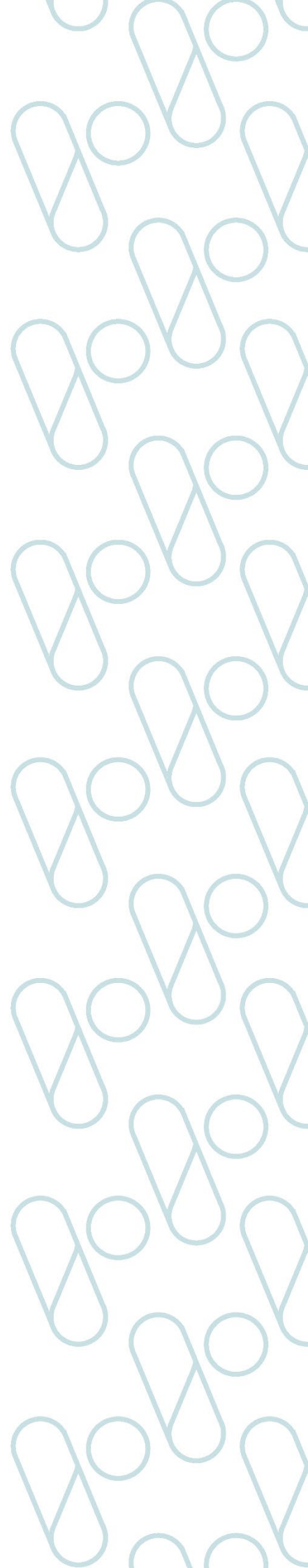


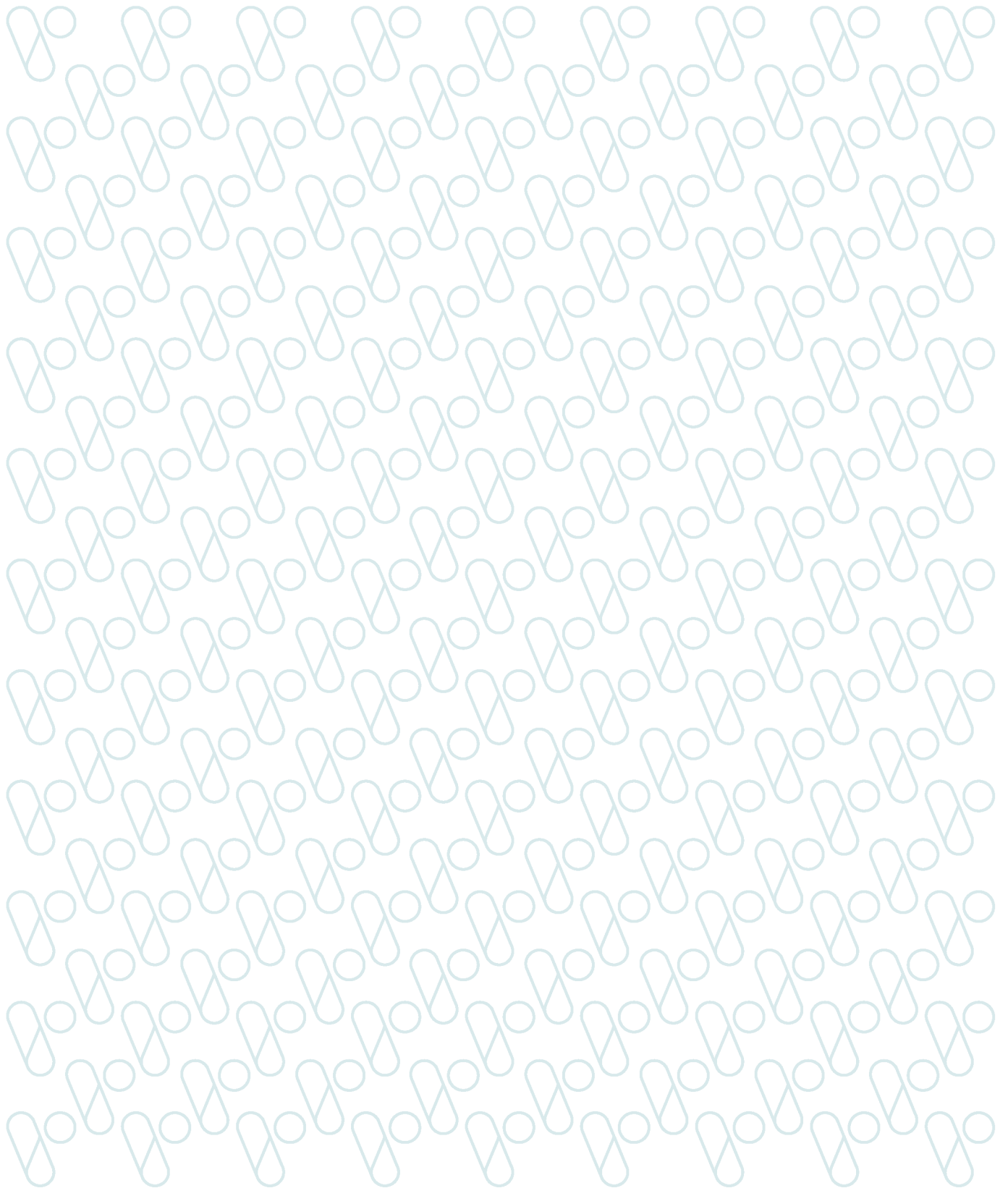


Renal
Clinical Network

Victorian renal key performance indicators

Quarter 2 2018 report





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List of abbreviations

AVF	Arteriovenous Fistula
AVG	Arteriovenous Graft
CKD	Chronic Kidney Disease
ESKD	End Stage Kidney Disease
HD	Haemodialysis
KHA-CARI	Kidney Health Australia Caring for Australasians with Renal Impairment
KPI	Key Performance Indicator
PD	Peritoneal Dialysis
RRT	Renal Replacement Therapy
RCN	Renal Clinical Network

Introduction

Since 2011 the Renal Clinical Network (RCN) has developed and implemented indicators to measure the performance of Victoria's renal services, through the renal key performance indicator (KPI) working group. These indicators aim to drive service improvement and increase efficiency and consistency through transparent comparison of agency performance.

The renal KPI working group includes a range of health professionals focused on improving the care of patients with chronic kidney disease (CKD). The group developed four KPIs related to CKD and dialysis. The RCN renal transplant working group developed another two KPIs related to renal transplantation.

All six KPIs were formally endorsed by the RCN leadership group in 2012 (Appendix 2). Data is collected monthly by Safer Care Victoria (SCV) through a specially designed website portal. Each health service CEO has given formal permission to participate in the data collection and benchmarking program.

In January 2018, the renal KPI working group became part of the broader RCN Insight subcommittee. The current members of the Insight committee are listed in Appendix 1. They come together at the end of each quarter to analyse the data and ensure the indicators are accurate, meaningful and relevant. Each indicator has clear definitions, parameters and targets set. Targets may be changed as performance evolves and will be assessed by the Insight subcommittee.

SCV oversees the data entry and puts together the quarterly reports. This report is the 21st edition and reviews data from July 2017 to June 2018.

We want to ensure this report meets the needs of health services and provides a useful basis for renal service evaluation.

If you have any feedback on this report, get in touch:

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Performance

KPI 1: PROPORTION OF NEW, PLANNED PATIENTS WHO HAVE RECEIVED CKD EDUCATION BEFORE STARTING DIALYSIS

Definition

The percentage of patients that attended a Chronic Kidney Disease (CKD) education session that is documented in their medical record, before commencement of renal replacement therapy (RRT).

Target

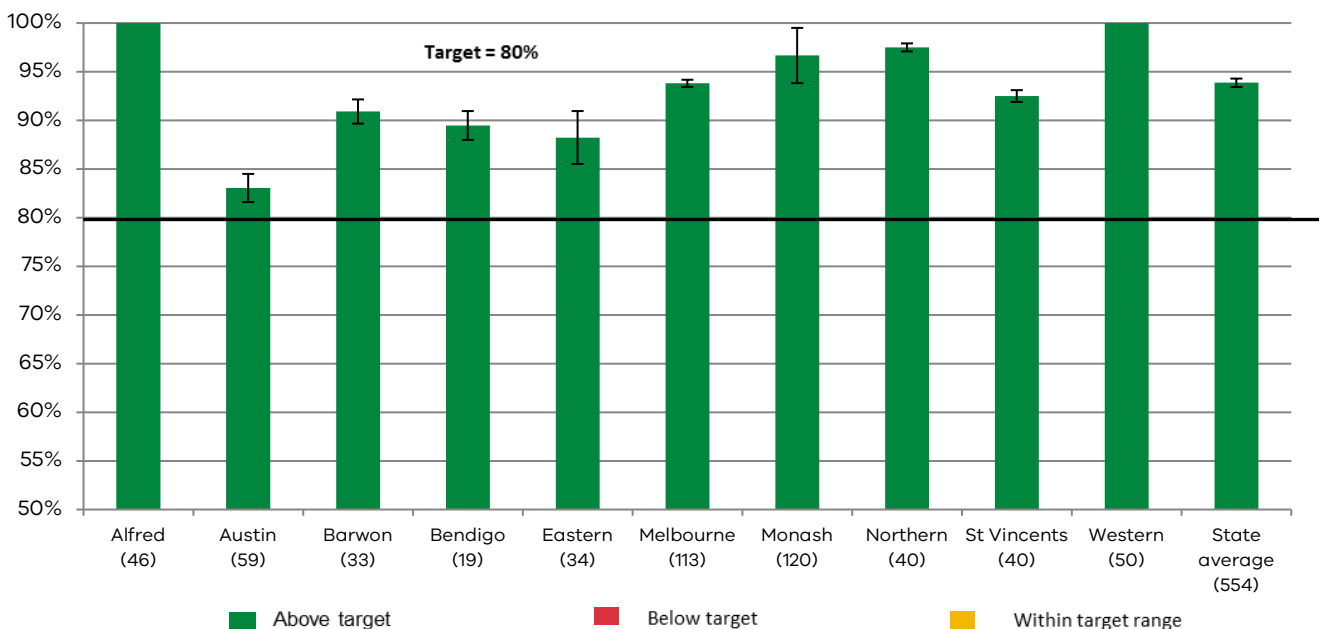
80 per cent of new, planned patients who start dialysis have attended a CKD education session.

Exclusions

- Late referrals (patients commencing dialysis within three months of first renal consultation).
- Patients returning to dialysis with a failed transplant.

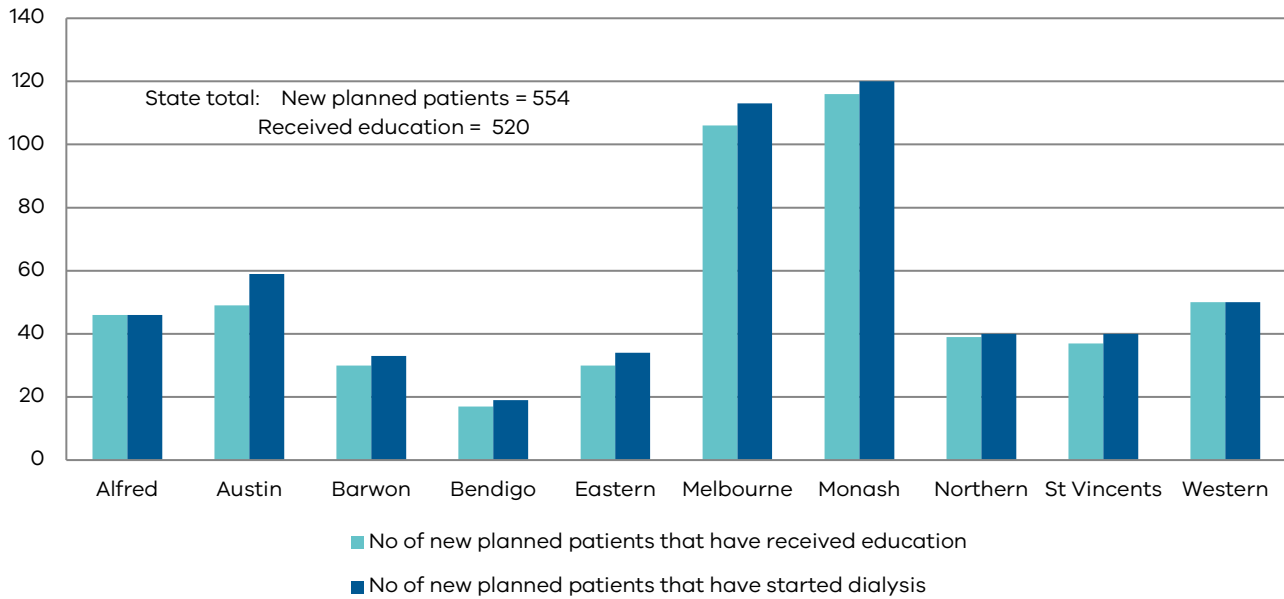
Results

KPI 1 - Percentage of new planned patients to receive CKD education before starting dialysis



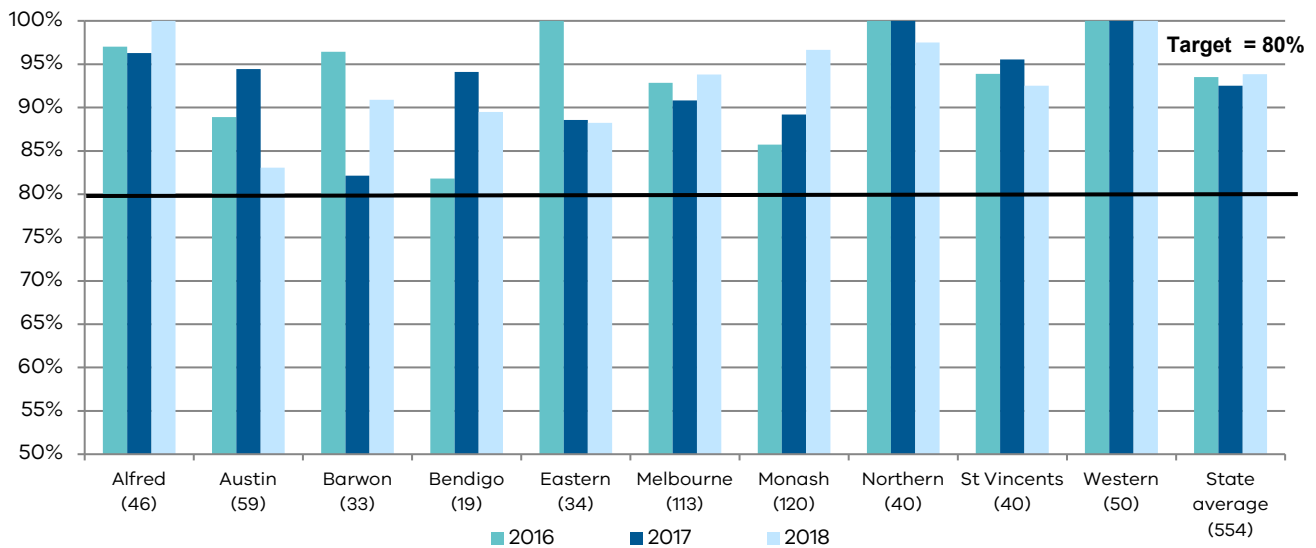
All confidence intervals used in this document are specified at the 95 per cent level.

KPI 1 - Number of new planned patients to receive CKD education before starting dialysis



Note: Results based upon data for the period Jul 2017 - Jun 2018

KPI 1 - Percentage of new planned patients to receive CKD education before starting dialysis 2016 - 2018



Note: Results showing trend over time: based on 12-month averages for the previous 3 years. 2018 (Jul 17 - Jun 18), 2017 (Jul 16 - Jun 17) and 2016 (Jul 15 - Jun 16)

KPI 2: PROPORTION OF NEW, PLANNED RRT PATIENTS (EXCLUDING PRE-EMPTIVE LIVE DONOR TRANSPLANTS WITHIN 2 WEEKS OF TRANSPLANT) WHO SUCCESSFULLY USE AN ARTERIOVENOUS FISTULA OR GRAFT ACCESS AT FIRST HD TREATMENT

Definition

The percentage of new planned renal replacement therapy (RRT) patients that started treatment using an arteriovenous fistula (AVF) or arteriovenous graft (AVG).

Target

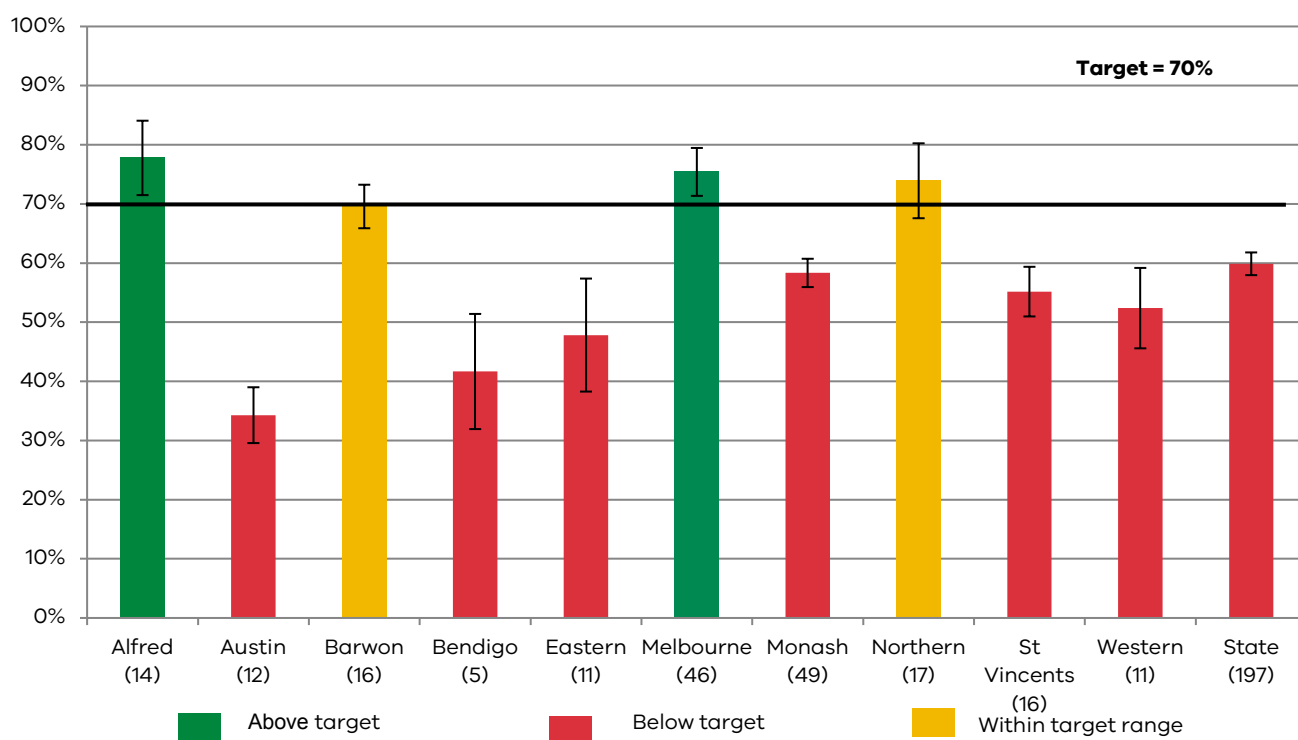
70 per cent of new planned dialysis patients use a vascular access at first treatment.

Exclusions

- Late referrals (patients commencing dialysis within three months of first renal consultation).
- Patients with a failed transplant or transferring from peritoneal dialysis (PD).

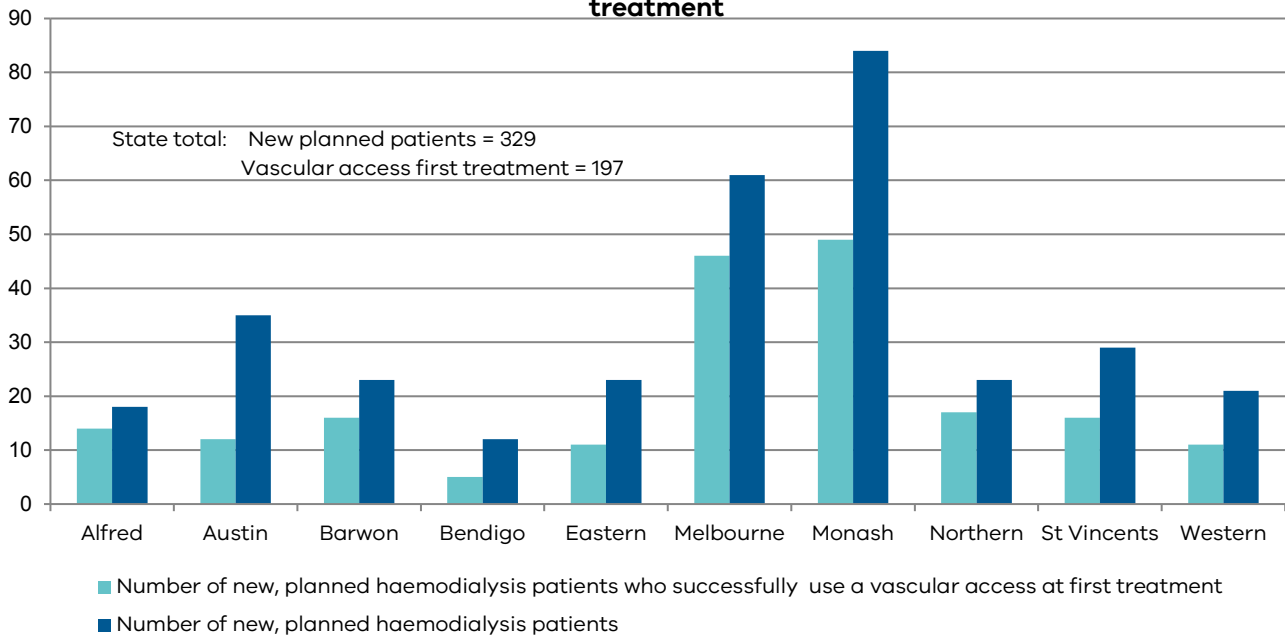
Results

KPI 2 - Percentage of patients that successfully used a vascular access at first HD treatment



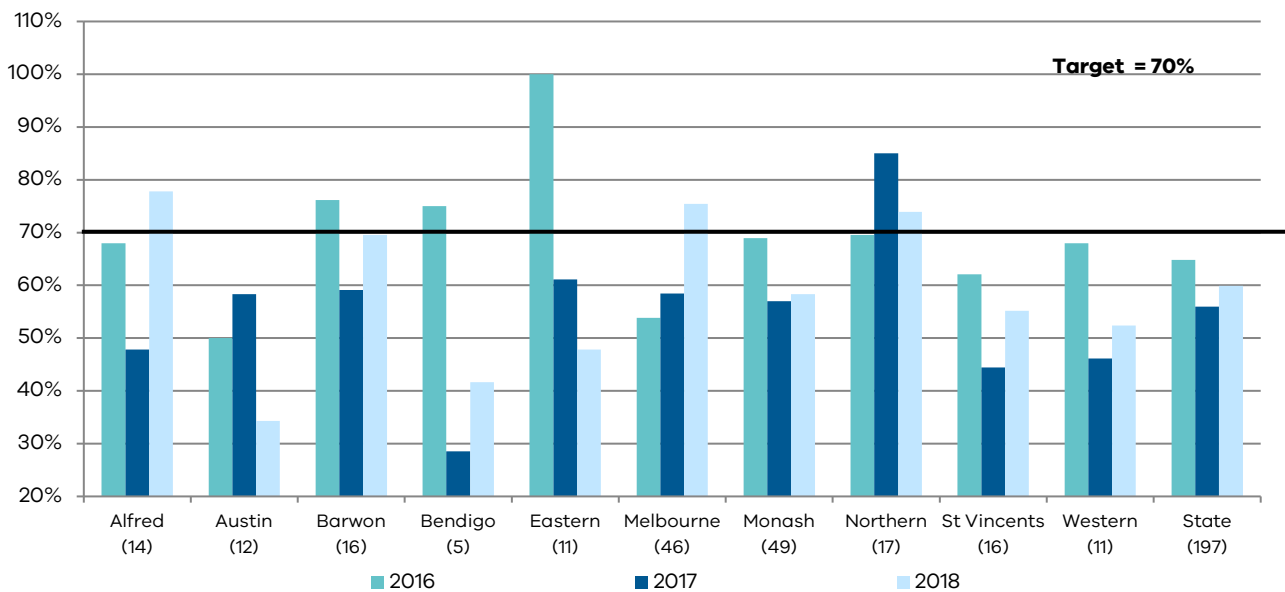
Note: Results based upon data averaged for the period Jul 2017 - Jun 2018.

KPI 2 - Number of patients that successfully used a vascular access at first HD treatment



Note: Results based upon data for the period Jul 2017 - Jun 2018

KPI 2 - Percentage of patients that successfully used a vascular access at first HD treatment



Note: Results showing trend over time: based on 12-month averages for the previous 3 years. 2018 (Jul 17 - Jun 18), 2017 (Jul 16 - Jun 17) and 2016 (Jul 15 - Jun 16)

KPI 3 PROPORTION OF DIALYSIS PATIENTS WHO ARE DIALYSING AT HOME

Definition

- Incident patients – the percentage of patients who are dialysing at home within six months of starting dialysis (out of total patients who started dialysis in the six months prior)
- Prevalent patients – the overall percentage of patients who are dialysing at home.

Target

- (i) Incident patients – 35 per cent of dialysis patients are on home dialysis within six months of starting dialysis
- (ii) Prevalent patients – 35 per cent of dialysis patients are on home dialysis.

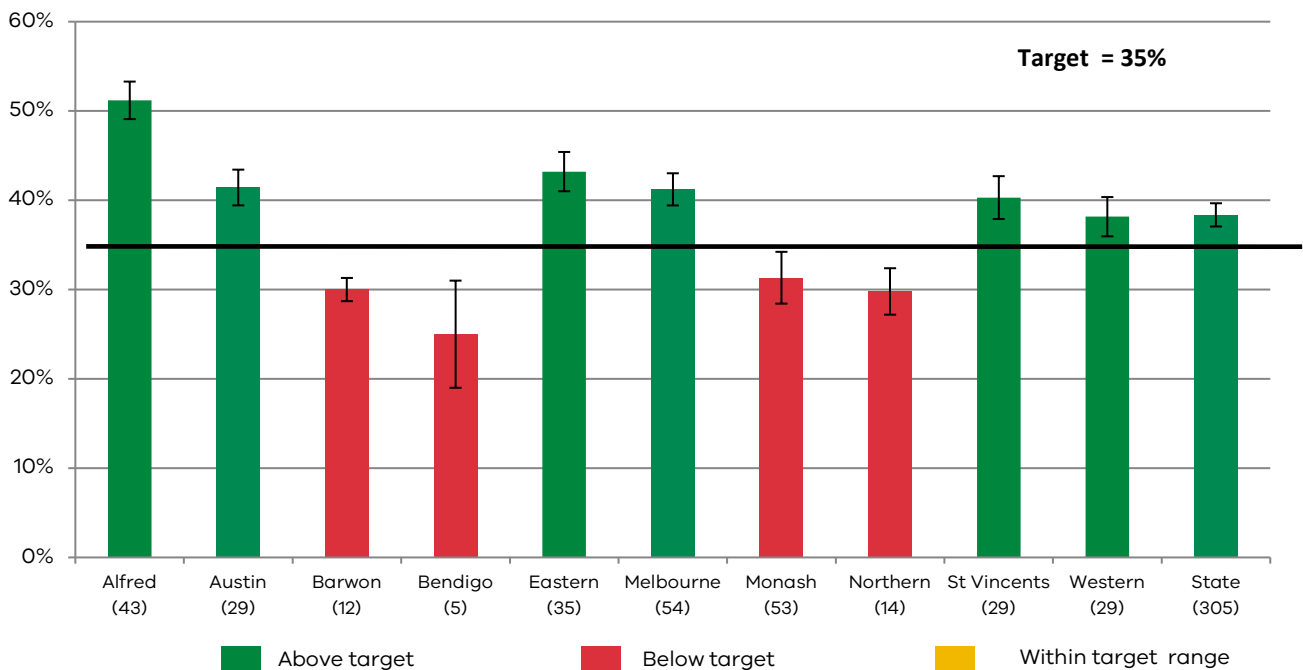
Exclusions

Patients who are in home training units.

Results

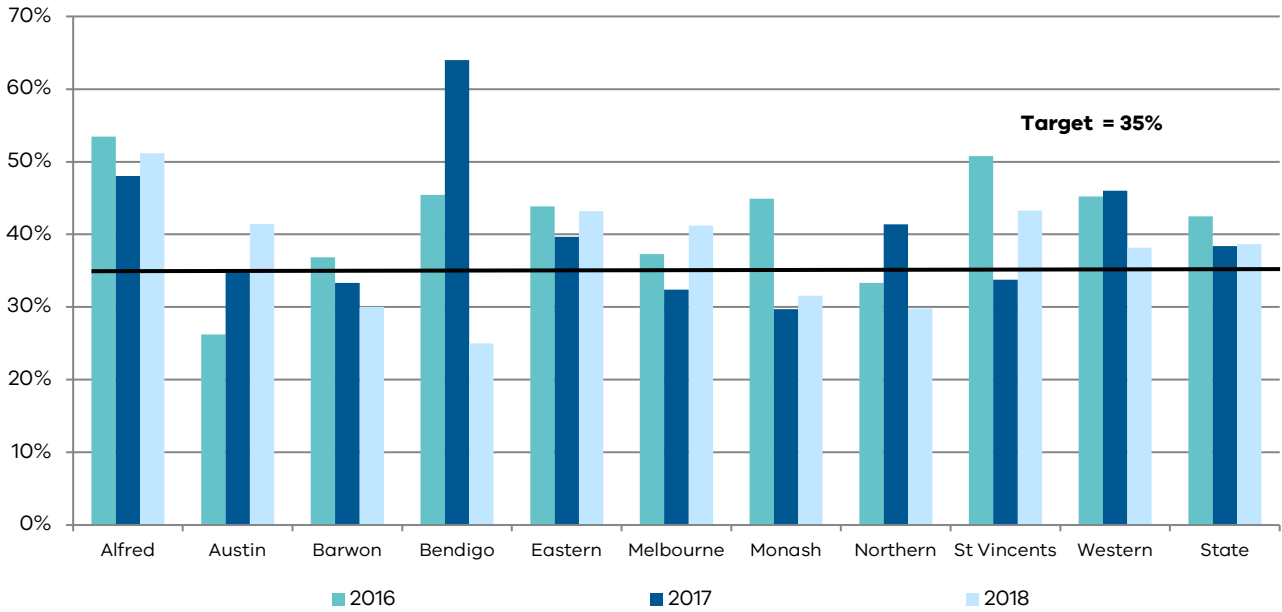
Incidence

KPI 3 - Incidence percentage of home dialysis patients



Note: Above graph represents the home incidence rate averaged for the 12 months of Jul 2017 - Jun 2018

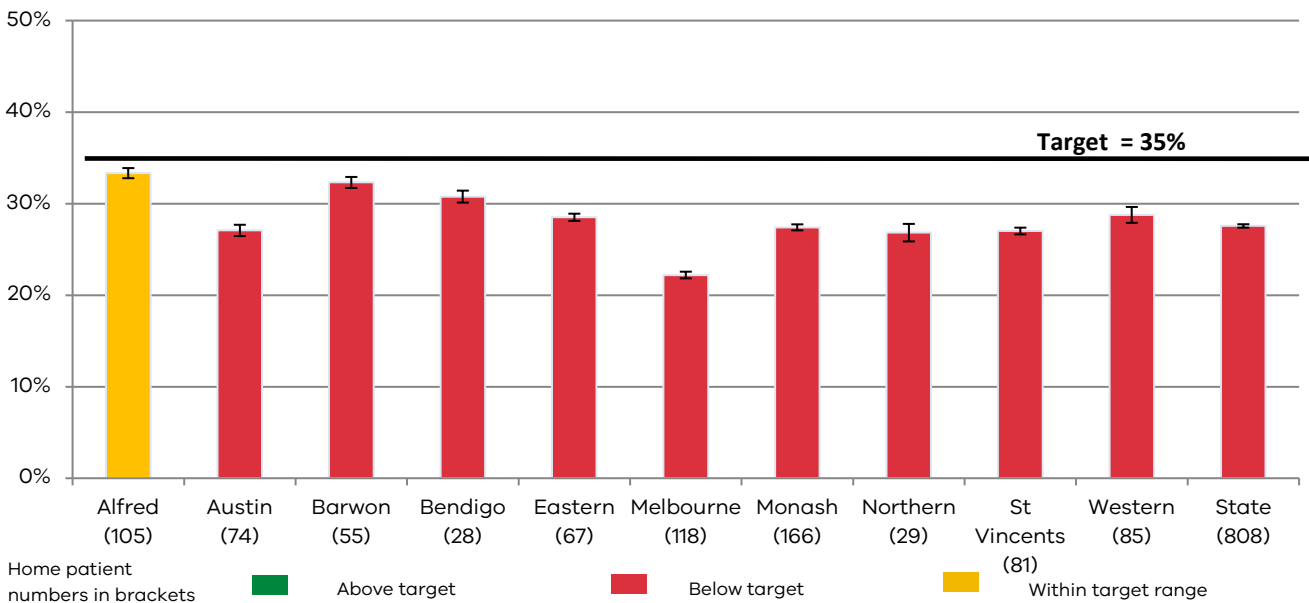
KPI 3 - Incidence percentage of home dialysis patients



Note: Results showing trend over time: based on 12 month averages for the previous 3 years. 2018 (Jul 17 – Jun 18), 2017 (Jul 16 – Jun 17) and 2016 (Jul 15 – Jun 16)

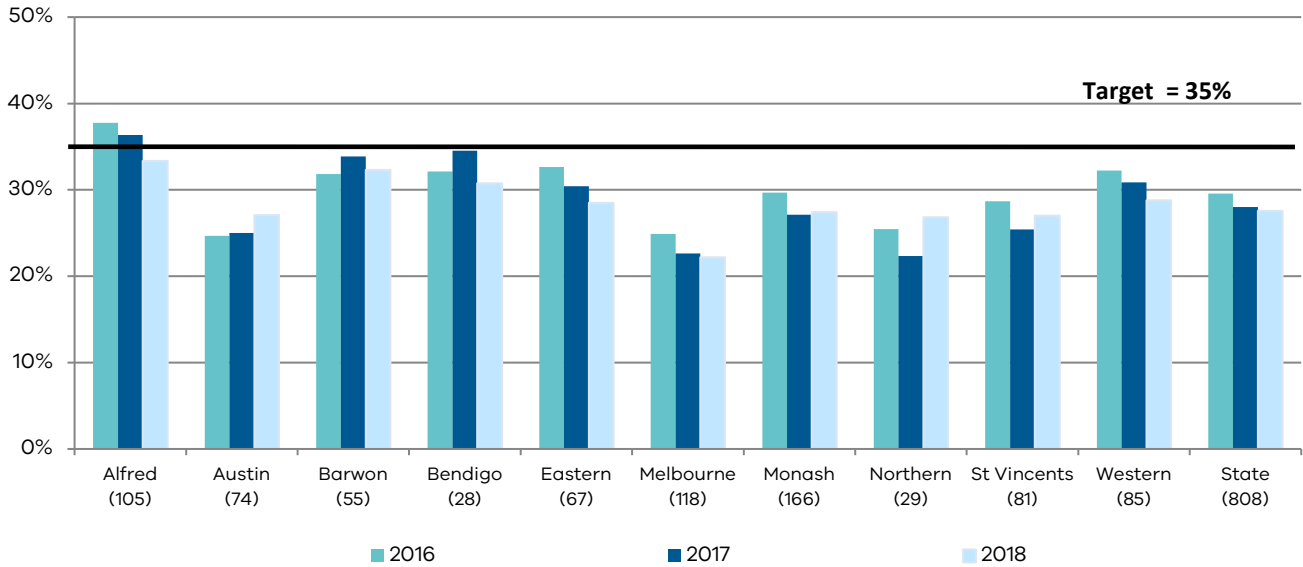
Prevalence

KPI 3 - Prevalence percentage of home dialysis patients



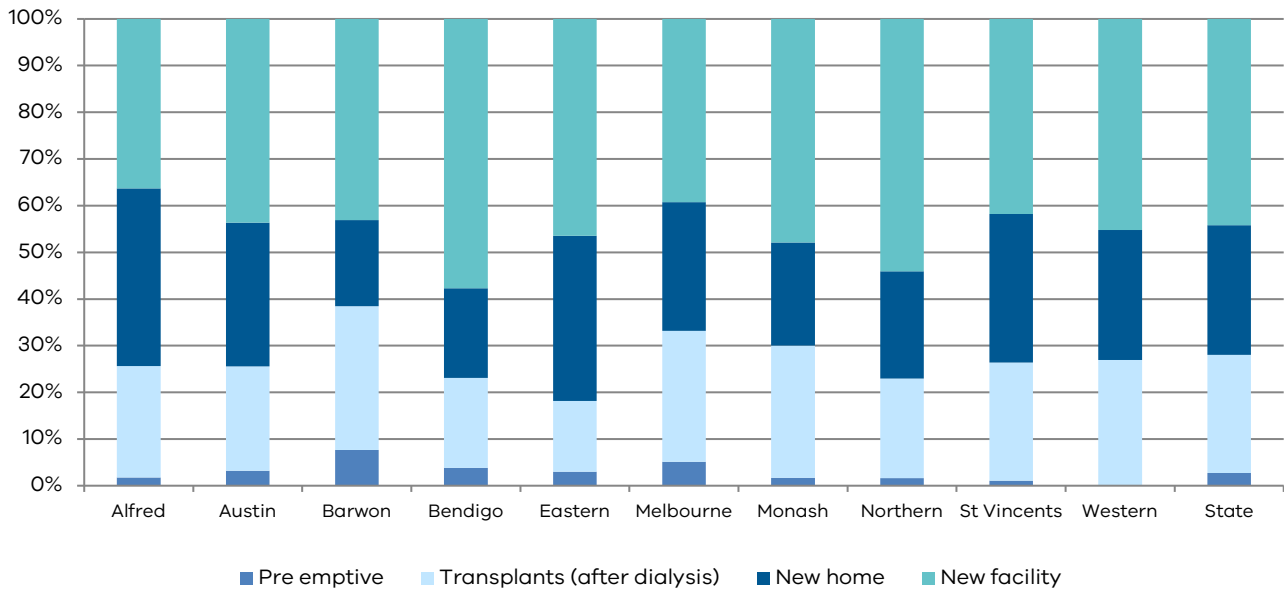
Note: Above graph represents the home prevalence rate averaged for the 12 months of Jul 2017 - Jun 2018

KPI 3 - Prevalence percentage of home dialysis patients



Note: Results showing trend over time: based on 12 month averages for the previous 3 years. 2018 (Jul 17 – Jun 18), 2017 (Jul 16 – Jun 17) and 2016 (Jul 15 – Jun 16).

% of transplant / dialysis outcomes for Jul 2017 - Jun 2018



The above graph demonstrates the percentage of all renal replacement therapy options at each hub in the twelve months to June 2018.

KPI 4: PERITONITIS RATES OF EACH HUB SERVICE

Definition

The average number of months between peritonitis episodes.

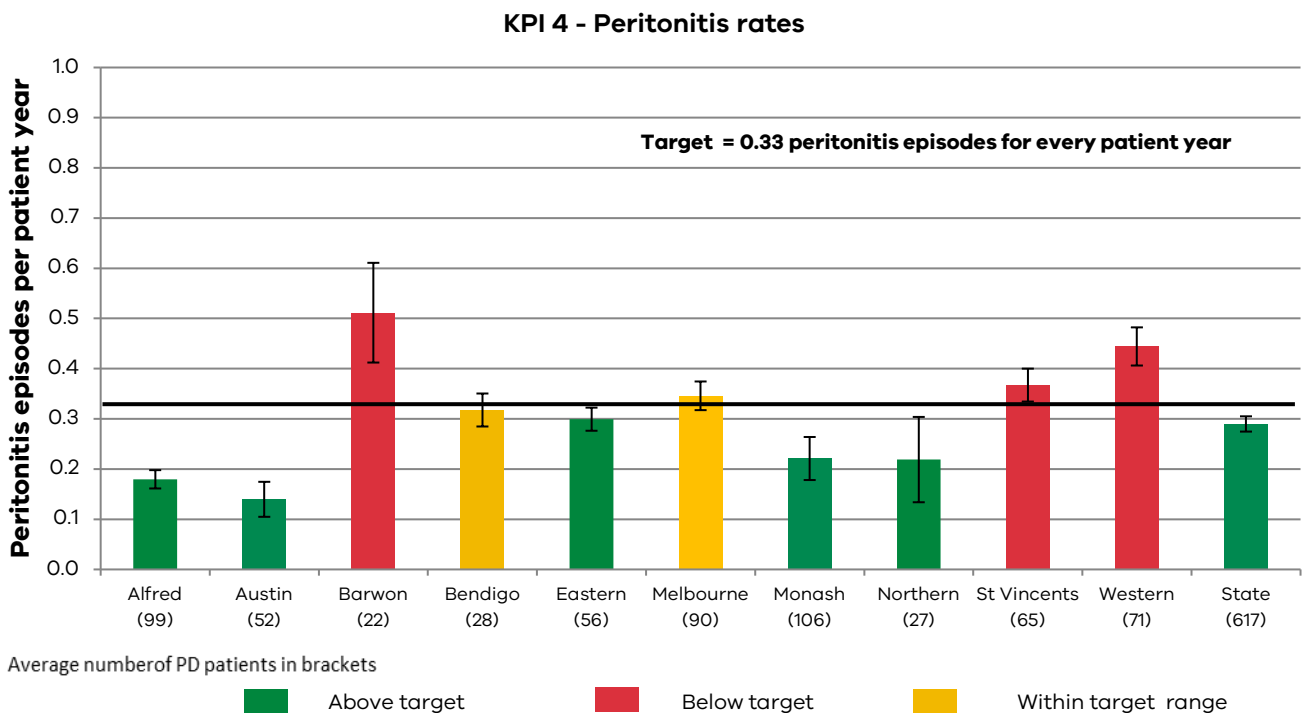
Target

A maximum of 0.33 peritonitis episodes for every patient year.

Exclusions

Patients who have a catheter in situ but are still pre-dialysis.

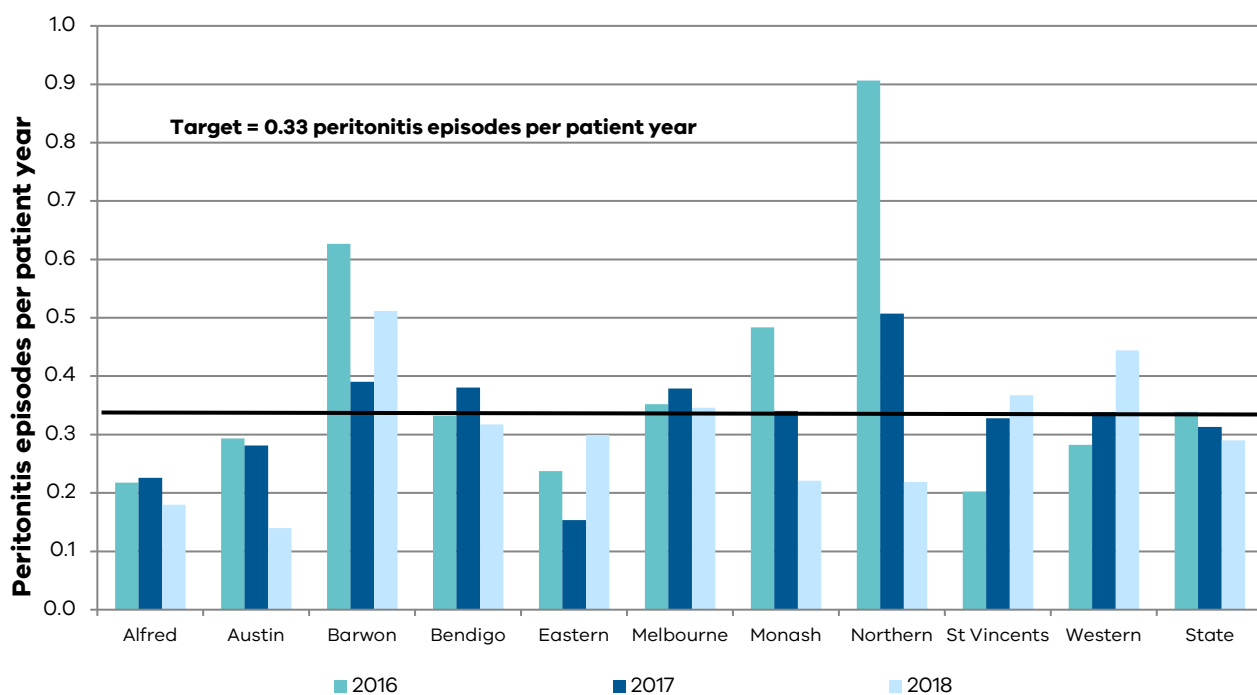
Results



Note: Results based upon data average for the period Jul 2017 - Jun 2018

Improved hub performance in this KPI is reflected in a smaller bar in the above graph. If better than the benchmark value of 0.33 peritonitis episodes per patient year the bar is shaded green and reported as "better than target"

KPI 4 - Peritonitis Rates (2016 to 2018 yearly rates)



Note: Results showing trend over time: based on 12-month averages for the previous 3 years. 2018 (Jul 17 – Jun 18), 2017 (Jul 16 – Jun 17) and 2016 (Jul 15 – Jun 16)

The International Society of Peritoneal Dialysis (ISPD) 2016 guidelines recommended the peritonitis rate should be reported as number of episodes per patient year. This is a change from the peritonitis episodes per month of the previous five reporting years. The ISPD have also recommended 0.5 episodes per year at risk as the minimum guideline for peritonitis incidence. However, as part of a continuous quality improvement program the RCN recommended the target be lowered to 0.33 episodes per year at risk. Note lower results reported for this KPI represent better performance. Currently five hub services are now performing above the benchmark standard (i.e below target) while the state average remains below the target range.

KPI 5: PROPORTION OF NEW LIVE DONOR TRANSPLANTS THAT ARE PRE-EMPTIVE

Definition

The percentage of new live donor transplants that are pre-emptive (in which the patient requires less than two weeks of dialysis).

Target

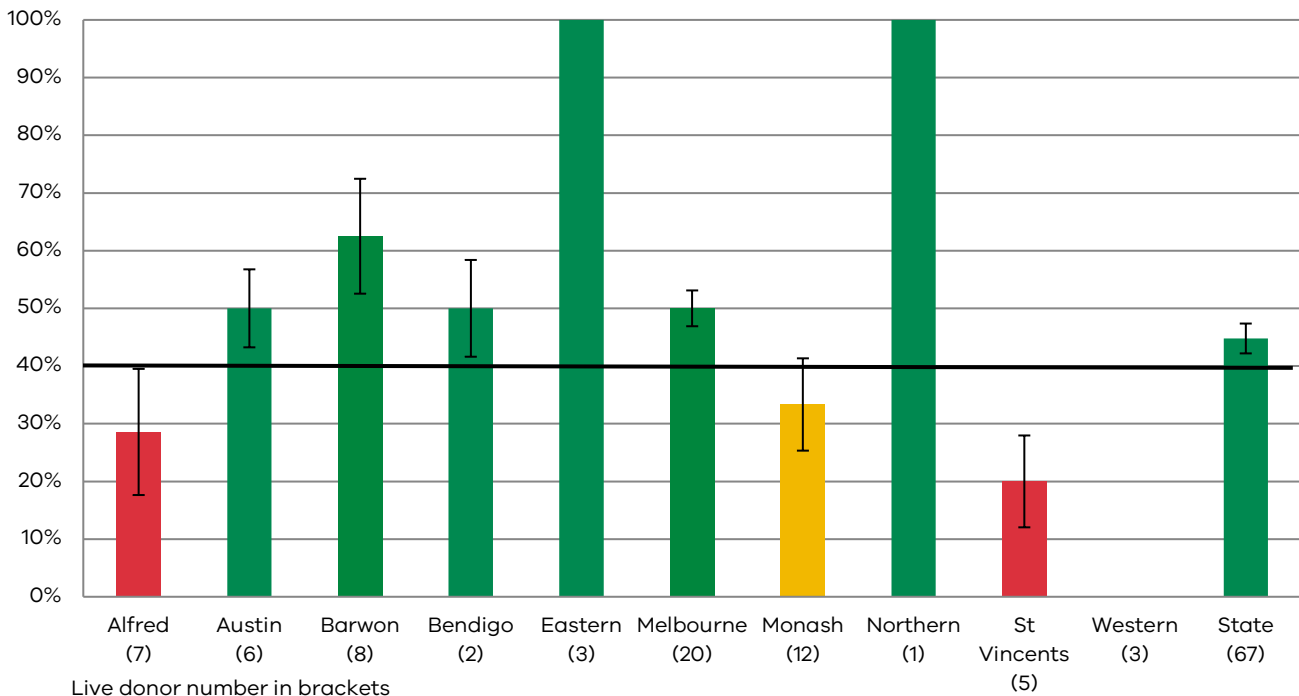
40 per cent of new live donor transplants are pre-emptive.

Exclusions

- Patients with failed transplants recommencing RRT.
- Patients having a combined organ transplant.

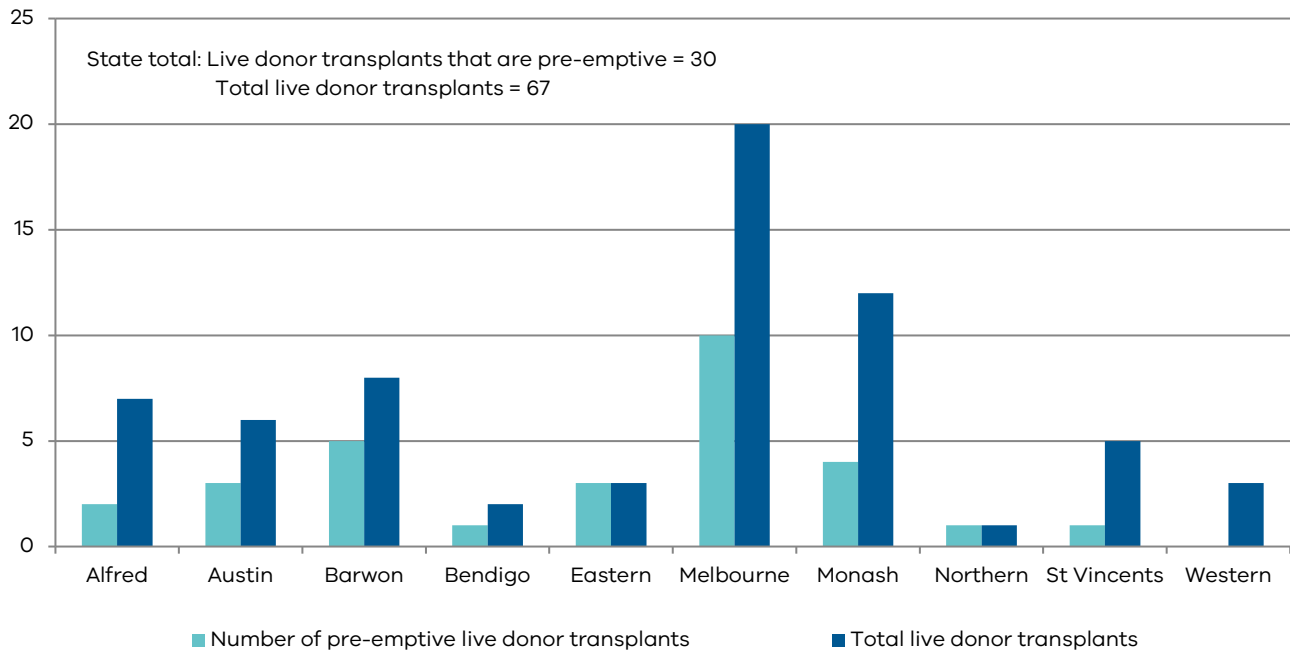
Results

KPI 5 - Percentage of live donor transplants that are pre-emptive



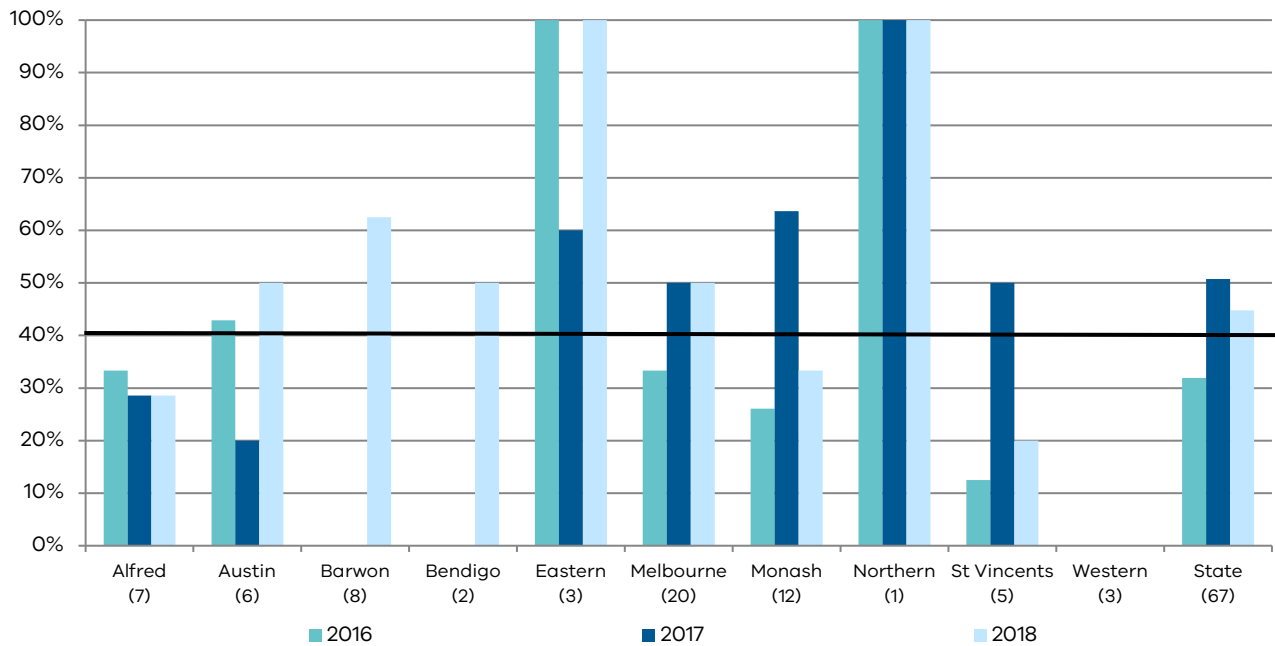
Note: Results based upon data average for the period Jul 2017 – Jun 2018

KPI 5 - Number of live donor transplants that are pre-emptive



Note: Results based upon data average for the period Jul 2017 – Jun 2018

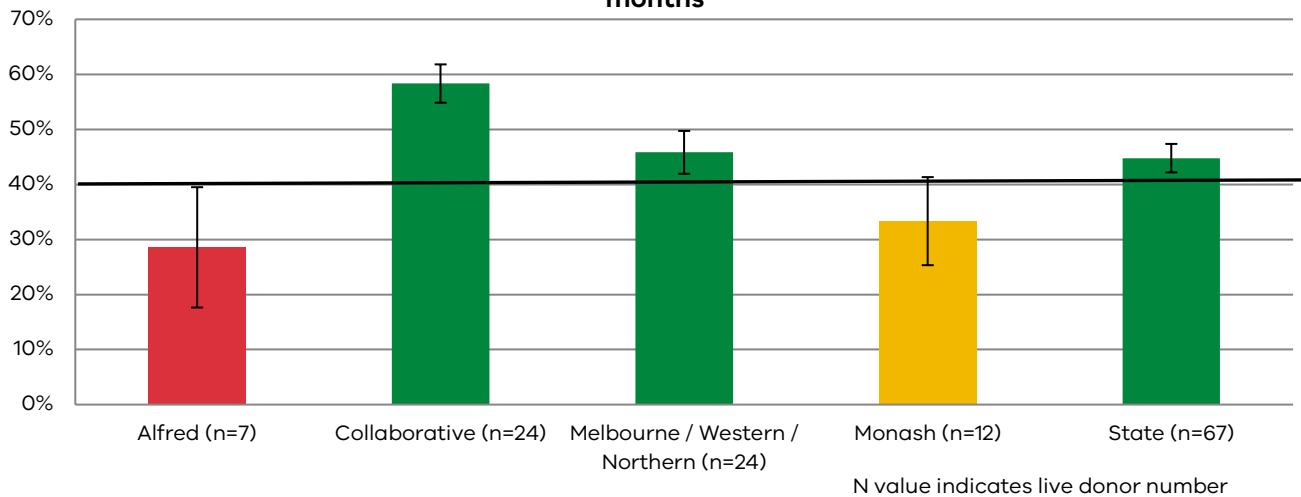
KPI 5 - Percentage of live donor transplants that are pre-emptive



Note: Results showing trend over time: based on 12-month averages for the previous 3 years. 2018 (Jul 17 – Jun 18), 2017 (Jul 16 – Jun 17) and 2016 (Jul 15 – Jun 15)

The preferred option is to report KPI 5 activity for each hub service. However due to low activity numbers of the smaller transplant centres their data can often appear statistically insignificant and difficult to meaningfully interpret. To alleviate this problem, their activity was aggregated to increase the statistical robustness. These centres, labelled the 'collaborative' in this report, comprise Austin, Barwon, St Vincent's, Eastern and Bendigo Health Services. Western and Northern Health had their activity numbers aggregated with Melbourne Health due to its transplant service arrangement. All other transplanting centres had their activity reported as per normal.

KPI 5 - Percentage of live donor transplants that are pre-emptive in last 12 months



Note: Results based on 12-month averages for previous 3 years.
2018 (Jul 17 – Jun 18), 2017 (Jul 16 – Jun 17) and 2016 (Jul 15 – Jun 16)

KPI 6: PROPORTION OF NEW END STAGE KIDNEY DISEASE (ESKD) PATIENTS UNDER 65 YEARS OLD WHO HAVE HAD A TRANSPLANT OR ARE ON THE ACTIVE LIST

Definition

The percentage of new ESKD patients under 65 years of age who have had a transplant or are on the 'active' list within:

- i. three months of requiring RRT
- ii. six months of requiring RRT.

Target

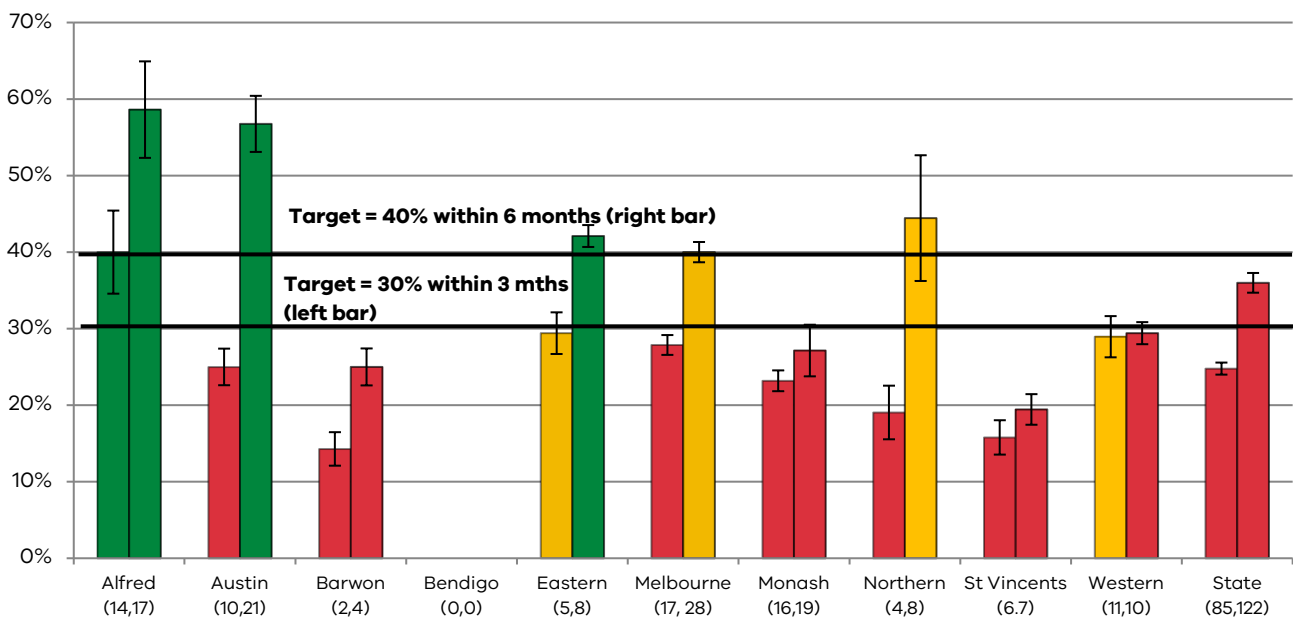
- iii. 30 per cent of new ESKD patients within three months of requiring RRT
- iv. 40 per cent of new ESKD patients within six months of requiring RRT.

Exclusions

- Patients with a failed transplant recommencing RRT
- Patients having a combined organ transplant.

Results

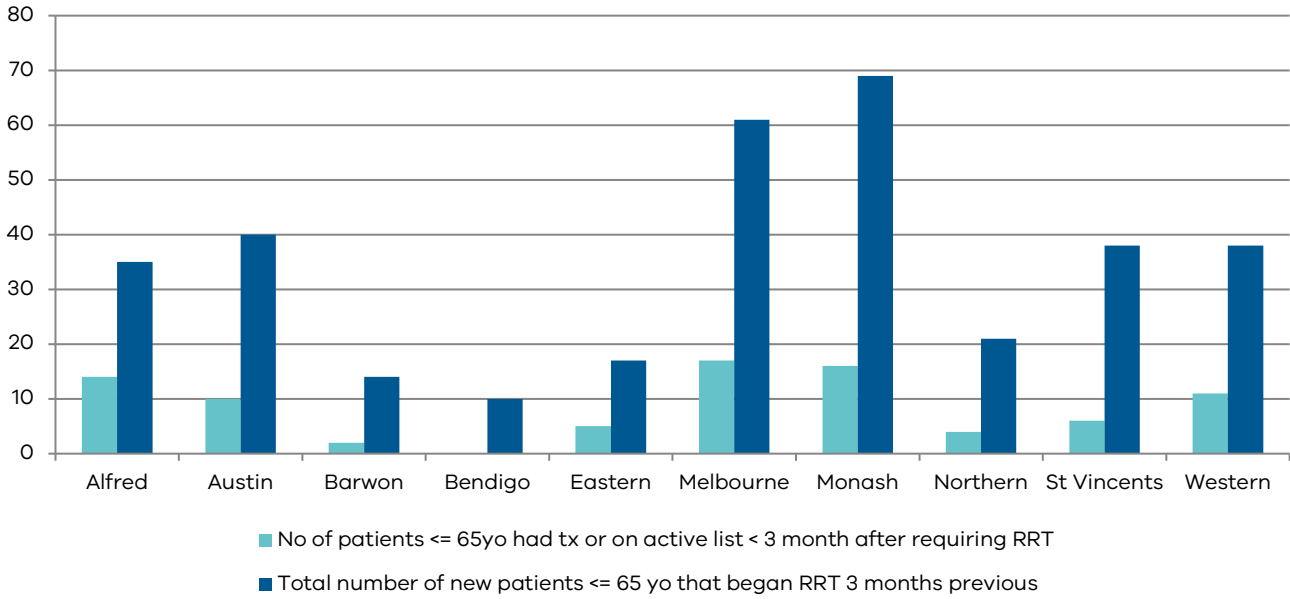
KPI 6 - Percentage of new ESKD patients <=65yo who are transplanted or on an active list



Activated or transplanted numbers at 3 or 6 months in brackets

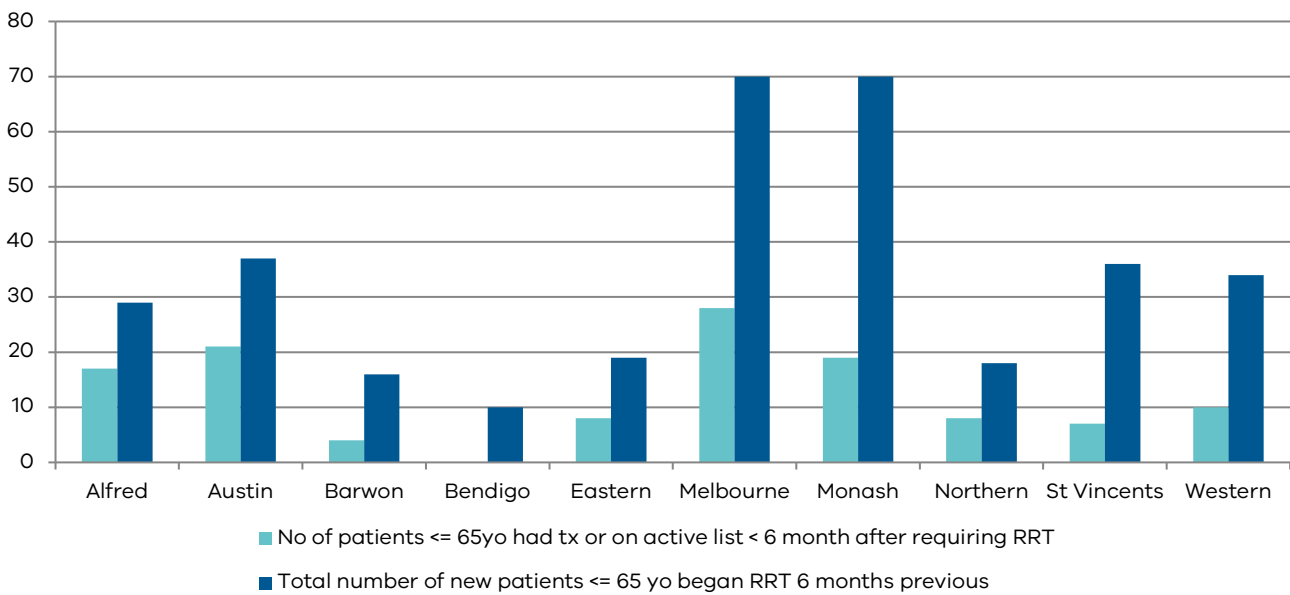
Note: Results based upon data averaged for the period Jul 2017 - Jun 2018 .

KPI 6 - Number of new ESKD patients <=65yo who are transplanted or on an active list within 3 months



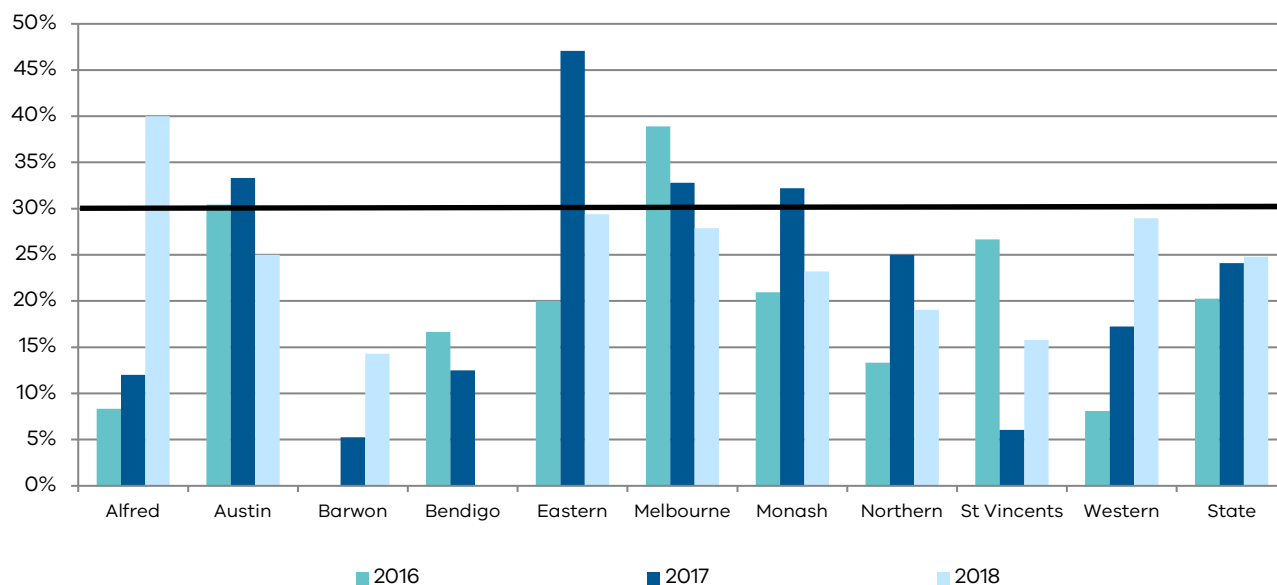
Note: Results based upon data for the period Jul 2017 - Jun 2018

KPI 6 - Number of new ESKD patients <=65yo who are transplanted or on an active list within 6 months

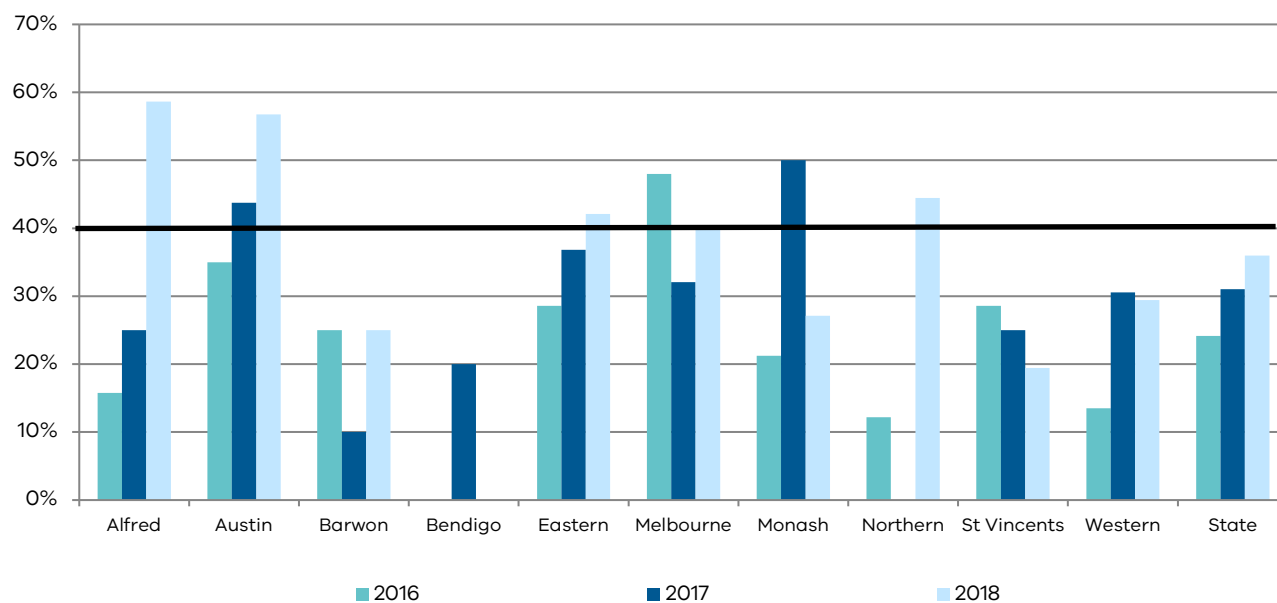


Note: Results based upon data for the period Jul 2017 - Jun 2018

KPI 6 - Percentage of new ESKD patients <=65yo who are transplanted or on an active list within 3 months (2016 to 2018 yearly averages)



KPI 6 - Percentage of new ESKD patients <=65yo who are transplanted or on an active list within 6 months (2016 to 2018 yearly averages)



Note: Results showing trend over time: based on 12-month averages for the previous 3 years. 2018 (Jul 17 – Jun 18), 2017 (Jul 16 – Jun 17) and 2016 (Jul 15 – Jun 16).

Appendix 1 Insight committee members

Associate Professor Nigel Toussaint (Chair) Melbourne Health

Dr Scott Wilson Alfred Health

Associate Professor Peter Mount Austin Health

Mr Richard Knight Barwon Health

Associate Professor Bill Mulley Monash Health

Dr David Langsford Northern Health

Ms Nuala Barker St Vincents Health

Ms Denise Fracchia Western Health

Mr Gregory Dowling Safer Care Victoria

Associate Professor Matthew Roberts Eastern Health

Appendix 2 KPI rationales

KPI 1: PROPORTION OF NEW, PLANNED PATIENTS WHO HAVE RECEIVED CKD EDUCATION BEFORE STARTING DIALYSIS

Definition

- 'Planned' is defined as patients referred to a nephrologist within three years but prior to three months before requiring RRT
- CKD education is defined as either attending a CKD session or a one-on-one session with a member of the CKD team (not a nephrologist consultation only). This education session is to be documented in the patient's medical record
- Numerator: All new, planned patients who have received CKD education before starting dialysis
- Denominator: All new planned patients who have started dialysis
- Exclusions:
 - Late referrals (patients commencing dialysis within three months of first renal consultation)
 - Patients returning to dialysis with a failed transplant

Rationale

The Kidney Health Australia (KHA)-Caring for Australasians with Renal Impairment (KHA-CARI) Guidelines¹ for Acceptance onto Dialysis (2005) support a multidisciplinary approach to pre-dialysis education. They note that patients and their families or carers should receive sufficient information and education about the nature of ESKD and treatment options to allow them to make an informed decision about the management of their ESKD (Level III evidence).

Recent literature^{2,3,4,5,6} reinforces the potential for timely and appropriate CKD education to support informed decision making and, where elected, facilitate a planned approach to the commencement of dialysis, contributing to:

- improved pre-dialysis care and self-management
- increased rates of permanent access
- reduced need for urgent start dialysis
- increased uptake of home therapies
- improved quality of life and reduced mortality in the first 90 days post dialysis initiation.

¹ Kelly, J., Stanley, M. & Harris, D. (2005) The CARI Guidelines. Acceptance onto Dialysis. Predialysis Education. Nephrology.

² Thomas, M. (2007) Pre-dialysis education for patients with chronic kidney disease. Nephrology. 12:S46-S48

³ Lacson Jnr, L., Wang, W., DeVries, C., Leste, K., Hakim, R., Lazarus, M. & Pulliam, J. (2011) Effects of Nationwide Predialysis Education Program on Modality Choice, Vascular Access and Patient Outcomes. Am J Kidney Dis. 58(2):235-242

⁴ Saggi, S.J., Allon, M., Bernardinin, J., Kalantar-Zadeh, K., Shaffer, R. & Mehrotra, R. (2012) Considerations in the Optimal Preparation of Patients for Dialysis. Nephrology. 8:381-389

⁵ Wu, W., Wang, S., Hsu, K., Lee, C., Sun, C., Tsai, C. & Wu, M. (2009) Multidisciplinary predialysis education decreases the incidence of dialysis and reduces mortality – a controlled cohort study based on the NKF/DOQI guidelines. Nephrol Dial Transplant. 24:3426-3433

⁶ Van Biesen, W., Verbeke, F. & Vanholder, R. (2009) We don't need no education... (Pink Floyd, The Wall) Multidisciplinary predialysis education programmes: pass or fail? Nephrol Dial Transplant. 24:3277-3279

Potential reasons for variation between services

- Disparity of patient access to education programs relating to:
 - inadequate resources – multidisciplinary staff, education materials, training equipment, delivery methods, data management systems and budget restraints
 - difficulty in attending due to distance, poor mobility, lack of transport and / or lack of support person
 - culturally and linguistically diverse patients (interpreter, information translation often required).
- Disparity in patient uptake of education programs due to variation in:
 - psychosocial acceptance rates, e.g. increased fear or denial
 - access to or acceptance of support, e.g. social work, psychologist
 - collaborative relationships in CKD care, e.g. private nephrologist, primary health, Hospital Admission Risk Program.
- Disparity in documentation of education provided due to:
 - variation in internal processes for defining and recording education sessions
 - no standardised definition of “appropriate” CKD education
 - lack of Level 1 evidence
 - lack of standardised measure for CKD education.

KPI 2: PROPORTION OF NEW, PLANNED RRT PATIENTS (EXCLUDING PRE-EMPTIVE LIVE DONOR TRANSPLANTS WITHIN 2 WEEKS OF TRANSPLANT) WHO SUCCESSFULLY USE AN ARTERIOVENOUS FISTULA OR GRAFT ACCESS AT FIRST HD TREATMENT

Definition

- New HD patients are those who have chronic maintenance HD as the first RRT
- 'Planned' is defined as patients referred to a nephrologist within three years but prior to three months before requiring RRT
- Vascular access is defined as either an AVF or AVG
- Successful use of an access is defined as not requiring a temporary access
- Numerator: number of new planned patients starting HD using an AVF/AVG
- Denominator: total number of new planned patients starting HD
- Exclusions:
 - late referrals (patients commencing dialysis within three months of first renal consultation)
 - patients with a failed transplant or transferring from PD.

Rationale

Consideration should be given as to the most appropriate type of vascular access for each individual patient. Current guidelines suggest that the arteriovenous fistula is the preferred choice of vascular access (over central or femoral venous catheters) for patients commencing haemodialysis.^{7,8} When compared to the use of central venous catheters, early access creation (AVF and AVG) is associated with a significantly reduced risk of sepsis and mortality.⁹

Potential reasons for variation between services

- Timing of referral for vascular access creation by nephrologist or the renal team
- Patient reluctance to address impending dialysis necessity or reliance upon pre-emptive transplant
- Public health service waiting list times for vascular surgery
- Differences in clinical follow-up of AVF development post-operatively
- Variation in the number of public / private patients between services
- Variation in skill level and needling techniques between dialysis staff and dialysis units.

⁷ The Renal Association (2011). Clinical Guidelines- Vascular Access for Haemodialysis final version. Electronic version accessed 19th November 2012. <http://www.renal.org/clinical/guidelinessection/vascularaccess.aspx>

⁸ CARI Guidelines 2011

⁹ Oliver M, J; Rothwell D, M; Fung K; Hux J, E and Lok C, E (2004). Late Creation of Vascular Access for Hemodialysis and Increased Risk of Sepsis. *Journal of the American Society of Nephrology*. 15 pp. 1936-1942.

KPI 3: PROPORTION OF DIALYSIS PATIENTS WHO ARE DIALYSING AT HOME

Definition

- Patients dialysing at home includes nocturnal and conventional HD, and automated and continuous ambulatory PD
- Incident patients – proportion of patients at six months after starting dialysis
- Prevalent patients – proportion of total dialysis population
- Numerator (incidence): number patients that have attempted at least one month of home dialysis within six months of starting dialysis
- Denominator (incidence): all new planned patients who have started dialysis (in that particular month only) six months previous
- Numerator (prevalence): number of patients on home dialysis
- Denominator (prevalence): all new planned patients who have started dialysis
- Inclusion: patients who have successfully been on home dialysis during any of the six months
- Exclusions: patients who are in home training units.

Rationale

Home dialysis maximises independence and assists in addressing current access issues, including transportation for rural patients. Further advantages include quality of life, social and economic benefits. Increasing home dialysis uptake encourages improved outcomes and lower costs and identifying barriers to home therapies will assist in enhancing the prevalence in the state.

Potential reasons for variation between services

- Lack of infrastructure for training, support and education
- Travel distances for rural patients, educators, and technicians
- Lack of local support for patients requiring time-dependent assistance
- Lack of adequate water supply or consistent electrical means for rural patients
- Prevalence of rental accommodation / transient living arrangement in a region.

KPI 4: PERITONITIS RATES OF EACH HUB SERVICE

Definition

- Peritonitis rate is calculated as the total number of peritonitis episodes experienced by all patients on dialysis (PD) during the reporting month, divided by the total number of months all patients have spent on dialysis (PD), and then multiplied by 12 to be expressed as yearly rate (0.33 episodes per patient year).
- Peritoneal dialysis peritonitis diagnosed when **at least 2** of the following are present
 - clinical features consistent with peritonitis i.e. abdominal pain and/or cloudy dialysis effluent
 - dialysis effluent white cell count $> 100\mu\text{L}$ or $> 0.1 \times 10^9/\text{L}$ (after a dwell time of at least 2 hours with $> 50\%$ polymorphonuclear)
 - positive dialysis effluent culture.
- Relapsing peritonitis: an episode occurring **within 4 weeks** of peritonitis therapy being completed with the same causative organism (or sterile episode) – to be considered as a **single continuous event**.
- Recurrent peritonitis: an episode occurring **within 4 weeks** of peritonitis therapy being completed with a different causative organism – to be considered as a **new peritonitis event** (see Table 6, *ISPD guidelines 2010*, vol. 30, no. 4, p. 404)
- Any event beyond 4 weeks after the completion of peritonitis therapy to be considered as a **new peritonitis event**.
- Numerator: number of peritonitis episodes in all PD patients
- Denominator: total number of patient-months on PD (expressed as a whole number)
- Peritonitis rate expressed as number of episodes per patient year
- Exclusions: patients who have a catheter in situ but are still pre-dialysis.

Rationale

Peritonitis remains the primary reason for PD failure. Peritonitis also contributes to increased hospitalisation and increased mortality.¹⁰ For a PD program to be successful, close attention must be paid to preventing PD-related infections including peritonitis,¹¹ and evaluating the causes when they do occur.

¹⁰ Strippoli G, F, M; Tong A; Johnson D; Schena F, P; Craig, J, C (2004). Peritoneal Dialysis: A Systematic Review of Randomized Controlled Trials. *Journal of the American Society of Nephrology*, 15, pp. 2735-2746.

¹¹ Piraino B; Bernadini J; Brown E; Figueiredo A; Johnson D, W; Lye W, C; Price V; Ramalakshmi S; Szeto C, C (2011). ISPD Position Statement on Reducing the Risks of Peritoneal Dialysis- Related Infections. *Peritoneal Dialysis International*, 31, pp. 614-630.

Potential reasons for variation between services

- Patient training techniques and patient's ability to perform procedure and manage the treatment
- Staff to patient ratios in PD training units and clinics
- Treatment regimens for peritonitis
- Patient demographics, supports, and time already spent on peritoneal dialysis.

KPI 5: PROPORTION OF NEW LIVE DONOR TRANSPLANTS THAT ARE PRE-EMPTIVE

Definition

- New patients are those new to ESKD, that is, not those who have previously had a transplant
- Pre-emptive transplant is defined as patients who are transplanted requiring no or under two weeks of dialysis
- Numerator: total number of pre-emptive new live donor transplants
- Denominator: number of new live donor transplants
- Exclusions:
 - patients with a failed transplant recommencing RRT
 - patients having a combined organ transplant.

Rationale

Kidney transplantation remains the optimal form of renal replacement therapy for ESKD. Live donor (related or unrelated) transplantation currently represents approximately 40 per cent of all transplants and offers excellent patient and transplant outcomes.

Timely live donor transplantation can potentially avoid prolonged periods of dialysis, which carry increased risk of morbidity and significant cost. In many instances, timely live donor transplantation can help patients to avoid dialysis completely. This is referred to as 'pre-emptive' transplantation. The quality and efficiency of a live donor program can be measured in part by the proportion of lived donor transplants that are 'pre-emptive'.

Potential reasons for variation between services

There is substantial variation across Victorian services in rates of live donor transplants. Some services have exceeded national averages, and some performed live donor transplants at less than 50 per cent of the national average rate. Variation can potentially be explained by timely access to relevant services, appropriate education of patients and potential donors and physician attitudes.

KPI 6: PROPORTION OF NEW ESKD PATIENTS UNDER 65 YEARS OLD WHO HAVE HAD A TRANSPLANT OR ARE ON THE ACTIVE LIST

Definition

- New patients are those new to ESKD (not those who have previously had a transplant)
- Requiring RRT is defined as the point at which either transplantation or dialysis is required to sustain life
- Numerator: number patients \leq 65 years old who have had a transplant or are 'active' within three or six months of requiring RRT
- Denominator: number of patients \leq 65 years old requiring RRT
- Inclusions:
 - any patient who has been 'active' within the three or six months
 - all pre-emptive transplants
- Exclusions:
 - patients with a failed transplant recommencing RRT
 - patients having a combined organ transplant.

Rationale

For those with ESKD that are medically, surgically and psychologically suitable early transplantation is the best life extending treatment option. Early live donor transplantation or timely listing for deceased donor transplantation is the ideal goal for these suitable individuals. This requires significant planning prior to commencement of dialysis. This KPI therefore serves as a measure of the efficiency of the work-up process and identifies barriers. The less than 65 years old group has been chosen to more accurately reflect the target dialysis group for transplantation.

There will always be a proportion of patients 65 years and under that are unsuitable for transplantation due to a variety of factors such as obesity, smoking, cardiovascular, psychiatric, non-adherence and malignancy. There is an assumption that the percentage of these unsuitable patients is similar across all health services.

Patients that have either not been assessed for transplantation or not completed the transplant work-up process will also be assessed as failing to meet this KPI.

The reasons for failing to meet this KPI will likely be extremely heterogeneous and reflect a variety of both unit and patient factors. Greater analysis is needed.

Potential reasons for variation between services

- Variation in the referral patterns to nephrology and transplant service
- Differences in the processes used to make final decision regarding suitability
- Different access to investigations, appointments and referrals to other services (such as imaging, cardiology services, psychiatry)
- Differing physician attitudes regarding suitability factors, for example surgical, medical, smoking status and weight
- Patient demographics, geographic factors and educational factors.

Reducing variation in any or all these factors will potentially lead to greater efficiency and equity in transplantation.

