress.[12] For these clients, and those who are coming to the end of their lives due to ageing, or complications, end of life care is an important part of their treatment plan. A 'no dialysis' option is not a 'no treatment' option. Clients need to be reassured that whenever they make a choice, they still retain the right to re-discuss their

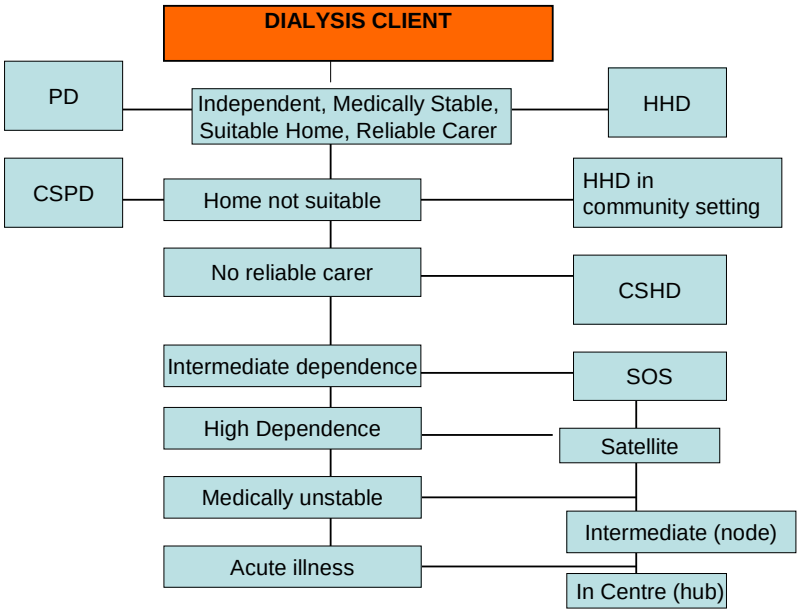
[11] WA Plan for Renal Dialysis Services 2008-2013.
[12] ANZDATA Registry 32nd 2009 Report, Chapter 3 Deaths.

options with a multi-skilled team and receive full supportive care from the resources of the renal service, even if they choose not to dialyse.

Client acuity

The suggested level of client acuity suitable for each type of service is shown below.

Figure 9: Client suitability for different dialysis options



Service level	Client acuity
PD	Client competent in dialysis technique. Client demonstrates commitment to ongoing care – fistula management, medications, fluid control, etc. Physical environment is well maintained. Family support and community health support available. Client's co-morbidity is able to be managed in the community. Client relatively stable on dialysis – doesn't need medical support on a regular basis.
HHD*	Client competent in dialysis technique. Client demonstrates commitment to ongoing care – fistula management, medications, fluid control, etc. Physical environment is suitable and well maintained* Family support and community health support available. Client's co-morbidity is able to be managed in the community. Client able to put 2 needles in his/her arm Client relatively stable on dialysis – doesn't need medical support on a regular basis. Client has a reliable carer/support person.
CSD	Client competent in dialysis technique. Client able to put 2 needles in his/her arm Client relatively stable on dialysis – doesn't need medical support on a regular basis. Client's co-morbidity is able to be managed in the community. Client may not have a reliable carer/support person.
CSPD	Physical (hostel) environment is well maintained.

	Staff support and community health support available. Client's co-morbidity is able to be managed in the community. Client relatively stable on dialysis – doesn't need medical support on a regular basis.
SOS	Client relatively stable on dialysis – doesn't need medical support on a regular basis. Client able to mostly set up and manage the dialysis machine. Client may need reminding/support with carrying out the dialysis process. Client may need help administering saline. Client may need assistance with needling. Client's co-morbidity is able to be managed in the community.
Node/ Satellite	As for SOS plus More complicated cases
Hub	Provides acute dialysis Unstable co-morbidities

* if home environment is not suitable but all other criteria are met, then the dialysis machine can be set up in a community facility.

Risk Analysis

The introduction of new models as described above would provide a strategy for meeting the anticipated increase in demand for dialysis, and assist many clients to return closer to home. There are a number of barriers and risks associated with these models and these are summarised as below.

Supported dialysis modes

Issue	Risk	Risk Mitigation strategy
Workforce	Attraction and retention of suitably trained and experienced nursing staff	A well resourced WACHS renal nursing workforce strategy
Staff competence	Local staff may be unable to manage dialysis if the client becomes medically unstable.	Staff competence would be assessed. Regional satellite services would provide telephone support/ video monitoring.
Local variation in clinical practice	Each site may develop different policies and procedures for the management of dialysis clients.	Standard policy and procedures developed across WACHS in consultation with hub services.
Community expectations	Expectation that local services would be able to meet the growing complexity in client's needs	Individual care plans drawn up for each client on commencement of treatment and agreed to by all relevant stakeholders
Client accommodation	Clients may require accommodation close to the dialysis service.	Accommodation needs to be a pre-requisite before a client is re-located closer to home.
Cost	Potential high cost of dialysis in locations with low throughput.	Integration with hospital services.
Impact on in-patient numbers	Local hospitals may experience increasing demand for complex dialysis care.	Role delineation will clarify the level of service available at each site.
Impact of RFDS/ ambulance services	Increased impact on emergency transport services and inter-hospital transfers.	Further modeling and planning is required.
Transport	Clients may be unable to get to dialysis and renal appointments.	Planning for dialysis services ensures that transport services are available. Clinical and referral pathways recognise the available transport routes between local, regional and metropolitan services.

Independent dialysis

Issue	Risk	Risk Mitigation strategy
Role of carer	The expectations on the carer may become increasingly more clinical over time	The patient's ability to remain independent is monitored. The scope of SCHD is carefully defined.
Community expectations	Expectation that local services would be able to meet the growing complexity in client's needs	Individual care plans drawn up for each client on commencement of treatment and agreed to by all relevant stakeholders
Impact on volunteer carers	Family members who care for a dialysis client at home may seek payment.	Client's looking after a dialysis patient are eligible for a carer's pension. Carers are provided with regular respite.
Expectation of host agency	The agency that houses the service may seek to increase the services they provide and seek funding for this.	Development of an MOU between the parties.

Plans for Additional Dialysis Capacity

The final projections for dialysis have been adjusted to account for chronic kidney disease management and allocated across different dialysis modalities based on the following assumptions:

- 5% reduction due to the impact of Chronic Disease management. This was applied as 1% per annum for five years from 2016 to 2020 as immediate impact on prevalence was not expected.
- 35% of clients on independent dialysis (home dialysis)
- 5% of clients treated in Perth

Table 16: Projected dialysis clients by treatment modality

Region	2010 Clients	2021 Projections	CKD reduction	Tertiary	Independent dialysis mode	Supported dialysis mode
Kimberley	96	199	10	9	66	114
Pilbara*	41	59	3	3	20	34
Midwest	38	48	2	2	16	27
Goldfields	49	71	3	3	24	41
South West	48	184	9	9	61	105
Great Southern	18	51	2	2	17	29
Wheatbelt**	34	57	3	3	19	33
TOTAL	324	669	33	32	223	382

*46 was used in the projection due to unusually large number of transplants in 2008
** Wheatbelt dialysis clients are estimated based on the metropolitan prevalence rates.

It should be noted that projections by region are based on low numbers and therefore are indications only and cannot be relied on for accuracy. There is a wide confidence interval.

Table 17 below indicates that, based on the assumptions regarding dialysis modalities and reduction in ESKD, WACHS will need to plan to provide supported dialysis for an additional approximately 100 clients over the next 10 years.

Table 17: Supported dialysis requirements by region

Region	Clients requiring supported dialysis	Current Planned Capacity	Difference
Kimberley	114	96	-18
Pilbara	34	44	10
Midwest	27	36	9
Goldfields	41	28	-13
South West	105	52	-53
Great Southern	29	24	-5
Wheatbelt	33	nil	-33
TOTAL	382	280	-102

Supported dialysis can be provided either by expanding the regional satellite/intermediate service, or providing a satellite outreach service in additional locations where a demand exists.
The dialysis projections by region and the options for dialysis models has been discussed with key staff in each region to identify the best option for expanding the capacity of dialysis across WACHS.

Holiday dialysis

The above projections do not take into account the demand for holiday dialysis. The demand for holiday dialysis and ability of satellite services to accommodate clients on holiday or needing to travel for family commitments varies. There has historically been a significant demand in Busselton.

Recommendations

It is recommended that:

Monitoring growth

1. Given the difficulty in making accurate projections at a regional level due to low client numbers, the regional dialysis population is monitored and reviewed every three years.

Satellite services

2. WACHS satellite services review and expand their capacity in order to provide an intermediate level of dialysis care, and the ability to support dialysis services and pre-dialysis clients across the region. This will include strengthening the workforce (see workforce section below), having spare dialysis capacity to accept referrals from dialysis clients who may require temporarily require additional support, and potentially, the ability to train new dialysis clients.

Satellite Outreach Services

3. WACHS consider establishing satellite outreach services at district and some small hospitals to enable more stable clients to return closer to home where:
    - the nearest satellite service is not within commutable distance
    - there is the physical capacity to accommodate the service
    - there are a minimum of two clients who would be appropriate for a local service
    - nursing staff attraction and retention issues could be managed

- local primary care services are accessible.

Expanding home dialysis

4. WACHS aims to achieve a prevalence target of 35% of clients on home dialysis.

It is recognized that reaching and maintaining the target for independent dialysis will require some additional strategies. These will include:

5. Working with renal physicians and the WAHDiP provider to ensure that where appropriate clients are encouraged to commence home therapies as the initial treatment,
6. WACHS work with WAHDiP to explore the options to increase home dialysis training, monitoring and support from within the region, and increasing the capacity to provide home visits as required.
7. WACHS aims to expand the proportion of clients on HHD by increasing the opportunity for HHD to be provided in a community setting where the client's home environment is not suitable.
8. WACHS works with the WAHDiP and the WA Health licensing branch to explore the option of providing a paid carer where home dialysis is in a community setting and the client is unable to provide a carer (CSHD).

9. The preferred options for providing supported dialysis and CSHD by region are as follows. Services for Aboriginal clients should be developed in consultation with the local community, including the clients themselves.

Region	Location	Comment
Kimberley:		
Continue services in Kimberley Satellite Dialysis Centre (KSDC)	Broome	Currently operating at capacity and as an intermediate level service.
Increase the planned Derby SOS from 10 to 12 chairs	Derby	Capital included in current Health and Hospitals Fund
Increase SOS from 4 to 6 chair	Kununurra	
Provide SOS 4 chairs	Fitzroy Crossing	
Provide CSHD/SOS 4 chairs	Halls Creek	Long term plan
Pilbara:		
Increase satellite from 8 to 11 chairs.	Port Hedland	Included in current redevelopment)
Provide SOS for 4 chairs	Roebourne	Hospital site
Develop SOS/CSHD for 4 chairs	Newman	To be considered in any future redevelopment
Midwest:		
Increase the capacity of satellite by expanding the number of sessions	Geraldton	Current capacity should be sufficient in the short term. Any redevelopment should consider increased capacity for dialysis and co-location with cancer centre on GH Campus
Develop SOS (4 chairs)	Carnarvon	To be included in hospital redevelopment
Develop CSHD (2 chairs)	Wiluna	Capacity has been included in the design of the new clinic
Develop CSHD (2 chairs)	Meekatharra	
Goldfields:		
Increase satellite from 7 to 12 chairs	Kalgoorlie	Redevelopment should consider increased capacity for dialysis and co-location with cancer centre.
Provide CSHD in BEGA AMS (2 chairs)	Kalgoorlie	
Provide SOS in Laverton/Leonora up to 4 chairs	Laverton or Leonora	
CSHD/SOS in Esperance (4 chairs)	Esperance	To be included in hospital redevelopment.
CSHD Warburton (2 chairs)	Warburton	Existing AMS has been built with capacity for 2 chairs.
South West		
Increase the capacity of satellite from 6 to 12 chairs	Bunbury	The development of the new oncology centre is expected to free up some capacity to increase dialysis.
Develop a 'shop front' SOS service in Bunbury (12 chairs)	Bunbury	This will be for high functioning low acuity clients – similar to the metropolitan satellite dialysis model.
Continue services at Busselton as an outreach of Bunbury	Busselton	Included in the new hospital redevelopment.
Great Southern		
Increase the capacity of satellite centre from 6 to 8 chairs.	Albany	To be included in hospital redevelopment. This service may be contracted out.
Wheatbelt		
Provide SOS dialysis (4 chairs)	Northam	To be collocated with the new cancer centre.
Provide SOS dialysis (4 chairs)	Narrogin	
Provide CSHD dialysis (2 chairs)	Moora	Facility to be identified.
Provide SOS dialysis (2 chairs)	Merredin	To be included in future hospital redevelopment.

The capacity has been based on a ratio of one chair to four clients in a satellite or satellite outreach setting, and one chair to 2 clients in a community setting. In smaller locations it would not be anticipated that the service would reach it's full capacity, and a ratio of one chair to one client may occur.

Capital requirements

The above options for future and expanded dialysis facilities has been identified by WACHS for consideration in the State Health Infrastructure Plan.

Where new hospital facilities are being developed, the need for dialysis will be identified in the District Services Plan. Capacity for one or two dialysis chairs will also be considered in all future redevelopments of remote area clinics.

The development of new Cancer Centres in some locations provides a unique opportunity to consider relocation of dialysis with other ambulatory care services.

A number of existing hospital and clinic facilities have the physical capacity for a small dialysis service, and require consideration in the minor capital works program for the necessary infrastructure modifications.

Workforce

The staff:client ratios for haemodialysis have been compared across Australia for different service types as outlined below. The variation in satellite staffing in WA is due to two factors – the small size of some regional satellite services, and reportedly relatively higher levels of client acuity in regional satellites compared with metropolitan satellite services.

Table 18: Staff to client ratio for haemodialysis

STATE	In-centre	Satellite	Remote
NSW	1:3	1:4	1:3
WA	1:3	1:4, 1:2.5	1:2
SA	1:3	1:4	1:3
Vic	1:3	1:4	
Qld	1:3	1:4	2:5
NT	2:5	1:4	1:5, 1:2

Source, NT DHCS 2000[13]

Nursing Hours per Patient Day

Nursing workload is implemented and monitored as described in the Registered Nurses, Midwives and Enrolled Mental Health Nurses - Australian Nursing Federation-WA Health Industrial Agreement 2007. The introduction of the Nursing Hours per Patient Day (NHpPD) model aims to capture all nursing activity and nursing workforce effort. It is an indicator designed to reflect an estimation of the amount of time nurses spend with each patient per day. The intention of the indicator is to monitor institution specific trends, assess nursing resource utilisation, and provide a measurement that enables units of similar activity to be benchmarked on an intra-hospital and inter-hospital level. In the absence of any other measure, NHpPD has come to be used as a tool to manage and contain nursing FTE. The NHPpD model dictates the minimum nursing requirements for renal dialysis services, and does not take account of alternative workforce models such as renal trained Aboriginal Health Workers.

[13] Gorham G, Prevention and Treatment Options for renal Disease in the Northern Territory, The Cooperative research Centre for Aboriginal and Tropical Health, Department of Health and Community Services, March 2001.

The current nursing hours per patient session for satellite dialysis is 2.18 hours and 3.02 for tertiary sites. This is for direct patient care only and therefore does not cover non-nursing duties such as calibrating machines, water testing etc. The model provides for an operation time of 5 hours with a staffing ratio of one nurse per three patients in a satellite setting, and 1:2 in a tertiary setting.

The WA Health CKD Model of Care[14] notes that:

> *'Satellite staffing levels have been based on the traditional satellite client population that presupposes that the majority of these clients 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 clients are elderly, poorly mobile and increasingly dependent on nursing staff for all aspects of their care. In order to accommodate these clients in the satellite setting it is imperative that sufficient non-nursing staff is employed additional to nursing staff to manage the manual handing requirements without the need for increased nursing numbers'.(page 71).*

The report goes on to recommend the re-establishment of a renal course for enrolled nurses and '*the establishment of a 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'.*

Renal Aboriginal Health Worker and Enrolled Nurse qualifications

Four units of competency have been endorsed by industry to form the Renal Care Skill Set. These four units can be elective units in the EN Advanced Diploma of Nursing and provide a pathway for enrolled nurses to specialise in renal care.

The same four units can be undertaken by workers who hold qualification at Diploma level or higher in Aboriginal and Torres Strait Islander Primary Health C (Practice) providing a pathway for AHWs to specialise in renal care. A training course for this qualification is under development in the Kimberley. Details of the qualification can be found at the following website link:
https://www.cshisc.com.au/index.php?option=com_content&task=view&id=72&Itemid=169

There is potential for renal trained AHWs to undertake non-nursing duties in satellite services that may currently be undertaken by RNs or ENs.

Proposed satellite staffing model

The following example staffing model for a 7 and 10 chair facility operating at capacity takes into account the NHPpD model and the additional non-nursing duties required. The model presupposes that AHWs are able to work under the supervision of an RN.

Table 19: Proposed Satellite Staffing Model

Position	Responsibilities	FTE for 28 clients	FTE for 40 clients
CNM	Management of regional satellite centre Follow-up of CKD clients	1	1
CN L2	Provides clinical care and HD expertise within the unit	2	3
RN	Clinical care and non-direct care	3	2
ASEN or RN	Provides clinical care and non-direct care under direction of RN (needs to be CVC competent)	1	1
EN/AHW	Provides clinical care and non-clinical duties under direction of RN. (needs to be medication competent)		2

[14] WA Renal Diseases Health Network Chronic Kidney Disease Model of Care, December 2007.

PCA	Non-clinical care: help client with: weighing, cleaning chairs, food, transport, reception etc.	1	2
Total nursing		6	8
Total non-nursing		2	3
TOTAL INCL 20% LEAVE		9.6	13.2

Allied Health Workforce
The WA CKD Model of Care outlines the importance of specialised allied health professionals in improving outcomes for renal dialysis clients and proposes the following staff:ESKD client benchmarks:

Renal social worker 1:140
Renal dietician 1:160
Renal pharmacist 1:250.

Access to specialised allied health services is generally only available in Perth. Within WACHS renal clients are referred to generic regional hospital allied health teams as needed. It is unlikely that dialysis client numbers will warrant the employment of specialised renal allied health professionals in WACHS. However, it is important that dieticians employed in WACHS regions have experience in the management of diabetes and renal disease.

Nurse Practitioner
Nurse practitioners, working collaboratively with nephrologists can be used to manage CKD clinics and dialysis patient care. Responsibilities may include regular monitoring of dialysis patients, performing annual history and physical examinations, interpreting weekly lab results, ordering diagnostic tests, managing dialysis access, prescribing appropriate medications, managing blood pressure, managing dialysis treatment prescriptions, referring patients to specialists, and managing acute problems.

Specialist Support Services
Statewide clinical services for satellite dialysis services are managed on a geographical basis by lead tertiary hospitals, which are referred to as 'parent hospitals'. The parent tertiary hospital manages ESKD clients within the region and provides renal clinical support services in terms of medical support, consultation and visits to relevant WACHS region.

WACHS regions are progressively increasing self sufficiency in these areas. For example, the Goldfields now employs a full time nephrologist who is attached to RPH. The Kimberley satellite service employs a renal GP who works closely with the RPH based nephrologist. Current links between WACHS and metropolitan providers for renal specialist support are as follows:

Table 20: Current WACHS – Metropolitan AHS linkages

Region	Metropolitan hospital	Approx number of clients*	Nephrology visits
Kimberley	SMAHS (RPH)	100	35 days/annum
Pilbara	SMAHS (RPH)	40	24 days/annum
Goldfields	SMAHS (RPH)	45	1 resident# Plus Esperance (4 days/annum)
Midwest	NMAHS (SCGH)**	30	30 days/annum
Great Southern	NMAHS (SCGH)	20	12 days/annum
Wheatbelt (no regional satellite)	various		n/a
TOTAL			Approx 1.6FTE

South West***	SMAHS (Fremantle and SCGH)	50	63 days/annum

* dialysis clients only – does not include all CKD clients.
** Midwest has visiting nephrologists from both SCGH and RPH. SCGH nephrologist is not taking any new referrals.
*** nephrology visits to the South West are made in a private capacity and therefore not included in the total.
# resident specialist is employed as a general physician in the region.

WACHS regions contract with individual nephrologists in regard to visiting services, and this determines the pattern of client flow to tertiary hospitals for specialised out-client and in-client care. The 2006 WA Dialysis Plan recommended realigning the metropolitan-country linkages in order to share out the workload more evenly between north and south metropolitan area health services. The Plan also recommended that arrangements for specialist services are formalised between health services, rather than with individual nephrologists.

The alignment of WACHS regions to metropolitan hospitals for renal services should take into account the needs of ESKD clients for a coordinated approach to the provision of the range of specialist services that they may require.

The British Renal Society (BRS) established a workforce planning group in 2002 and set a benchmark of ESKD clients per nephrologist of 100 clients per FTE, or 2.45 FTE per 250,000 population[15]. The Renal Diseases Health Network estimated that using this benchmark, and to match the client:staff ratio in other Australian jurisdictions, WA needed an additional 4-5 nephrologists (2007). Applying this benchmark to the dialysis prevalence projections, WACHS would need approximately 8 nephrology FTE or equivalent by 2021. (600 on dialysis plus an additional 35% functioning transplants).

Table 21: Projected WACHS Renal Specialist Requirements

Region	Current number of clients	Current Nephrology visits	Current FTE requirements to meet benchmark	Projected clients*	Future specialist FTE requirement**
Kimberley	96	35 days/annum	1	199	2.7
Pilbara	41	24 days/annum	0.4	59	0.8
Goldfields	49	1 resident Plus Esperance (4 days/annum)	0.5	71	1
South West***	48	51 days/annum	0.5	184	2.5
Midwest	38	30 days/annum	0.4	48	0.6
Great Southern	18	8 days/annum	0.2	51	0.7
Wheatbelt (no regional satellite)	34	n/a	0.3	57	0.5
TOTAL	324	Approx 1.8FTE	3.3	669	8.8

* these figures are based on approx number of dialysis and transplant clients, and do not include CKD clients.
** based on a benchmark of 100:1 (dialysis plus transplant clients)
*** the SW is currently serviced by nephrologists working in a private capacity.

[15] WA Renal Diseases Health Network Chronic Kidney Disease Model of Care, December 2007.

Just maintaining the current WACHS staff:client ratio for nephrology, rather than achieve the recommended benchmarks would require the equivalent of 4.8 FTE by 2021. Options for obtaining this specialist nephrology support include:

- Increasing resident specialists in WACHS
- Increasing visiting specialist services
- Negotiating with metropolitan AHSs to release advanced trainee registrars to work alongside visiting or resident nephrologists.
- Employing alternative workforce models such as Nurse Practitioners, Renal GPs and physician assistants.

In close liaison with the consultant nephrologist, Renal trained GPs and Nurse Practitioners can assist with managing the care of dialysis clients including ordering tests, reviewing test results, assessment and diagnosis, and changing medications. They can also run clinics and education sessions for the management of chronic kidney disease in the community.

The current model of visiting specialists has served WACHS well up to now as it has provided good continuity and strong linkages with tertiary services. However, relying on specialist nephrologists going to become increasingly difficult as demand outstrips supply. A combination of all four strategies would best suit our needs. The development of strategies to retain and support resident specialist positions is vital and will require strong linkages with renal departments in metropolitan area health services.

Multidisciplinary care teams

If regional satellite services are to take on a broader role in supporting dialysis services across the region, the establishment of regional multidisciplinary care teams will be essential to support staff and patients. Such a team would also have a broader role in supporting CKD patients. This is also a recommendation from the Chronic Kidney Disease Model of Care. (Recommendation 12: that nurse-led multidisciplinary CKD management clinics for patients with advanced stage CKD be established at 12 identified rural and remote regions across WACHS).

Nursing Staff profile

The minimum nursing requirements in each of the dialysis modality options described above are as follows:

Service Type	Level	Description (see also CSF framework role delineation)	Minimum staffing	Staff training	Client training
PD	1	Self-care PD clients in their own home. Weekly monitoring. Telephone support.	Nil	N/a	New clients and carer trained in hub or node.
HHD	1	Self-care HHD clients in their own home or community facility. Weekly monitoring. Telephone support.	Nil	N/a	New clients and carer trained in hub.
CSPD	1	APD clients in supported residential hostel or aged care, who need assistance connecting and disconnecting dialysis bags.	1:10 AHW or PCA	Training as for carer for PD.	New clients trained in hub or node.
CSHD	1	As HHD plus paid carer.	1:4 AHW or PCA	Training as for carer for HHD	New clients trained in hub.
SOS	2	Responsible for day to day monitoring of dialysis. All clients experiencing serious co morbidities or vascular access problems are referred to node or hub.	1:3 RN/EN	At least two nurses have received supervised training from an accredited renal nurse.	New clients trained in hub or node.
Satellite/ Node	4	Responsible for day to day monitoring of dialysis. All clients experiencing serious co morbidities are referred to hub. Plus at least bi-monthly clinical review of clients. Plus supports and trains staff in a number of SOS services.	1:3 RN. Access to renal GP or Renal Nurse Practitioner.	At least one accredited renal trained RN.	New clients are trained in the hub or node.

Hub	5/6	As CSF framework. Provides clinical management of at least one satellite, or node and associated outreach (SOS).			

Recommendations

It is recommended that

10. WACHS develop a renal workforce strategy which includes:
    - the introduction of alternative workforce models such as renal dialysis trained ENs and AHWs
    - a program to train, assess and support nursing staff in SOSs to undertake dialysis
    - the capacity of regional satellite services to support outreach services across the region
    - specialist support services.
11. as ESKD patient numbers increase, WACHS regions increase the specialist support available. This can be achieved by a combination of resident and/or visiting nephrologists, renal GPs and renal Nurse Practitioners, depending on regional needs.
12. WACHS review the alignment between regional and metropolitan hospitals taking into account the new services from the Fiona Stanley Hospital and works towards more formal arrangements with metropolitan area health services rather than individual consultants, for the provision of specialist support. It is proposed that this occur over time and without disruption to existing arrangements where these are working well. Alignment with metropolitan services should also include nursing support for education, training, procedural support, policy and guidelines.
13. Each region establish a multi-disciplinary care team to support dialysis and CKD clients from across the region. Such a team may include:
    - Renal GP or Renal Nurse Practitioner
    - Visiting renal physician
    - Renal educator
    - Social worker
    - Dietician, pharmacist
    - Aboriginal health worker
14. WACHS establish a nursing and medical renal clinical network to link and support the dialysis workforce across WACHS.

Housing and Transport

For many clients who have had to relocate or travel in order to access dialysis, housing and transport become critical issues in maintaining their treatment.

Housing

The availability of accommodation is critical for clients who have had to relocate in order to access dialysis in regional centres, and for country clients who are getting treated in Perth. Often only hostel accommodation is available. For many people this is not an appropriate option as they need long term accommodation where their family can join them.

Long term accommodation close to the dialysis facility is critical for dialysis clients from remote locations. Health services need to work closely with the Department of Housing and Works to ensure that accommodation needs are planned for. Social work involvement is important to advocate on behalf of the client and their family to obtain suitable housing.

Transport

Transport services are often important in ensuring compliance with dialysis treatment. In the metropolitan area, dialysis contracts generally include provision for one way transport for a small proportion of clients who may require it. In WACHS, the need for a transport service to and from dialysis varies from region to region and depends upon the individual client circumstances, distance travelled and availability of alternative services. In some regions clients are driving considerable distances to access dialysis. Clients who have to travel more than 70kms are entitled to a PATS subsidy. The current arrangements in each region are as follows:

Satellite	Transport
Broome	Satellite service has a mini-bus and paid drivers who take clients to and from dialysis.
Port Hedland	Satellite service has a bus and also uses taxis when necessary.
Geraldton	Lack of transport is a barrier. Taxis are used when necessary
Kalgoorlie	Taxis are used when necessary
Bunbury/ Busselton	Clients are given a subsidy in particular circumstances
Albany	The community provides a voluntary transport service for those who need it.

Transport links between some smaller hospitals and Perth are better than between the hospital and the regional centre, and this needs to be acknowledged in referral pathways for patients, and clinical support for satellite outreach services.

RFDS and Ambulance Services
The expansion of dialysis options across country WA will inevitably impact upon the number of transfers and evacuations of renal clients having an acute episode. Typically a dialysis client might need to return to the hub centre for services one or two times per annum.

Recommendations

It is recommended that

15. WACHS, in consultation with local Aboriginal organisations, works with the Department of Housing and Works to ensure that housing needs for dialysis clients from remote locations are addressed.
16. Supported dialysis services include provision for client transport where a need is indicated.
17. Analysis is undertaken on the potential impact of expanding dialysis on the RFDS and ambulance services.

Information systems

There is no single data system for monitoring and managing CKD and ESKD clients. Individual clinicians and hospitals maintain their own data sets. As clients tend to move between dialysis modalities and providers, a secure information system to monitor and track clients is critical.

The Royal Perth Hospital has developed the WA Nephrology Database (WAND) which has the potential to provide current information about all CKD clients including the progression of their kidney disease their treatment modality and place of treatment. This database is not being used by all tertiary centres, and is not available to practitioners outside of WA Health.

MMeX has the ability to monitor CKD clients and coordinate treatment across service providers. It also has the capacity to record client results. The future of MMeX in WACHS is still to be determined.

There is a pressing need for a coordinated secure system to monitor pre-dialysis and dialysis clients, treatment regimes, medications and to track test results which can enable information to be shared across metropolitan, private and WACHS providers. Such a system would meet the needs of:

- Clients in terms of increased safety and quality of care;
- Clinicians and nurses in terms of enhanced decision making, risk management and productivity; and
- Planners to monitor trends and make future projections of need.

Recommendations

It is recommended that

18. WACHS work with the WA Renal Reference Group and HIN to meet the need for a coordinated, secure system to monitor and manage CKD and ESKD across the continuum of care and across providers.

IMPLEMENTATION

Implementation of the WACHS dialysis plan will require significant resources. Where there are plans to redevelop a health facility but the facility design and budget have not yet been developed, it is anticipated that the redevelopment plans will include provision for dialysis as outlined in this plan. In all other cases, an estimate for the capital requirements of the renal dialysis plan has been provided for the ten year State Health Infrastructure Plan.

It is proposed that the implementation plan address the immediate and medium term needs for expanded dialysis services in WACHS. Implementation will require more detailed consultation at the local level with the range of service providers involved in caring for dialysis clients, and with the clients themselves.

The long term need should be continuously monitored and reviewed again in 2-3 years to assess whether:

- the projections require adjustment
- the new models of dialysis introduced in priority locations are robust
- any new models of service have been developed.

Implementation of the dialysis plan will also require consideration of the additional needs of dialysis clients, especially for remote Aboriginal clients. These include housing, social support and transport.

Of critical importance is also the need for appropriate renal education on their condition and treatment delivered in a way that the client and their family can comprehend.

6. APPENDICES

APPENDIX 1: PLANNING METHODOLOGY

Two methodologies are available for dialysis planning:

- dialysis prevalence and incidence data
- dialysis hospital separations.

The use of separations data has limitations because:

- It does not include people on home dialysis
- It does not reflect the patient's region of origin if they have had to relocate for treatment
- There can be inconsistencies in coding.

Prevalence and incidence data is sourced from the ANZDATA Registry (Australia and New Zealand Dialysis and Transplant Registry). Dialysis prevalence identifies all dialysis patients in the population in a twelve month period. Incidence indicates the number of new cases in the population over a given time period. The ANZDATA Registry has been capturing uniform dialysis data from all treatment centres in Australia for the last 30 years and is recognised as the superior source of dialysis data.

The WACHS Dialysis Plan is based on the following data sources:

Data	Source
Prevalence	ANZDATA Registry 2005 - 2008 data, WACHS 2009 data
Current Population	WACHS Area CSP
Population projections	ABS Series C 2008
ATSI population projections	ABS 2009 Indigenous population projections

The projections have been determined using prevalence data from ANZDATA for the years 2005 – 2008, and data on actual patient numbers collected from regions to represent 2009 case data. Future cases have been projected using a linear regression method to determine projections for the number of patients in a region to the year 2021. The assumption is that population growth and survival on dialysis remain constant, and that no new interventions to prevent ESKD will be implemented. Prevalence data from before 2005 could not be used as postcode information was only collected from 2005 onwards.

It is important to note that the data was analysed by place of initial treatment in order to try and project demand based on place of residence. There were several limitations with the dataset; there were a number of missing values in the place of initial treatment field. It is also acknowledged that the place of initial treatment is not necessarily indicative of the place of residence of a patient.

The year of initial treatment was also quite dated and without knowing patient histories, it is acknowledged that the patient may have moved from the place of initial treatment to another region and that the dataset does not capture such movements. To account for missing values, where the place of initial treatment was not available the place of treatment was used to determine the region of the patient for the purpose of the analysis.

Ten years worth of incidence data, from 1998 to 2008, was used to project for the number of incident patients that a region would have in the future; a linear method of regression was also used to ensure there was consistency in terms of methodology used for both the prevalence and incidence projections. The incidence projections were also done based on the patient's health region at first treatment result to try and ensure that patients were assigned to regions based on their initial place of residence.

The trends and projections were sent to each region and the relevant nephrologist to check whether the assumptions made were valid, and whether the draft projections appeared to reflect local experience.

An adjustment was made to the projections for the Pilbara as the initial projections seemed to be too low based on feedback from clinicians and key stakeholders. The number of transplants in the Pilbara in 2008 was quite high compared to previous years. An assumption was made for modelling purposes to reduce the number of transplant patient for 2008 from 21 to 16 to be more inline with the average of the number of transplants from 2005 to 2007. This resulted in an additional 5 dialysis patients being included in 2008 and 2009 for the purpose of the linear regression model applied to the Pilbara.

Wheatbelt has high numbers of dialysis patients who relocate to the metropolitan area for treatment these were unable to be identified as originally Wheatbelt residents. To account for this, projected Metropolitan age standardised rates were applied to projected Wheatbelt population and age profile.

Satellite Capacity

The capacity of a satellite dialysis facility is based on the assumption of operating two shifts per day, 6 days per week, 52 weeks per annum with three sessions per patient per week. Thus each chair can accommodate 4 patients.

Dialysis Modality

The projected number of patients who will require supported dialysis in each region has been estimated on the following assumptions:

- Dialysis prevalence projections were decreased by 1% per annum from 1026 on the basis that Chronic Disease Management Strategies will impact on patients numbers in the future. This produces a total reduction of 5% by 2021.
- An estimated 5% of all patients will be treated in Tertiary hospitals
- An estimated 35% of patients within a region will have independent dialysis ie either home haemodialysis or home peritoneal dialysis.

APPENDIX 2: KIMBERLEY

The Kimberley region has the highest incidence of end stage kidney disease in WA and has five times the incidence of Perth.

Kimberley Satellite Dialysis Centre located in Broome has been operating at full capacity since it opened in 2004. It provides dialysis for 40 patients using 10 chairs and operates six days per week, with two shifts per day, which provides 12 sessions per week. All new renal patients need to relocate to Perth to wait for a vacancy to this unit.

The satellite centre is managed by the Kimberley Aboriginal Medical Services Council (KAMSC) and employs a full time renal GP who provides medical support to the dialysis patients and other CKD patients across the region under the supervision of the Perth based nephrologist.

The Derby Aboriginal Health Service (DAHS) also has 2 chairs, which provide dialysis for eight patients. This unit is supported by the Broome satellite service.

Home dialysis in a community setting occurs in various locations including Kununurra, Fitzroy Crossing and Kalumburu.

The Local Implementation Plans for the Remote Service Delivery National Partnership Agreements in the Kimberley all identify the development of a renal plan as a priority for their community.

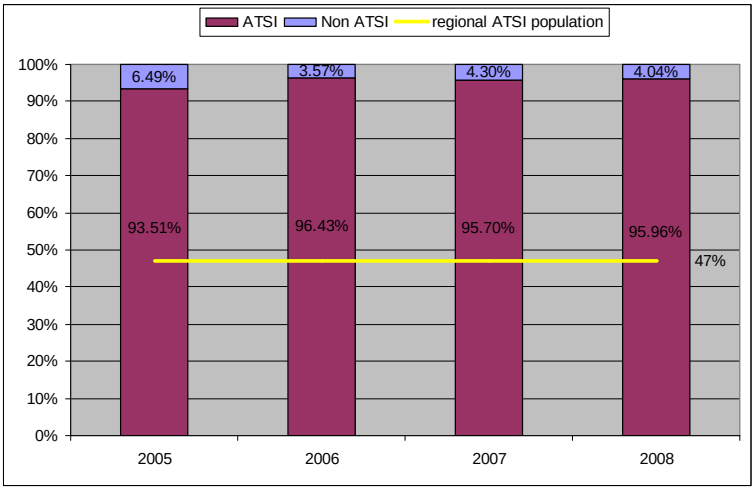
A snapshot of known dialysis clients from the Kimberley as at 31 January 2010 is shown below.

Table 22: Kimberley renal patients by community of origin at 31 January 2010.

	Number of Patients						
Place of origin	**Broome SDU**	**Derby CSHD**	**In Perth requiring tertiary level care**	**In Perth awaiting placement in WACHS**	**Home HD dialysis**	**PD**	**ESKD Stage 5**
Broome	6			3		7	
Lombadina	2						
One Arm Point	1						
Bidgyadanga	8			1		1	1
Derby	3	3		1	1	2	4
Looma	1	1		1		1	
Jarlmadangah	1						
Fitzroy Crossing	8			10		1	
Halls Creek	3			4		1	1
Balgo				3		2	
Mulan	1						
Kununurra				2	2	5	4
Wyndham	2			1		1	2
Beagle Bay						1	
Kalumburu	2				2		
Total	38	4	0	28	5	21	13

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 10: Dialysis by ATSI , Kimberley



Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend. For the Kimberley this growth pattern has been consistent over the last ten years.

Table 23: Dialysis prevalence projections for the Kimberley region excluding transplants by place of initial treatment.

Prevalence projections for Kimberley, 2005–2021 by Region of First Treatment

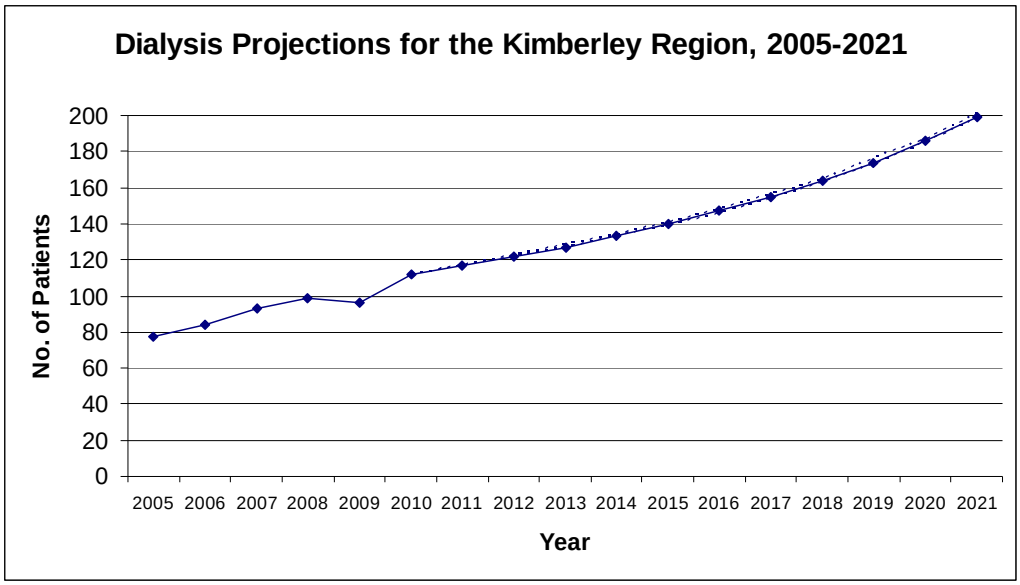
Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	241.6	236.0	77.0	-	-
2006	263.1	252.3	84.0	-	-
2007	280.5	265.0	93.0	-	-
2008	289.6	272.2	99.0	-	-
2009	221.0	221.0	96.0	-	-
2010	250.0	247.5	112.0	112.0	112.0
2011	253.7	248.3	117.0	117.0	117.0
2012	257.6	249.6	122.0	122.0	123.0
2013	261.5	251.5	127.0	127.0	128.0
2014	266.6	253.8	133.0	133.0	134.0
2015	272.2	256.7	140.0	139.0	141.0
2016	278.9	260.2	147.0	146.0	148.0
2017	287.3	264.1	155.0	154.0	156.0
2018	297.2	268.6	164.0	163.0	165.0
2019	308.2	273.6	174.0	173.0	176.0
2020	321.2	279.2	186.0	185.0	187.0
2021	336.5	285.2	199.0	198.0	201.0

Average annual increase of 0.97% not significant

Trend: not significant (P =.296) 0.97

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Kimberley population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 11: Dialysis prevalence projections for the Kimberley region excluding transplants by place of initial treatment.



Dialysis incidence for the region has been projected based on the previous 10 years of data.

Table 24: Incidence projections for the Kimberley region by place of initial treatment.

Incidence projections, Kimberley, 1998–2021 by Region of First Treatment

Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	36	44	10	-	-
1999	37	44	11	-	-
2000	32	36	10	-	-
2001	40	45	13	-	-
2002	37	39	12	-	-
2003	56	62	18	-	-
2004	41	44	13	-	-
2005	38	40	12	-	-
2006	41	41	13	-	-
2007	69	70	23	-	-
2008	44	44	15	-	-
2009	49	52	21	19	24
2010	50	53	23	20	25
2011	52	54	24	21	27
2012	54	55	26	22	29
2013	58	59	28	24	32
2014	60	60	30	26	34
2015	62	62	32	27	36
2016	64	63	34	29	39
2017	65	64	35	30	41
2018	67	66	37	31	43
2019	69	67	39	33	46
2020	71	69	41	34	48
2021	73	70	43	36	51

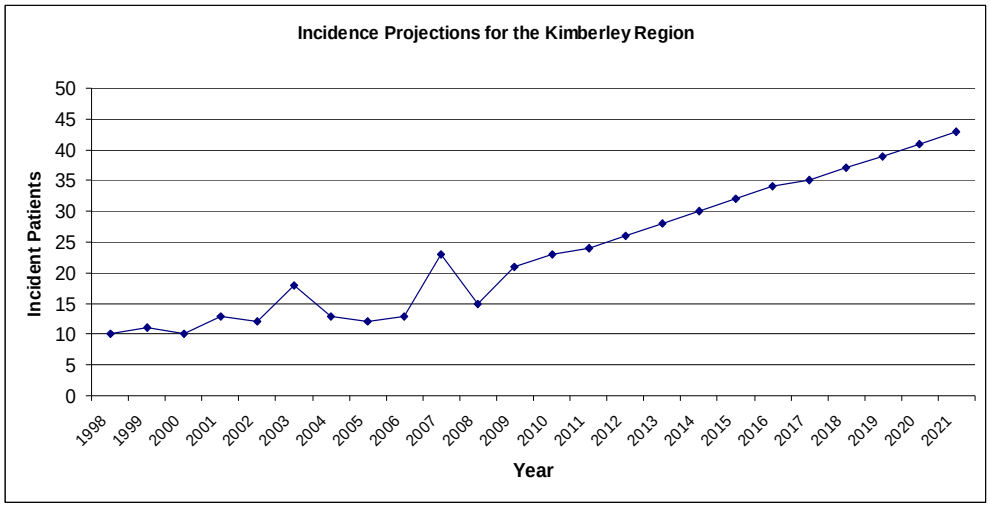
Average annual increase of 2.39% significant

Trend:	significant (P < .0001)	2.39

Crude Crude rate

ASR	Age standardised rate (Standardised to the total 2008 Kimberley population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend Regression Method	Average annual change (per cent) Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 12: Incidence projections for the Kimberley region by place of initial treatment.



The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 25: Kimberley

Year	Home PD	Home HD	Hospital or Satellite
2005	29.87%	5.19%	64.94%
2006	21.43%	4.76%	73.81%
2007	19.35%	5.38%	75.27%
2008	23.23%	4.04%	72.73%

Chronic disease

From 1998 to 2007, the mortality rate for all conditions, where a rate ratio was measurable, was significantly higher in the Kimberley Aboriginal population compared with the combined (Aboriginal and non-Aboriginal) State population (Table 3).

Table 3: Age standardised mortality ratio, various conditions, Kimberley Aboriginal population, compared with the State population, 1998 – 2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	142.6	39.8 ^	32.1	49.3
Cardiovascular Disease	433.3	2.3 ^	2.1	2.6
Respiratory Disease	129.6	3.2 ^	2.6	4.0
Injury and Poisoning	150.0	4.1 ^	3.5	4.7
Mental Health Conditions	29.7	2.1 ^	1.2	3.1
Kidney Failure	50.5	7.8 ^	4.9	11.0
Kidney Disease	95.8	9.5 ^	7.2	12.4
Cancer - Males	329.4	1.4 ^	1.2	1.8
Cancer - Females	242.6	1.8 ^	1.4	2.2
Alcohol-related	109.4	5.6 ^	4.6	6.8
Tobacco-related	196.4	2.7 ^	2.2	3.2
Other Drug-related	—	—	—	—

^ Significantly higher than the non-Aboriginal and Aboriginal State population.

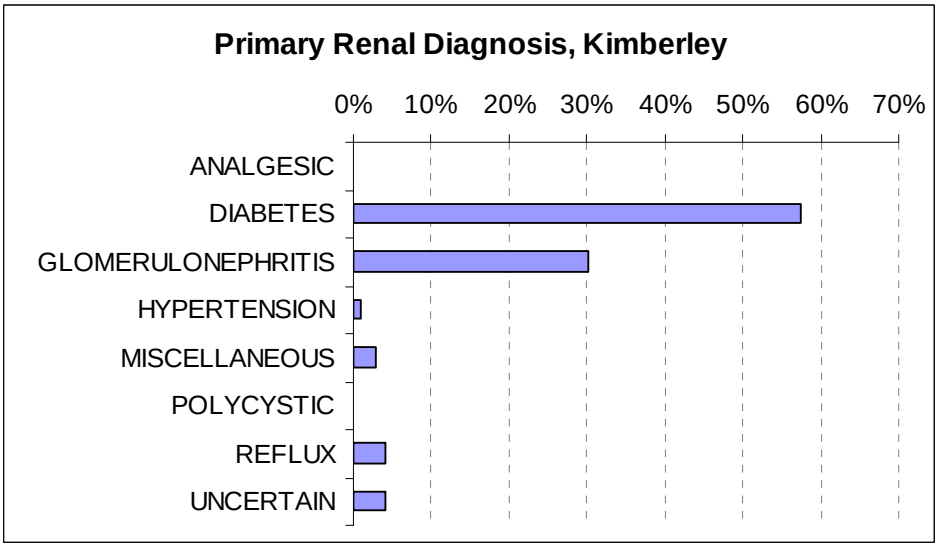
Significantly lower than thenon-Aborigingal and Aboriginal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 13: Primary Renal Diagnosis, Kimberley 2005-2008



APPENDIX 3: PILBARA

The SDU in Port Hedland currently provides dialysis for 24 patients using eight chairs. One of these chairs is located in an isolation area for patients who are unwell. As there are currently no patients requiring isolation, the chair is being used as a regular chair.
The Port Hedland Unit operates six days per week with two shifts on Mondays, Wednesdays and Fridays and one shift on Tuesdays, Thursdays and Saturdays. This equates to nine sessions per week.

Once the new hospital has been built, the number of chairs will be increased to 11 with capacity for 44 patients. This is expected to occur in 2010.

Currently there are sixteen people waiting for admission into the Port Hedland unit or anticipated to need dialysis in the near future.

Home dialysis in a community setting is available at Roebourne with two chairs set up at Roebourne AMS.

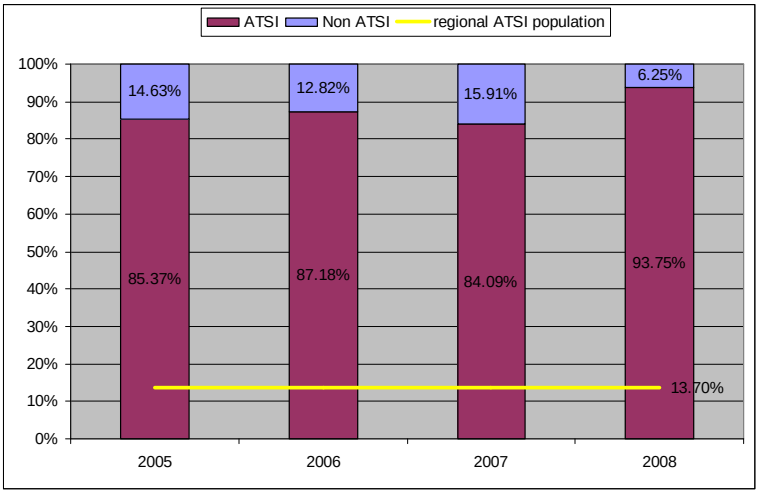
A snapshot of known dialysis clients from the Pilbara as at 31 January 2010 is shown below.

Table 26: Pilbara patients by community of origin

Place of origin	Number of patients					
	SDU	In Perth requiring tertiary level care	In Perth awaiting placement in WACHS	PD	HHD	ESKD Stage 5
Newman	0		2	1		
Yandeyarra	2					
Roebourne	7		1	1	2	2
Wiluna	0					
Jigalong	5					
Nullagine	1					
Warralong	2					
Strelley	0					
Karratha	0			2		
Tom Price	0			1		2
Perth	1					
Marble Bar	4					
Hedland	0		3	1	2	8
Wickham	0				1	
Onslow	0					
Meekatharra	1					
Geraldton			1			
Total	24		7	6	4	12

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 14:Dialysis by ATSI , Pilbara



Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend.

An adjustment was made to the projections for the Pilbara as the initial projections seemed to be too low based on feedback from clinicians and key stakeholders. The number of transplants in the Pilbara in 2008 was quite high compared to previous years, as such an assumption was made for modelling purposes to reduce the number of transplant patient for 2008 from 21 to 16 to be more inline with the average of the number of transplants from 2005 to 2007. This resulted in an additional 5 dialysis patients being included in 2008 and 2009 for the purpose of the linear regression model applied to the Pilbara.

Table 27: Dialysis prevalence projections for the Pilbara region excluding transplants by place of initial treatment.

Prevalence projections for Pilbara, 2005–2021 by Region of First Treatment

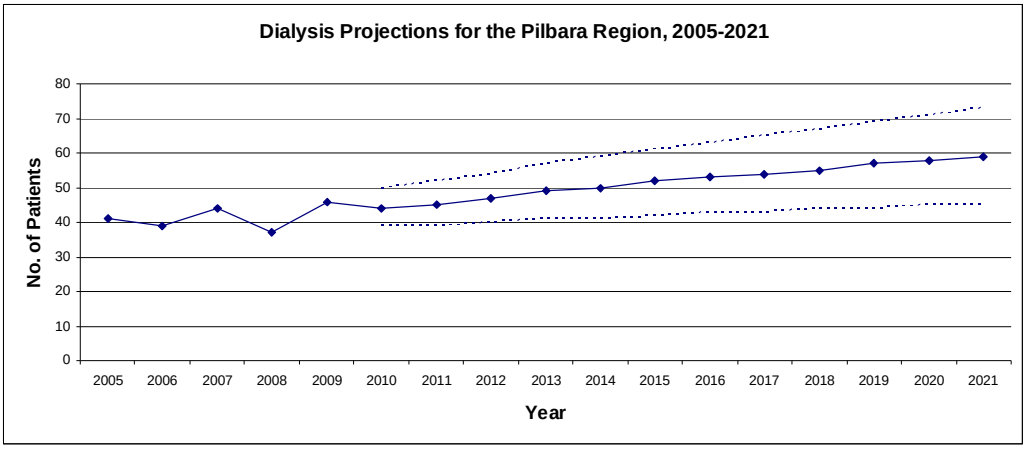
Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	95.9	98.6	41.0	-	-
2006	88.5	90.3	39.0	-	-
2007	97.7	98.5	44.0	-	-
2008	80.5	79.4	37.0	-	-
2009	102.2	102.2	46.0	-	-
2010	97.3	96.1	44.0	39.0	50.0
2011	99.9	97.4	45.0	39.0	52.0
2012	102.3	98.6	47.0	40.0	54.0
2013	104.9	99.9	49.0	41.0	57.0
2014	107.2	101.1	50.0	41.0	59.0
2015	109.3	102.3	52.0	42.0	61.0
2016	111.3	103.5	53.0	43.0	63.0
2017	112.7	104.7	54.0	43.0	65.0
2018	114.4	106.0	55.0	44.0	67.0
2019	116.2	107.2	57.0	44.0	69.0
2020	118.1	108.5	58.0	45.0	71.0
2021	120.2	109.8	59.0	45.0	73.0

Average annual decrease of -0.05% not significant

Trend:		not significant	-0.05
Crude	Crude rate		
ASR	Age standardised rate (Standardised to the total 2008 Pilbara population) per 100,000		

Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 15: Dialysis prevalence projections for the Pilbara region excluding transplants by place of initial treatment.



Dialysis incidence for the region has been projected based on the previous 10 years of data.

Table 28: Incidence projections for the Pilbara region by place of initial treatment.

Incidence projections, Pilbara, 1998–2021 by Region of First Treatment

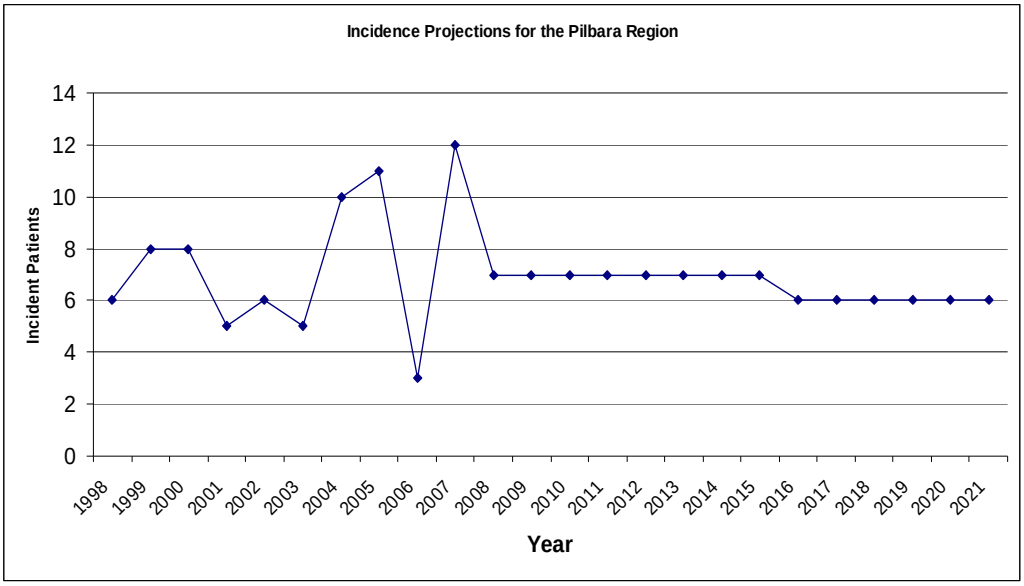
Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	15	19	6	-	-
1999	20	24	8	-	-
2000	20	21	8	-	-
2001	13	14	5	-	-
2002	15	16	6	-	-
2003	12	13	5	-	-
2004	24	25	10	-	-
2005	26	27	11	-	-
2006	7	7	3	-	-
2007	27	27	12	-	-
2008	15	15	7	-	-
2009	15	15	7	6	8
2010	15	15	7	6	8
2011	15	14	7	6	8
2012	15	14	7	5	8
2013	14	14	7	5	8
2014	14	14	7	5	8
2015	14	13	7	5	8
2016	14	13	6	5	8
2017	13	13	6	5	8
2018	13	12	6	4	8
2019	13	12	6	4	8
2020	12	12	6	4	8
2021	12	11	6	4	8

Average annual increase of -2.65% significant

Trend:	significant (P < .0001)	-2.65

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Pilbara population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 16: Incidence projections for the Pilbara region by place of initial treatment.



The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 29: Pilbara

Year	Home PD	Home HD	Hospital or Satellite
2005	17.07%	2.44%	80.49%
2006	15.38%	7.69%	76.92%
2007	15.91%	6.82%	77.27%
2008	9.38%	6.25%	84.38%

Chronic Disease

From 1998 to 2007, mortality rates for diabetes, cardiovascular disease, respiratory disease, injury and poisoning, mental health conditions, kidney disease, alcohol-related conditions and tobacco-related conditions were all significantly higher in the Pilbara Aboriginal population than the combined (Aboriginal and non-Aboriginal) State population (Table 3). Mortality rates for cancer for both Aboriginal males and females were similar to the combined State population.

Table 3: Age standardised mortality ratio, various conditions, Pilbara Aboriginal populations, compared with the State population, 1998 – 2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	181.6	19.1 ^	13.7	25.0
Cardiovascular Disease	440.0	2.7 ^	2.3	3.3
Respiratory Disease	158.2	4.0 ^	2.8	5.3
Injury and Poisoning	170.0	4.1 ^	3.4	5.1
Mental Health Conditions	103.8	6.6 ^	4.2	9.3
Kidney Failure	—	—	—	—
Kidney Disease	68.7	9.8 ^	6.0	14.1
Cancer - Males	272.0	1.2	0.8	1.6
Cancer - Females	168.8	1.2	0.7	1.7
Alcohol-related	127.9	6.7 ^	5.1	8.6
Tobacco-related	212.7	3.2 ^	2.5	4.1
Other Drug-related	—	—	—	—

^ Significantly higher than the non-Aboriginal and Aboriginal State population.

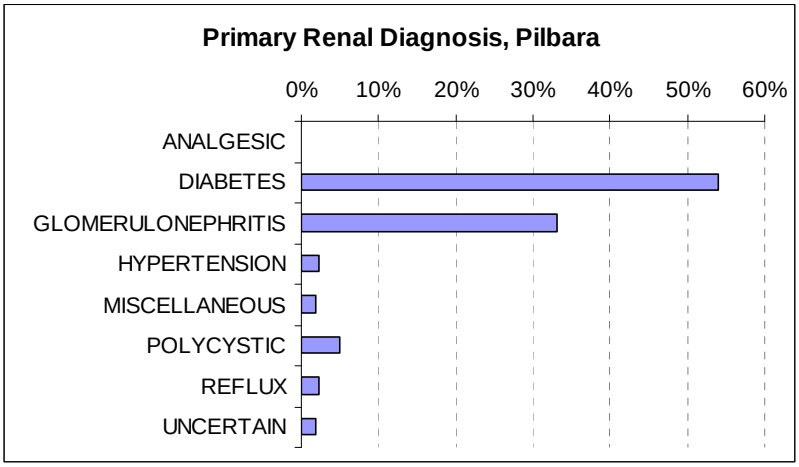
Significantly lower than the non-Aboriginal and Aboriginal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 17: Primary Renal Diagnosis, Pilbara 2005-2008



APPENDIX 4: MIDWEST

A renal dialysis service operates from Geraldton Hospital with nine chairs.
The Geraldton unit currently provides dialysis for 18 patients. There is one chair that is an isolation chair which is available for general use if required. The unit is open seven days per week. It provides one shift per day and two shifts on Wednesdays and Fridays. This equates to nine sessions per week.

There are two patients from Meekatharra on home dialysis and one patient from Geraldton in Perth currently being trained in home dialysis.

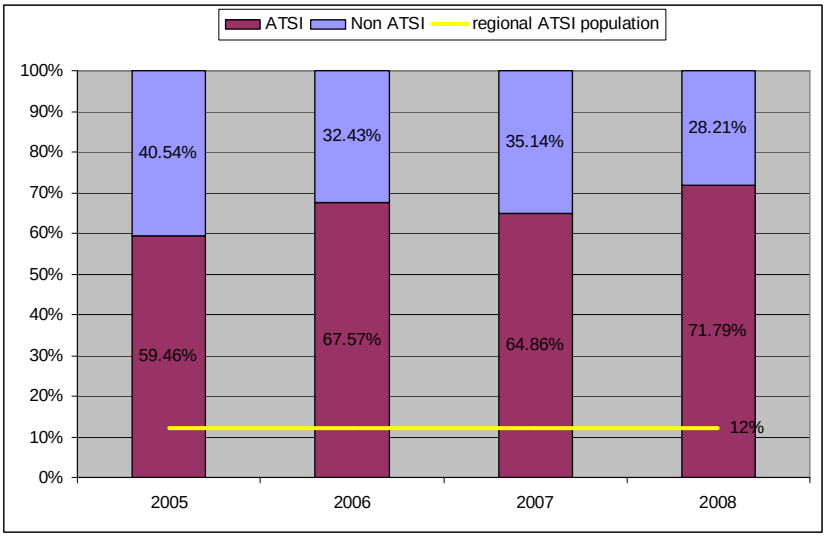
A snapshot of known dialysis clients from the Midwest as at 31 January 2010 is shown below.

Table 30: Midwest patients by community of origin

Place of origin	Number of Patients					
	Geraldton SDU	In Perth requiring tertiary level care	In Perth awaiting placement in WACHS	PD	HHD	ESKD stage 5
Carnarvon						1
Exmouth				1		
Geraldton	18		1	4	1	2
Meekatharra	1			2	1	1
Morawa						1
Mount magnet	1					
Mullewa	2					
Northampton	2					
Tarcoola Beach					1	
Yalgoo	1					
Port Hedland	1					
TOTAL	**26**		**2**	**7**	**3**	**5**

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 18: Dialysis by ATSI , Midwest



Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend.

Table 31: Dialysis prevalence projections for the Midwest region excluding transplants by place of initial treatment.

Prevalence projections for Midwest, 2005–2021 by Region of First Treatment

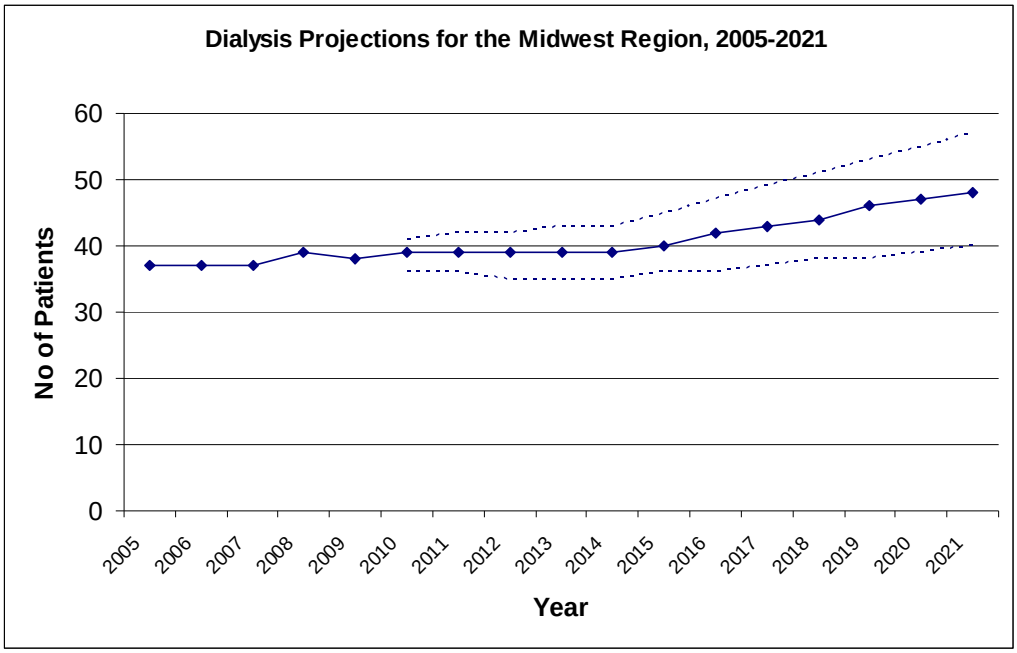
Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	60.8	62.4	37.0	-	-
2006	60.3	60.5	37.0	-	-
2007	59.7	59.2	37.0	-	-
2008	61.5	60.9	39.0	-	-
2009	58.2	58.2	38.0	-	-
2010	58.5	58.2	39.0	36.0	41.0
2011	58.4	57.7	39.0	36.0	42.0
2012	58.2	57.3	39.0	35.0	42.0
2013	57.9	56.9	39.0	35.0	43.0
2014	57.4	56.7	39.0	35.0	43.0
2015	59.3	58.5	40.0	36.0	45.0
2016	60.8	60.0	42.0	36.0	47.0
2017	62.1	61.6	43.0	37.0	49.0
2018	63.6	63.3	44.0	38.0	51.0
2019	65.1	65.1	46.0	38.0	53.0
2020	66.7	66.9	47.0	39.0	55.0
2021	68.4	68.8	48.0	40.0	57.0

Average annual increase of 0.45% not significant

Trend: not significant (P =.759) 0.45

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Goldfields population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 19: Dialysis prevalence projections for the Midwest region excluding transplants by place of initial treatment.



Dialysis incidence for the region has been projected based on the previous 10 years of data.

Table 32: Incidence projections for the Midwest region by place of initial treatment.

Incidence projections, Midwest, 1998–2021 by Region of First Treatment

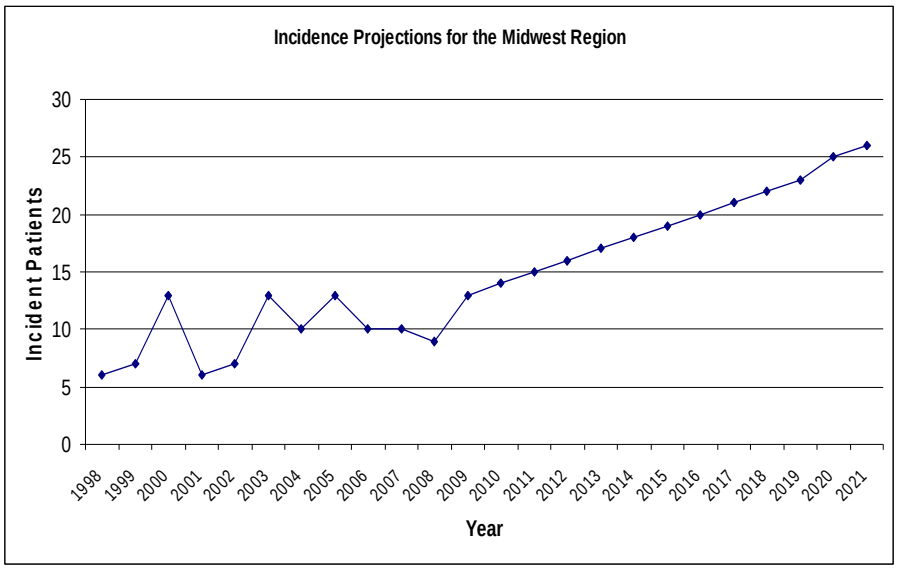
Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	10	11	6	-	-
1999	12	14	7	-	-
2000	22	24	13	-	-
2001	10	11	6	-	-
2002	12	13	7	-	-
2003	21	22	13	-	-
2004	17	18	10	-	-
2005	21	23	13	-	-
2006	16	17	10	-	-
2007	16	16	10	-	-
2008	14	14	9	-	-
2009	20	20	13	13	13
2010	21	21	14	13	14
2011	22	22	15	14	15
2012	23	23	16	15	16
2013	25	24	17	16	17
2014	26	25	18	17	18
2015	27	26	19	18	19
2016	29	27	20	19	20
2017	30	28	21	20	21
2018	32	29	22	21	23
2019	33	30	23	23	24
2020	35	31	25	24	25
2021	37	32	26	25	27

Average annual increase of 3.61% significant

Trend:	significant (P < .0001)	3.61

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Midwest population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 20: Incidence projections for the Midwest region by place of initial treatment.



The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 33: Midwest

Year	Home PD	Home HD	Hospital or Satellite
2005	32.43%	2.70%	64.86%
2006	29.73%	5.41%	64.86%
2007	18.92%	5.41%	75.68%
2008	17.95%	5.13%	76.92%

Chronic disease

From 1998 to 2007, the mortality rates for diabetes, cardiovascular disease, respiratory disease, injury and poisoning, kidney disease, cancer (males only), cancer (females only), alcohol-related conditions and tobacco-related conditions were significantly higher than the combined non-Aboriginal and Aboriginal State population (Table 3).

Table 3: Age standardised mortality ratio, various conditions, Midwest Aboriginal population, compared with the State population, 1998 – 2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	222.1	16.4 ^	12.3	21.7
Cardiovascular Disease	511.0	3.3 ^	2.8	4.0
Respiratory Disease	186.0	4.4 ^	3.1	5.9
Injury and Poisoning	124.3	3.3 ^	2.6	4.2
Mental Health Conditions	—	—	—	—
Kidney Failure	—	—	—	—
Kidney Disease	106.8	10.5 ^	6.1	15.4
Cancer - Males	437.1	1.8 ^	1.3	2.4
Cancer - Females	230.7	1.7 ^	1.1	2.4
Alcohol-related	103.7	4.7 ^	3.2	6.3
Tobacco-related	268.1	3.8 ^	3.0	4.9
Other Drug-related	—	—	—	—

^ Significantly higher than the non-Aboriginal and Aboriginal State population.

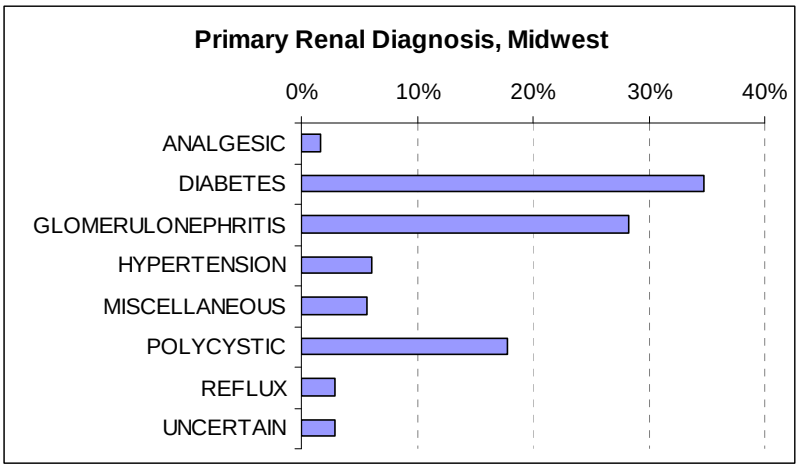
Significantly lower than the tnon-Aboriginal and Aborignal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 21: Primary Renal Diagnosis, Midwest 2005-2008



APPENDIX 5: GOLDFIELDS

Kalgoorlie SDU currently provides dialysis for 27 patients using eight chairs (Table 35). One chair is used only for sick patients. The unit is open six days per week and provides two shifts per day, equating to 12 sessions per week.

Clients from remote communities north and east of Warburton are physically much closer to Alice Springs than Kalgoorlie, and agreement has been reached with the Northern Territory that these clients will receive renal services from Alice Springs. There are currently 7 Goldfields patients being dialysed in Alice Springs. Warburton has one chair available, but this is currently not being used.

A snapshot of known dialysis clients from the Goldfields as at 31 January 2010 is shown below.

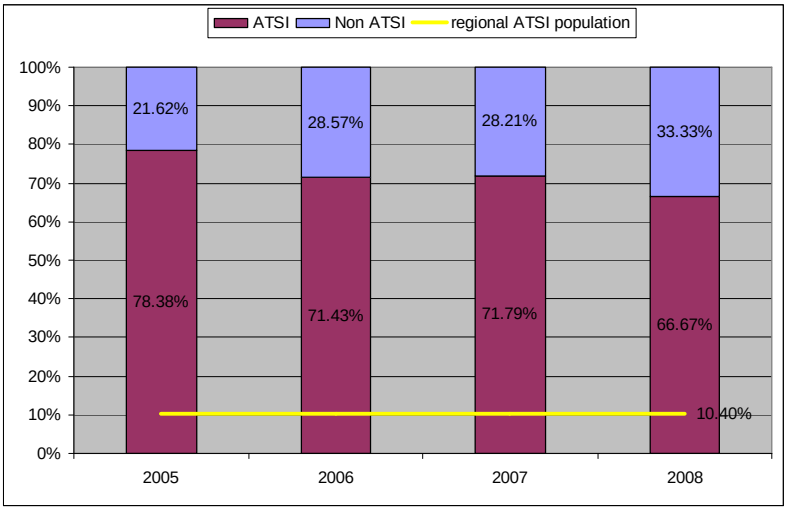
Table 34: Goldfields RRTx/Pre-dialysis Patients Jan 2010

	Number of Patients							
Place of origin	**Alice Springs**	**Kal SDU**	**In Perth requiring tertiary level care**	**In Perth awaiting placement in WACHS**	**PD**	**HHD**	**Transplants**	**Pre-Dialsyis eGFR <15**
Alice Springs				**1**				
Coonana		3						
Cue								
Esperance		1			2			
Hopetown								
Kalgoorlie		11		5	1		6	7
Kambalda								
Laverton/ Leonora		8			3			1
Menzies					1			
Norseman				1				
Ravensthorpe								
Tjuntjuntjarra								1
Warburton		2	1	2	1		1	
Wiluna		2						
NE of Warburton	2	1						2
NZ		1						
Total	**2**	**29**	**1**	**9**	**8**	**0**	**7**	**11**

Note:
2 training for HHD (1xKal, 1xLaverton) – currently on HD in Kal SDU
1 new transplant patient, 1 new transplant expected within 6 months
One patient requiring Tertiary care prior to moving to Warburton as a 2nd PD in Warburton
1 HD death in last 6months, 2 HD patients relocated permanently to Perth.

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 22: Dialysis by ATSI , Goldfields



The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 35: Goldfields

Year	Home PD	Home HD	Hospital or Satellite
2005	24.32%	0.00%	75.68%
2006	33.33%	0.00%	66.67%
2007	33.33%	0.00%	66.67%
2008	30.77%	0.00%	69.23%

Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend.

Table 36: Dialysis prevalence projections for the Goldfields region excluding transplants by place of initial treatment.

Prevalence projections for Goldfields, 2005–2021 by Region of First Treatment

Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	67.3	71.7	37.0	-	-
2006	75.9	79.7	42.0	-	-
2007	68.9	71.6	39.0	-	-
2008	67.2	69.7	39.0	-	-
2009	82.7	82.7	49.0	-	-
2010	79.7	78.5	48.0	44.0	51.0
2011	82.3	79.8	50.0	46.0	54.0
2012	84.9	81.0	52.0	47.0	56.0
2013	87.8	82.3	54.0	49.0	59.0
2014	90.7	83.6	56.0	50.0	61.0
2015	93.4	84.8	58.0	52.0	64.0
2016	96.2	86.1	60.0	54.0	67.0
2017	98.9	87.4	62.0	55.0	69.0
2018	101.5	88.7	64.0	57.0	72.0
2019	104.2	90.0	66.0	58.0	74.0
2020	107.0	91.3	69.0	60.0	77.0
2021	110.0	92.6	71.0	62.0	80.0

Average annual increase of 1.52% significant

Trend: significant (P = .0227) 1.52

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Goldfields population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 23: Dialysis Projections for the Goldfields region excluding transplants by place of initial treatment.

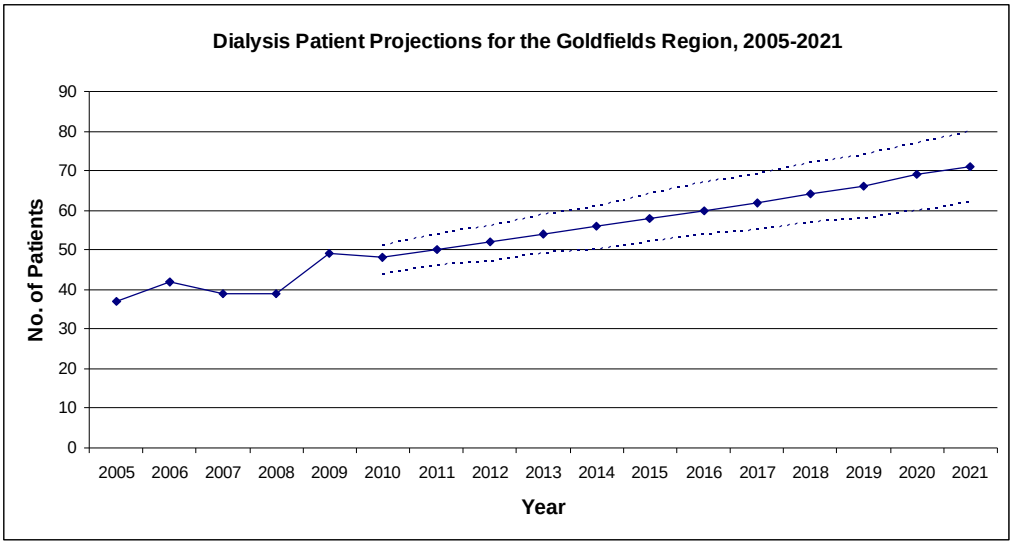


Table 37: Incidence projections for the Goldfields region by place of initial treatment.

Incidence projections, Goldfields, 1998–2021 by Region of First Treatment

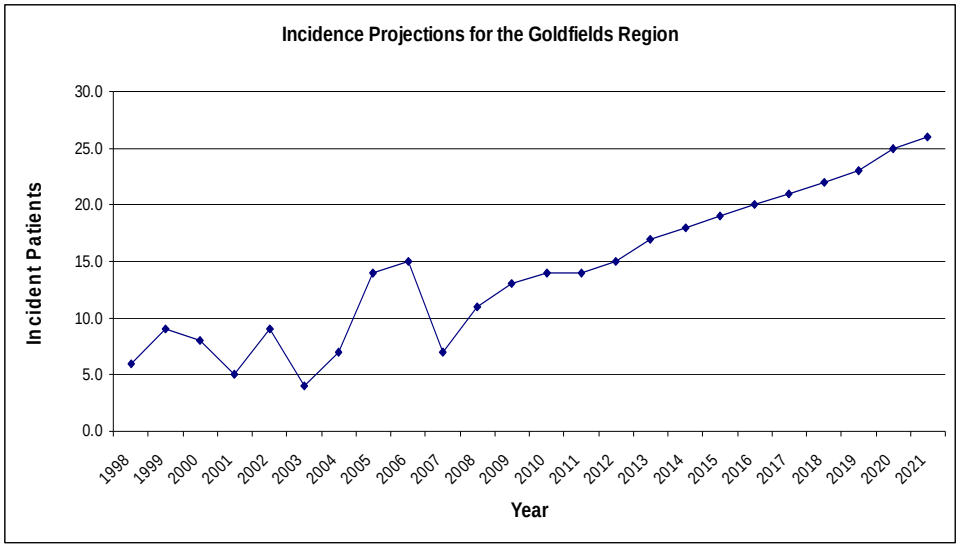
Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	10.6	11.6	6.0	-	-
1999	16.0	17.8	9.0	-	-
2000	14.3	16.0	8.0	-	-
2001	9.1	9.8	5.0	-	-
2002	16.3	17.7	9.0	-	-
2003	7.2	7.4	4.0	-	-
2004	12.7	13.9	7.0	-	-
2005	25.5	26.2	14.0	-	-
2006	27.1	27.4	15.0	-	-
2007	12.4	12.4	7.0	-	-
2008	18.9	18.9	11.0	-	-
2009	21.3	20.5	13.0	11.0	14.0
2010	22.6	21.3	14.0	12.0	15.0
2011	24.0	22.1	14.0	13.0	16.0
2012	25.4	22.9	15.0	14.0	17.0
2013	27.0	23.8	17.0	14.0	19.0
2014	28.6	24.6	18.0	15.0	20.0
2015	30.2	25.5	19.0	16.0	21.0
2016	31.8	26.3	20.0	17.0	22.0
2017	33.4	27.2	21.0	18.0	24.0
2018	35.1	28.0	22.0	19.0	25.0
2019	36.8	28.9	23.0	21.0	26.0
2020	38.6	29.7	25.0	22.0	28.0
2021	40.5	30.6	26.0	23.0	29.0

Average annual increase of 3.76% significant

Trend:	significant (P < .0001)	3.76

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Goldfields population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 24: Incidence projections for the Goldfields region by place of initial treatment.



Chronic disease

From 1998 to 2007, mortality rates for diabetes, cardiovascular disease, respiratory disease, injury and poisoning, kidney disease, alcohol-related conditions and tobacco-related conditions were all significantly higher in the Goldfields Aboriginal population compared with the combine non-Aboriginal and Aboriginal State population (Table 3).

Table 3: Age standardised mortality ratio, various conditions, Goldfields Aboriginal population compared with the State population, 1998–2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	213.1	18.2 ^	13.8	24.0
Cardiovascular Disease	381.7	2.5 ^	2.0	3.1
Respiratory Disease	236.1	7.1 ^	5.4	9.3
Injury and Poisoning	190.1	4.2 ^	3.3	5.3
Mental Health Conditions	—	—	—	—
Kidney Failure	—	—	—	—
Kidney Disease	92.0	13.0 ^	7.7	18.9
Cancer - Males	—	—	—	—
Cancer - Females	—	—	—	—
Alcohol-related	84.3	5.0 ^	3.3	6.7
Tobacco-related	180.5	2.7 ^	1.9	3.6
Other Drug-related	—	—	—	—

^ Significantly higher than the combined non-Aboriginal and Aboriginal State population.

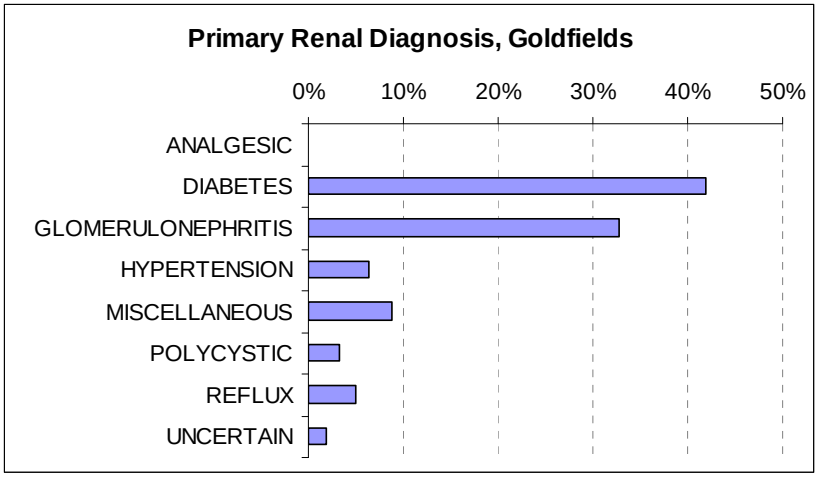
Significantly lower than the combined non-Aboriginal and Aboriginal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 25: Primary Renal Diagnosis, Goldfields 2005-2008



APPENDIX 6: SOUTH WEST

Bunbury SDU has six chairs and currently provides dialysis for 24 patients. A seventh chair is available for patients commencing treatment or for urgent cases. This chair is not used on a regular basis as it is located in a common area within the Chemotherapy Unit.

A satellite unit has been established for Busselton as an outreach of the Bunbury service. This unit has six chairs and capacity to dialyse 24 patients. Due to funding limitations, it is currently operated at two shift capacity only, with 11 patients.

Dialysis services are provided by St John of God hospital on a fee for service basis. There are four Bunbury patients who are Vietnam Veterans and costs of dialysis for these patients are claimed from the Department of Veterans Affairs (DVA) rather than WACHS. There are no other known DVA patients in WACHS.

A snapshot of known dialysis clients from the South West as at 31 January 2010 is shown below.

Table 38: South West patients by community of origin

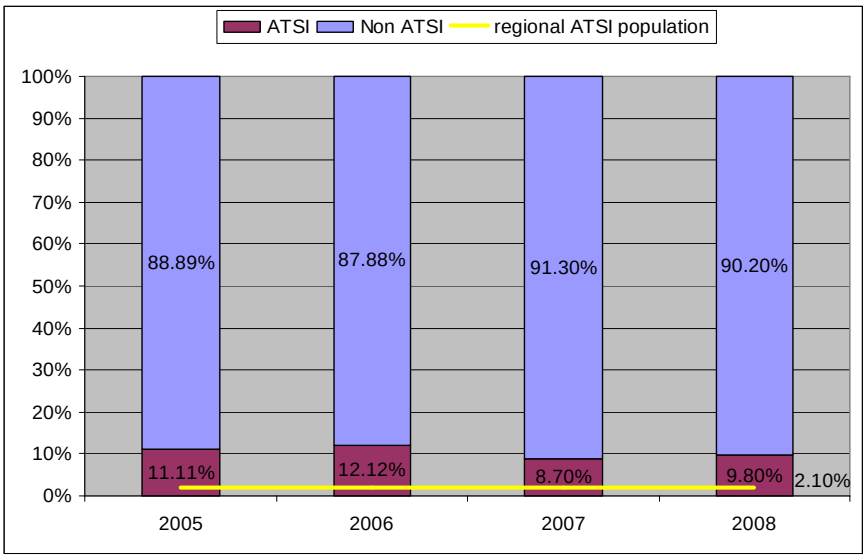
Place of origin	Number of Patients						
	SDU Bunbury	SDU Busselton	In Perth requiring tertiary level care	In Perth awaiting placement in WACHS	PD	HHD	ESKD Stage 5
Australind	4	1			1		
Bridgetown	2				2		
Bunbury	12 4 (DVA)	1			1		
Busselton		5 1 (DVA)			2		
Collie (Allanson)	1				1		
Eaton	1	1			1		
Greenbushes	1						
Manjimup	1				2		
Pemberton	1						
Harvey							
Nannup							
Holiday patients Shenton Park Wembley		1 (2 Rx) 1 (2 Rx)					
TOTAL	27	11		0	10	0	n/k

The provided data is a snapshot of treatments in the SW (December client list).

For 2009 there were 16 holiday clients who had 53 treatments (~1.1% of total treatment activity)

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 26: Dialysis by ATSI , South West



Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend.

Table 39: Dialysis prevalence projections for the South West region excluding transplants by place of initial treatment.

Prevalence projections for the South West, 2005–2021 by Region of First Treatment

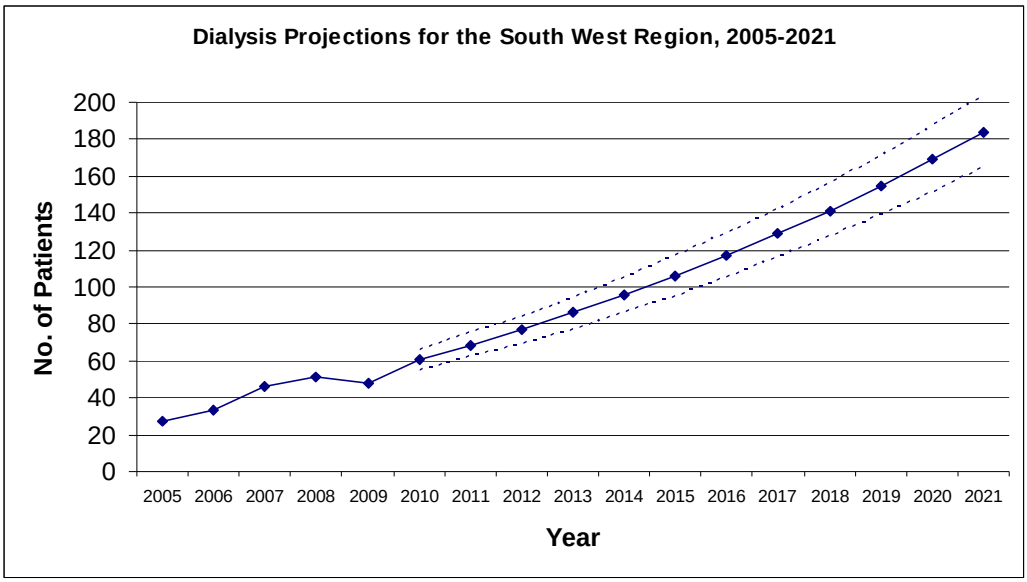
Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	19.4	20.4	27.0	-	-
2006	23.1	23.8	33.0	-	-
2007	31.3	31.8	46.0	-	-
2008	33.5	34.1	51.0	-	-
2009	31.5	31.5	48.0	-	-
2010	39.0	38.5	61.0	55.0	66.0
2011	43.3	42.2	68.0	62.0	75.0
2012	47.9	46.0	77.0	69.0	84.0
2013	52.6	49.9	86.0	77.0	94.0
2014	57.6	53.9	96.0	86.0	105.0
2015	62.9	58.0	106.0	95.0	117.0
2016	68.4	62.2	117.0	105.0	129.0
2017	74.5	66.5	129.0	116.0	142.0
2018	80.8	70.9	141.0	127.0	156.0
2019	87.4	75.4	155.0	139.0	171.0
2020	94.3	80.0	169.0	151.0	187.0
2021	101.5	84.8	184.0	165.0	203.0

Average annual increase of 8.07% significant

Trend:	significant (P =.0001)	8.07

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 South West population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 27: Dialysis prevalence projections for the South West region excluding transplants by place of initial treatment.



Dialysis incidence for the region has been projected based on the previous 10 years of data.

Table 40: Incidence projections for the South West region by place of initial treatment.

Incidence projections, South West, 1998–2021 by Region of First Treatment

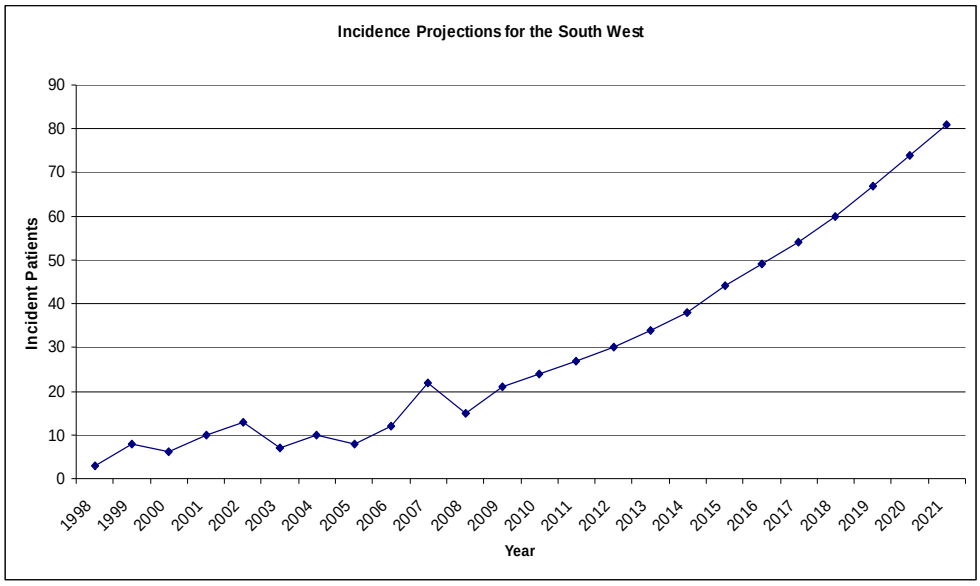
Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	3	2	3	-	-
1999	7	7	8	-	-
2000	5	5	6	-	-
2001	8	9	10	-	-
2002	10	11	13	-	-
2003	5	6	7	-	-
2004	7	8	10	-	-
2005	6	6	8	-	-
2006	8	9	12	-	-
2007	15	15	22	-	-
2008	10	10	15	-	-
2009	14	13	21	20	22
2010	15	15	24	23	24
2011	17	16	27	26	28
2012	19	18	30	29	31
2013	21	19	34	33	35
2014	23	21	38	37	39
2015	26	23	44	43	45
2016	29	25	49	48	50
2017	32	27	54	53	56
2018	35	29	60	59	62
2019	38	31	67	66	68
2020	41	33	74	72	75
2021	45	35	81	80	83

Average annual increase of 8.86% significant

Trend:	significant (P < .0001)	8.86

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 South West population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 28: Incidence projections for the South West region by place of initial treatment.



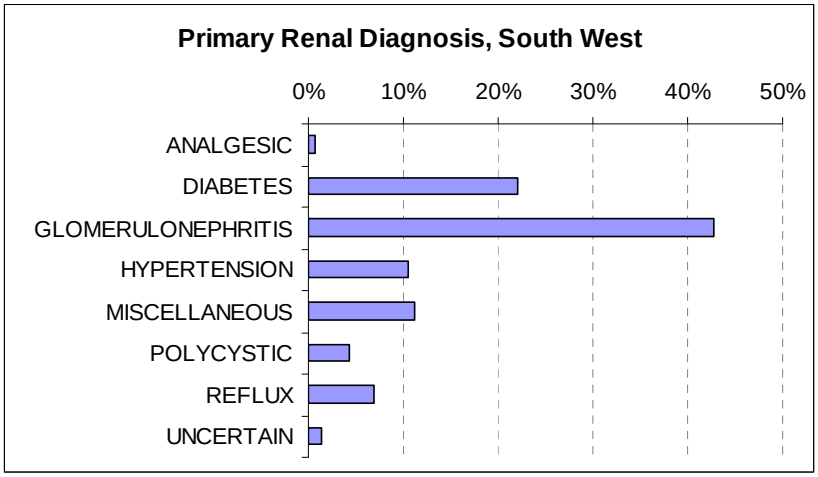
The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 41: South West

Year	Home PD	Home HD	Hospital or Satellite
2005	25.93%	0.00%	74.07%
2006	21.21%	0.00%	78.79%
2007	23.91%	0.00%	76.09%
2008	21.57%	0.00%	78.43%

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 29: Primary Renal Diagnosis, South West 2005-2008



Chronic Disease

From 1998 to 2007, the mortality rates for diabetes, cardiovascular disease, respiratory disease, injury and poisoning, alcohol-related conditions and tobacco-related conditions were all significantly higher in the combined Wheatbelt, Great Southern and South West Aboriginal population compared with the combined(Aboriginal and non-Aboriginal) State population (Table 3). The mortality rates for cancer in both males and females were similar to thel State population.

Table 3: Age standardised mortality ratio, various conditions, Wheatbelt, Great Southern and South West Aboriginal population, compared with the State population, 1998 – 2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	174.9	10.4 ^	6.8	14.4
Cardiovascular Disease	1,138.3	5.4 ^	4.6	6.3
Respiratory Disease	323.8	5.5 ^	3.9	7.3
Injury and Poisoning	93.9	2.3 ^	1.7	3.0
Mental Health Conditions	—	—	—	—
Kidney Failure	—	—	—	—
Kidney Disease	—	—	—	—
Cancer - Males	257.7	1.0	0.6	1.5
Cancer - Females	192.9	1.5	0.9	2.1
Alcohol-related	93.1	3.5 ^	2.3	4.9
Tobacco-related	382.1	4.4 ^	3.4	5.6
Other Drug-related	—	—	—	—

^ Significantly higher than the total non-Aborignal and Aboriginal State population.

Significantly lower than the total non-Aboriginal and Aboriginal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

APPENDIX 7: GREAT SOUTHERN

Albany SDU currently dialyses 11 patients. The unit has six chairs (7 machines) and is open f or one shift six days per week. The unit has the physical capacity to treat 24 patients.

The one HHD patient accesses dialysis from the Katanning hospital.

Albany has no Aboriginal patients and with the exception of one, all patients have genetic kidney disease.

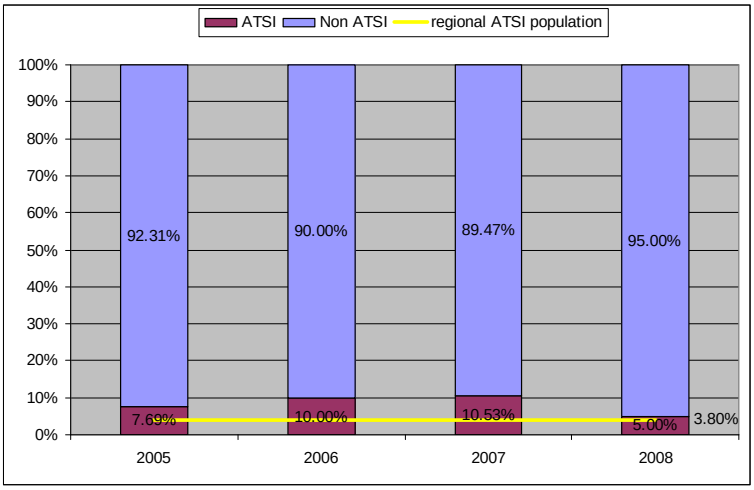
A snapshot of known dialysis clients from the Great Southern as at 31 January 2010 is shown below.

Table 42: Great Southern patients by community of origin

	Number of Patients					
Place of origin	**Albany SDU**	**In Perth requiring tertiary level care**	**In Perth awaiting placement in WACHS**	**PD**	**HHD**	**ESKD Stage 5**
Albany	8			0		4
Mt Barker		1				
Denmark				1		
Gnowangerup	1					
Katanning				2		
Kojonup	1				1	
Ongerup				1		
Hyden	1					
Tambellup				1		
n/k		1				
Total	11	2	0	5	1	4

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 30: Dialysis by ATSI , Great Southern



The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 43: Great Southern

Year	Home PD	Home HD	Hospital or Satellite
2005	38.46%	0.00%	61.54%
2006	30.00%	0.00%	70.00%
2007	36.84%	0.00%	63.16%
2008	40.00%	0.00%	60.00%

Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend.

Table 44: Dialysis prevalence projections for the Great Southern region excluding transplants by place of initial treatment.

Prevalence projections for Great Southern, 2005–2021 by Region of First Treatment

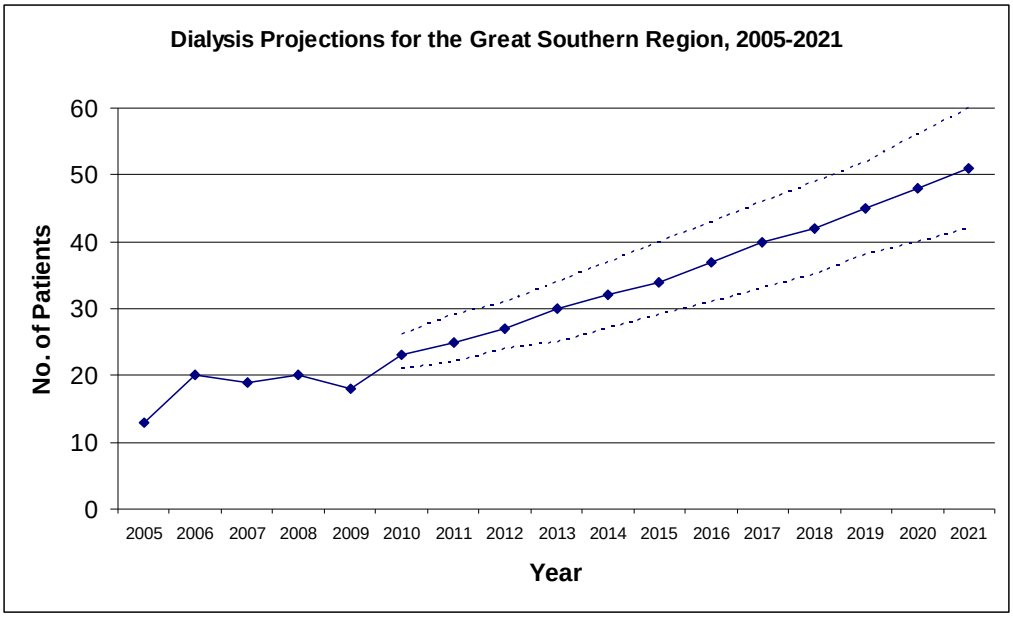
Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	23.6	25.0	13.0	-	-
2006	35.9	37.6	20.0	-	-
2007	33.8	35.1	19.0	-	-
2008	34.8	35.9	20.0	-	-
2009	31.2	31.2	18.0	-	-
2010	40.0	39.4	23.0	21.0	26.0
2011	43.0	41.7	25.0	22.0	29.0
2012	46.1	44.0	27.0	24.0	31.0
2013	49.3	46.4	30.0	25.0	34.0
2014	52.6	48.8	32.0	27.0	37.0
2015	56.1	51.4	34.0	29.0	40.0
2016	59.6	54.0	37.0	31.0	43.0
2017	63.3	56.8	40.0	33.0	46.0
2018	67.2	59.6	42.0	35.0	49.0
2019	71.1	62.4	45.0	38.0	52.0
2020	75.2	65.4	48.0	40.0	56.0
2021	79.4	68.5	51.0	42.0	60.0

Average annual increase of 5.27% significant

Trend:	significant (P < .0001)	5.27

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Great Southern population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 31: Dialysis prevalence projections for the Great Southern region excluding transplants by place of initial treatment.



Dialysis incidence for the region has been projected based on the previous 10 years of data.

Table 45: Incidence projections for the Great Southern region by place of initial treatment.

Incidence projections, Great Southern, 1998–2021 by Region of First Treatment

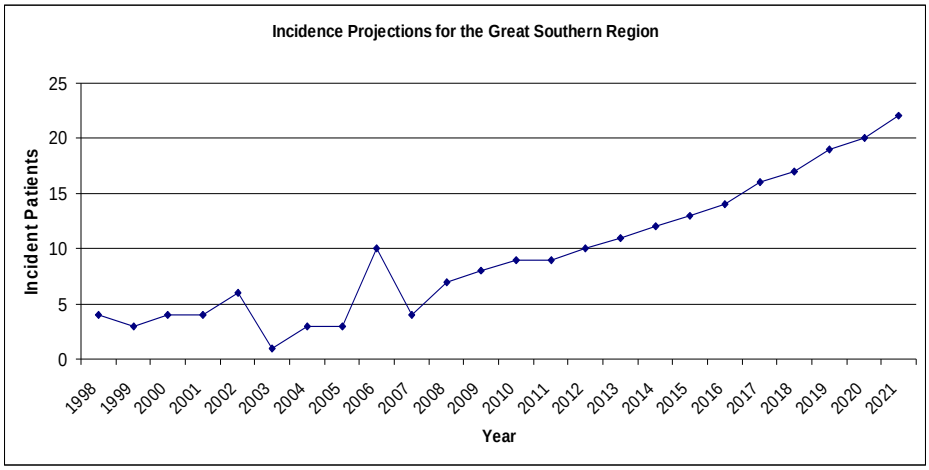
Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	8	9	4	-	-
1999	6	6	3	-	-
2000	8	8	4	-	-
2001	8	8	4	-	-
2002	11	12	6	-	-
2003	2	2	1	-	-
2004	6	6	3	-	-
2005	5	6	3	-	-
2006	18	19	10	-	-
2007	7	7	4	-	-
2008	12	12	7	-	-
2009	14	13	8	6	9
2010	15	14	9	7	10
2011	16	15	9	8	11
2012	17	16	10	8	12
2013	18	17	11	9	13
2014	20	18	12	10	14
2015	22	19	13	11	16
2016	23	20	14	12	17
2017	25	21	16	13	18
2018	27	22	17	14	20
2019	29	23	19	16	21
2020	32	25	20	17	23
2021	34	26	22	19	25

Average annual increase of 6.57% significant

Trend:	significant (P < .0001)	6.57

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Great Southern population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 32: Incidence projections for the Great Southern region by place of initial treatment.



Chronic disease

From 1998 to 2007, the mortality rates for diabetes, cardiovascular disease, respiratory disease, injury and poisoning, alcohol-related conditions and tobacco-related conditions were all significantly higher in the combined Great Southern, South West and Wheatbelt Aboriginal population compared with the combined non-Aboriginal and Aboriginal State population (Table 3). The mortality rates for cancer for both Aboriginal males and females were similar to males and females from the combined non-Aboriginal and Aboriginal State populations.

Table 3: Age standardised mortality ratio, various conditions, Great Southern, South West and Wheatbelt Aboriginal population, compared with the State population, 1998 – 2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	174.9	10.4 ^	6.8	14.4
Cardiovascular Disease	1,138.3	5.4 ^	4.6	6.3
Respiratory Disease	323.8	5.5 ^	3.9	7.3
Injury and Poisoning	93.9	2.3 ^	1.7	3.0
Mental Health Conditions	—	—	—	—
Kidney Failure	—	—	—	—
Kidney Disease	—	—	—	—
Cancer - Males	257.7	1.0	0.6	1.5
Cancer - Females	192.9	1.5	0.9	2.1
Alcohol-related	93.1	3.5 ^	2.3	4.9
Tobacco-related	382.1	4.4 ^	3.4	5.6
Other Drug-related	—	—	—	—

^ Significantly higher than the total non-Aborignal and Aboriginal State population.

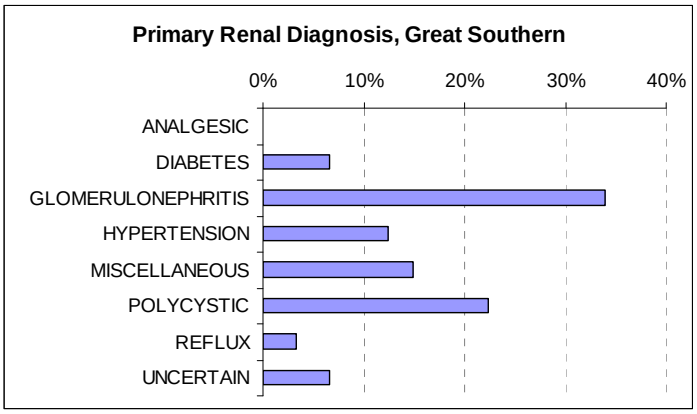
Significantly lower than the total non-Aboriginal and Aboriginal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 33: Primary Renal Diagnosis, Great Southern 2005-2008



APPENDIX 8: WHEATBELT

There is no satellite dialysis service in the Wheatbelt. Current Wheatbelt patients requiring dialysis are on home dialysis, or access treatment in Perth. As many of these patients have permanently relocated to Perth, it is not easy to identify them in the dialysis data.

A snapshot of known dialysis clients from the Wheatbelt as at 31 January 2010 is shown below.

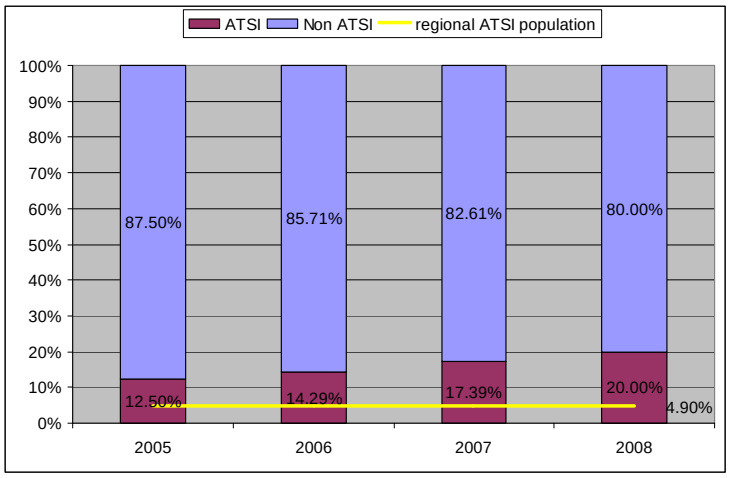
Table 46: Wheatbelt dialysis patients by community of origin

	Number of Patients				
Place of origin	**In Perth requiring tertiary level care**	**In Perth awaiting placement in WACHS**	**PD**	**HHD**	**ESKD Stage 5**
Bakers Hill			1		
Boddington				1	
Dowerin			1		
Goomalling					1
Kellerberrin			1		2
Kulin			1		1
Merredin					1
Moora		2*			2
Northam		1*	3		1
Quairading		1*	2		
Toodyay			1		
Wyalkatchem			1		
Wundowie			1		1
n/k			1		
TOTAL		**4****	**13**	**1**	**10**

*commutes
** additional Wheatbelt patients who have relocated to Perth for dialysis are not known.

The figure below indicates the proportion of Aboriginal clients on dialysis compared with the regional Aboriginal population.

Figure 34: Dialysis by ATSI , Wheatbelt



The breakdown of dialysis modality for clients from the region over the last three years is as follows.

Table 47: Wheatbelt

Year	Home PD	Home HD	Hospital or Satellite
2005	29.17%	8.33%	62.50%
2006	35.71%	7.14%	57.14%
2007	52.17%	8.70%	39.13%
2008	44.00%	4.00%	52.00%

Dialysis prevalence for the years 2010-2021 has been projected based on a five year trend.

Table 48: Dialysis prevalence projections for the Wheatbelt region excluding transplants by place of initial treatment.

Prevalence Projections for Wheatbelt, excluding transplants by Region of First Treatment

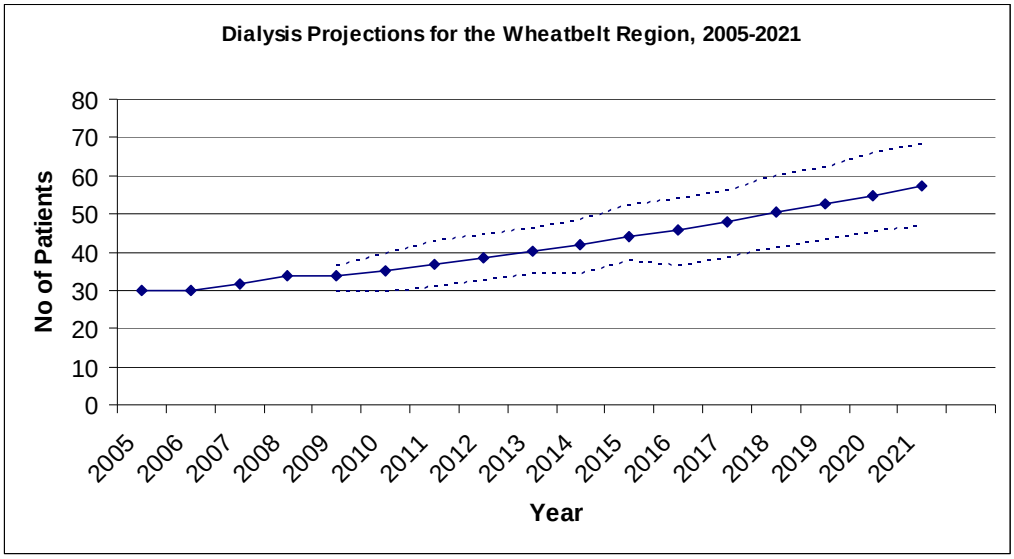
Year	Crude rate	Standardised rate	CASES	LCI	UCI
2005	32.6	34.0	24.0	-	-
2006	38.0	39.0	28.0	-	-
2007	31.1	31.3	23.0	-	-
2008	33.3	33.3	25.0	-	-
2009	32.3	32.5	25.0	22.0	27.0
2010	32.1	32.2	25.0	21.0	28.0
2011	32.0	32.1	25.0	21.0	29.0
2012	32.1	32.3	25.0	21.0	29.0
2013	32.4	32.7	26.0	22.0	30.0
2014	32.9	33.3	27.0	22.0	31.0
2015	33.5	34.2	27.0	23.0	32.0
2016	34.4	35.2	29.0	23.0	34.0
2017	35.5	36.5	30.0	24.0	35.0
2018	38.0	38.9	32.0	26.0	38.0
2019	39.3	40.3	34.0	28.0	40.0
2020	40.7	41.8	35.0	29.0	42.0
2021	42.1	43.2	37.0	30.0	44.0

Average annual increase of 1.31% significant

Trend:	significant (P < .0001)	1.31

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Wheatbelt population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 35: Dialysis prevalence projections for the Wheatbelt region excluding transplants by place of initial treatment.



Dialysis incidence for the region has been projected based on the previous 10 years of data.

Table 49: Incidence projections for the Wheatbelt region by place of initial treatment.

Incidence projections, Wheatbelt, 1998–2021 by Region of First Treatment

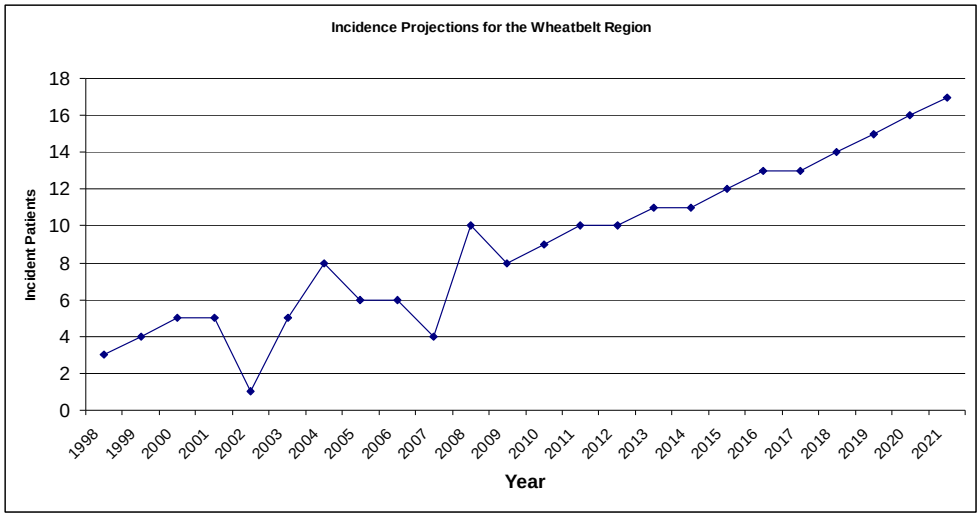
Year	Crude rate	Standardised rate	CASES	LCI	UCI
1998	4	5	3	-	-
1999	5	6	4	-	-
2000	7	9	5	-	-
2001	7	8	5	-	-
2002	1	2	1	-	-
2003	7	7	5	-	-
2004	11	11	8	-	-
2005	8	8	6	-	-
2006	8	8	6	-	-
2007	5	5	4	-	-
2008	13	13	10	-	-
2009	11	11	8	8	9
2010	12	12	9	8	10
2011	12	12	10	9	10
2012	13	13	10	9	11
2013	13	13	11	10	11
2014	14	14	11	11	12
2015	15	15	12	11	13
2016	15	15	13	12	14
2017	16	16	13	13	14
2018	17	16	14	13	15
2019	17	17	15	14	16
2020	18	18	16	15	17
2021	19	18	17	16	18

Average annual increase of 5.49% significant

Trend:	significant (P < .0001)	5.49

Crude	Crude rate
ASR	Age standardised rate (Standardised to the total 2008 Wheatbelt population) per 100,000
Cases	Actual and estimated cases
LCI	Lower confidence interval for the cases
UCI	Upper confidence interval for the cases
Trend	Average annual change (per cent)
Regression Method	Linear Regression Method used
Cases	Attributed to the Region based on Region of First Treatment

Figure 36: Incidence projections for the Wheatbelt region by place of initial treatment.



Chronic Disease

From 1998 to 2007, the mortality rates for diabetes, cardiovascular disease, respiratory disease, injury and poisoning, alcohol-related conditions and tobacco-related conditions were all significantly higher in the combined Wheatbelt, Great Southern and South West Aboriginal population compared with the combined(Aboriginal and non-Aboriginal) State population (Table 3). The mortality rates for cancer in both males and females were similar to thel State population.

Table 3: Age standardised mortality ratio, various conditions, Wheatbelt, Great Southern and South West Aboriginal population, compared with the State population, 1998 – 2007

Condition	ASR per 100,000 persons	Rate Ratio	LCI	UCI
Diabetes	174.9	10.4 ^	6.8	14.4
Cardiovascular Disease	1,138.3	5.4 ^	4.6	6.3
Respiratory Disease	323.8	5.5 ^	3.9	7.3
Injury and Poisoning	93.9	2.3 ^	1.7	3.0
Mental Health Conditions	—	—	—	—
Kidney Failure	—	—	—	—
Kidney Disease	—	—	—	—
Cancer - Males	257.7	1.0	0.6	1.5
Cancer - Females	192.9	1.5	0.9	2.1
Alcohol-related	93.1	3.5 ^	2.3	4.9
Tobacco-related	382.1	4.4 ^	3.4	5.6
Other Drug-related	—	—	—	—

^ Significantly higher than the total non-Aborignal and Aboriginal State population.

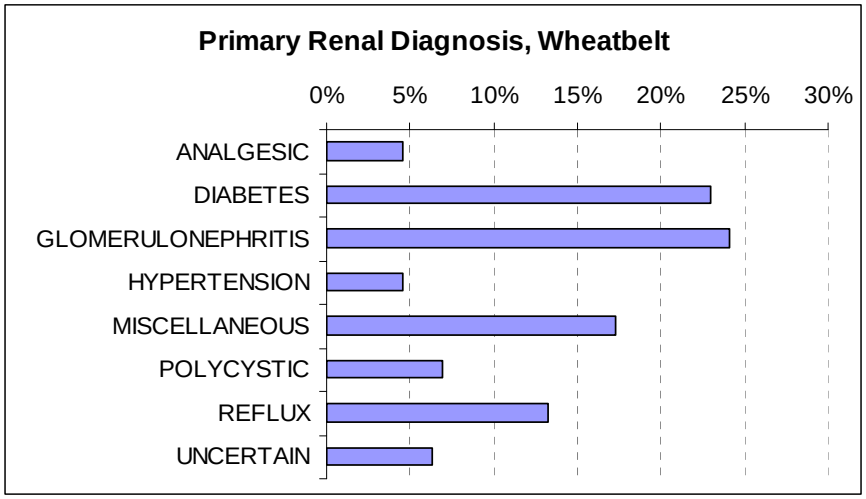
Significantly lower than the total non-Aboriginal and Aboriginal State population.

– Numbers too low to accurately report the Rate Ratio.

Source: ABS Mortality Data and WA Cancer Registry.

The primary renal diagnosis based on 2008 ANZDATA is as follows.

Figure 37: Primary Renal Diagnosis, Wheatbelt 2005-2008



APPENDIX 9: SATELLITE UNIT DEPENDENCY CRITERIA

This appendix is the appendix 6 in the WA Plan for Renal Dialysis Services, 2008-2013.

Satellite Dialysis Unit - Dependency and Referral Criteria

In 2005 a set of suitability and dependency criteria for haemodialysis patients was established by the South Metropolitan Renal Service to determine appropriateness of referral to Satellite Dialysis Units (SDU).

The objective of the **suitability criteria** was to develop standardised criteria allowing potential new or temporary patients to be assessed prior to arrival to ensure safety and quality of patient care is maintained. The objective of the **dependency criteria** was to develop standardised criteria to assess the dependency levels of each current patient of a SDU to establish safe nursing staff to patient ratio and to determine the distribution of patients from each category level that can be accommodated each shift.

1. SUITABILITY CRITERIA

Compliance with the following criteria has been regarded as **mandatory** *prior to transfer* of patients to the SDU:

- A dependency scoring based on criteria outlined #2 of <12 (category 1 and 2)
- A well functioning vascular access with BFR≥250ml/min (Hickman Lines: BFR≥200-250).
- Patients have received the first dose of EPO and intravenous iron medications.
- A medical assessment including a current fluid assessment and medication review, particularly antihypertensives. This assessment should indicate that patients will be
  - Medically stable whist dialysing – ie requiring infrequent nursing intervention
  - Requiring infrequent medical review – ie monthly or less frequently
- Transport arrangements organised, if required, specific appointment with social worker.

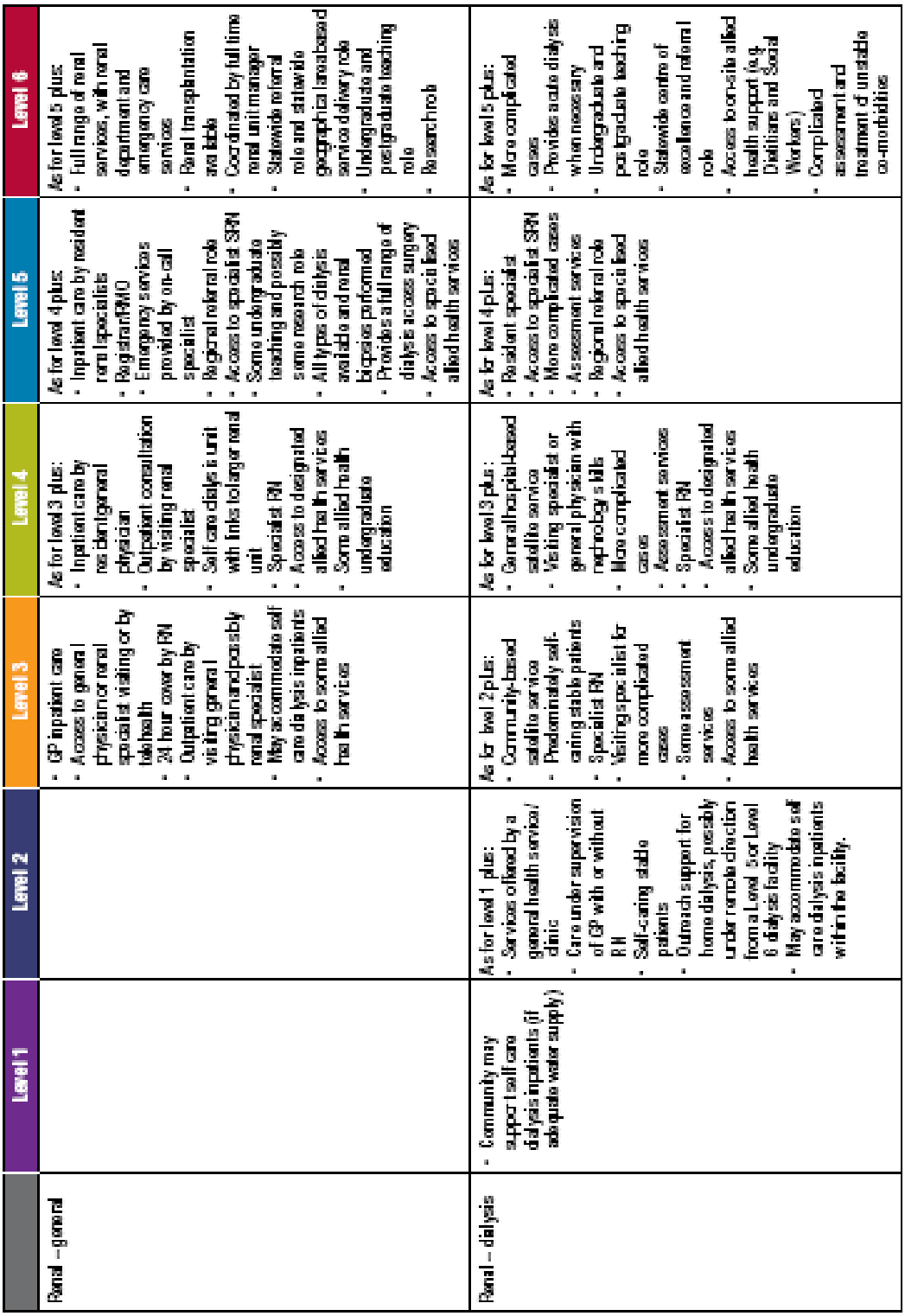
3. DEPENDENCY CRITERIA

The following ***quantitative criteria*** have been tabled to determine the level of dependency of the satellite patient. Score to be added to determine category rating.

Training	Independent	1
	Requires assistance/in training	2
	Not able to train	3
Mobility	Mobilise independently	1
	Standby assistance nurse/relative	2
	Dependent on staff for mobility	3
Perform Physical tasks	Sets up chair, table and drink	1
	Partner sets up above	2
	Staff perform all tasks	3
Transport	Independent	1
	Transport organised, occ problems	2
	Nursing staff organise all transport	3
Haemodynamic stability	Maintains BP through treatment	1
	Occasionally drops BP	2
	Regular hypotensive episodes	3
Medical intervention	Three month review only	1
	Occasionally requires review	2
	Requires constant review of condition	3

Category	Level of care	Score
1	Independent	≤7
2	Intermediate	8 - 11
3	High dependence	≥12

APPENDIX 10: CLINICAL FRAMEWORK DEFINITIONS



	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Renal – general			• GP inpatient care • Access to general physician or renal specialist visiting or by telehealth • 24 hour cover by RN • Outpatient care by visiting general physician and possibly renal specialist • May accommodate self care dialysis inpatients • Access to some allied health services	As for level 3 plus: • Inpatient care by resident general physician • Outpatient consultation by visiting renal specialist • Self care dialysis unit with links to larger renal unit • Specialist RN • Access to designated allied health services • Some allied health undergraduate education	As for level 4 plus: • Inpatient care by resident rural specialists • Registrar/RMO • Emergency services provided by on-call specialist • Regional referral role • Access to specialist SRN • Some undergraduate teaching and possibly some research role • All types of dialysis available and renal biopsies performed • Provides a full range of dialysis access surgery • Access to specialised allied health services	As for level 5 plus: • Full range of renal services, with renal department and emergency care services • Renal transplantation available • Coordinated by full time renal unit manager • Statewide referral role and statewide geographical area based service delivery role • Undergraduate and postgraduate teaching role • Research hub
Renal – dialysis	• Community may support self care dialysis inpatients (if adequate water supply)	As for level 1 plus: • Services offered by a general health service / clinic • Care under supervision of GP with or without RN • Self-caring stable patients • Outreach support for home dialysis, possibly under remote direction from a Level 5 or Level 6 dialysis facility • May accommodate self care dialysis inpatients within the facility.	As for level 2 plus: • Community-based satellite service • Predominately self-caring stable patients • Specialist RN • Visiting specialist for more complicated cases • Some assessment services • Access to some allied health services	As for level 3 plus: • General hospital-based satellite service • Visiting specialist or general physician with nephrology skills • More complicated cases • Assessment services • Specialist RN • Access to designated allied health services • Some allied health undergraduate education	As for level 4 plus: • Resident specialist • Access to specialist SRN • More complicated cases • Assessment services • Regional referral role • Access to specialised allied health services	As for level 5 plus: • More complicated cases • Provides acute dialysis when necessary • Undergraduate and postgraduate teaching role • Statewide centre of excellence and referral role • Access to on-site allied health support (e.g. Dietitians and Social Workers) • Complicated assessment and treatment of unstable co-morbidities