Nephrol Dial Transplant (2020) 35: 1761–1769
doi: 10.1093/ndt/gfaa008
Advance Access publication 10 February 2020

Identifying critically important cardiovascular outcomes for trials in hemodialysis: an international survey with patients, caregivers and health professionals

Emma O'Lone[1,2], Martin Howell [1,2], Andrea K Viecelli[3,4], Jonathan C. Craig[5], Allison Tong[1,2], Benedicte Sautenet[6,7,8], William G. Herrington [9], Charles A. Herzog[10], Tazeen H. Jafar[11,12,13], Meg Jardine[14,15], Vera Krane[16], Adeera Levin[17], Jolanta Malyszko[18], Michael V. Rocco[19], Giovanni Strippoli[1,2,20,21,22], Marcello Tonelli [23], Angela Yee-Moon Wang[24], Christoph Wanner[16], Faiez Zannad[25], Wolfgang C. Winkelmayer[26] and David C. Wheeler[27]; on behalf of the SONG-HD Investigators

[1]Sydney School of Public Health, University of Sydney, Sydney, NSW, Australia, [2]Centre for Kidney Research, Children's Hospital at Westmead, Sydney, NSW, Australia, [3]Department of Nephrology, Princess Alexandra Hospital, Brisbane, QLD, Australia, [4]Australasian Kidney Trials Network, University of Queensland, Brisbane, QLD, Australia, [5]College of Medicine and Health, Flinders University, Adelaide, SA, Australia, [6]Department of Nephrology and Clinical Immunology, Tours University, Tours, France , [7]Department of Nephrology-Hypertension, Dialysis, Renal Transplantation, Tours Hospital, Tours, France, [8]INSERM U1246, Tours, France, [9]Nuffield Department of Population Health, University of Oxford, Medical Research Council Population Health Research Unit, Clinical Trial Service Unit and Epidemiological Studies Unit, Oxford, UK, [10]Department of Medicine, Division of Cardiology, Hennepin County Medical Center, University of Minnesota, Minneapolis, MN, USA, [11]Program in Health Services and Systems Research, Duke-NUS Graduate Medical School, Singapore, [12]Department of Renal Medicine, Singapore General Hospital, Singapore, [13]Department of Medicine, Section of Nephrology, Aga Khan University, Karachi, Pakistan, [14]George Institute for Global Health, Sydney, NSW, Australia, [15]Concord Repatriation General Hospital, Sydney, NSW, Australia, [16]Department of Medicine I, Division of Nephrology, University Hospital, Würzburg, Germany, [17]Division of Nephrology, University of British Columbia, Vancouver, BC, Canada, [18]Department of Nephrology, Dialysis and Internal Medicine Warsaw Medical University, Warsaw, Poland, [19]Wake Forest School of Medicine, Section on Nephrology, Winston-Salem, NC, USA, [20]Department of Emergency and Organ Transplantation, University of Bari, Bari, Italy, [21]Medical Scientific Office, Diaverum Sweden AB, Lund, Sweden, [22]Diaverum Academy, Bari, Italy, [23]Department of Medicine, Division of Nephrology, University of Calgary, Calgary, AB, Canada, [24]Department of Medicine, Queen Mary Hospital, University of Hong Kong, Hong Kong, PR China, [25]Université de Lorraine, Inserm CIC 1433 and INI-CRCT, CHU, Nancy, France, [26]Selzman Institute for Kidney Health, Section of Nephrology, Baylor College of Medicine, Houston, TX, USA and [27]Department of Renal Medicine, University College London, London, UK

Correspondence to: Emma O'Lone; E-mail: Eolo0909@uni.sydney.edu.au; Twitter handles: @ChristophWanne4, @winkeldoc, @song_initiative, @JonathanCCraig, @DavidCWheeler2, @allisontong1, @emma_olone

ABSTRACT

Background. Cardiovascular disease (CVD) is a major contributor to morbidity and mortality in people on hemodialysis (HD). Cardiovascular outcomes are reported infrequently and inconsistently across trials in HD. This study aimed to identify the priorities of patients/caregivers and health professionals (HPs) for CVD outcomes to be incorporated into a core outcome set reported in all HD trials.

Methods. In an international online survey, participants rated the absolute importance of 10 cardiovascular outcomes (derived from a systematic review) on a 9-point Likert scale, with 7–9 being critically important. The relative importance was determined using a best–worst scale. Likert means, medians and proportions and best–worst preference scores were calculated for each outcome. Comments were thematically analyzed.

Results. Participants included 127 (19%) patients/caregivers and 549 (81%) HPs from 53 countries, of whom 530 (78%) completed the survey in English and 146 (22%) in Chinese. All but one cardiovascular outcome ('valve replacement') was rated as critically important (Likert 7–9) by all participants; 'sudden cardiac death', 'heart attack', 'stroke' and 'heart failure' were all rated at the top by patients/caregivers (median Likert score 9). Patients/caregivers ranked the same four outcomes as the most important outcomes with mean preference scores of 6.2 (95%

confidence interval 4.8–7.5), 5.9 (4.6–7.2), 5.3 (4.0–6.6) and 4.9 (3.6–6.3), respectively. The same four outcomes were ranked most highly by HPs. We identified five themes underpinning the prioritization of outcomes: ‘clinical equipoise and potential for intervention’, ‘specific or attributable to HD’, ‘severity or impact on the quality of life’, ‘strengthen knowledge and education’, and ‘inextricably linked burden and risk’.

Conclusions. Patients and HPs believe that all cardiovascular outcomes are of critical importance but consistently identify sudden cardiac death, myocardial infarction, stroke and heart failure as the most important outcomes to be measured in all HD trials.

Keywords: cardiovascular, myocardial infarction, outcomes, sudden cardiac death

INTRODUCTION

People on hemodialysis (HD) have a risk of cardiovascular death 20 times greater than that found in the general population [1]. Cardiovascular death accounts for nearly 50% of mortality in the HD population [1, 2]. There is a high prevalence of cardiovascular risk factors in people on HD, including hypertension and diabetes mellitus [3, 4] as well as fluid and electrolyte imbalance, metabolic bone disease, uremic toxins and persistent inflammation [5, 6]. Cardiovascular disease (CVD) is a substantial contributor to morbidity and impaired quality of life in patients on HD. However, patients with kidney failure are often excluded from cardiovascular trials [7] and the majority of interventions that have been studied in this population have not been found to improve cardiovascular mortality [8–10].

Cardiovascular outcomes are reported in only 12% of all trials in HD and have used >47 different measures that are assessed at many different time points [11]. The relevance and importance of these outcomes to patients and clinicians remain unknown [12]. These limitations make decisions regarding the management of CVD in people on HD challenging and thus highlight the need for consistent reporting of outcomes across trials.

The Standardized Outcomes in Nephrology–Hemodialysis (SONG-HD) initiative has established CVD as a core outcome domain for clinical trials in HD (as well as mortality, vascular access and fatigue) [11, 13, 14]. We performed this study to assess the absolute and relative importance of a range of cardiovascular outcomes based on the shared priorities of patients, caregivers, clinicians, researchers, policy- makers and relevant stakeholders. Our goal was to determine a core set of cardiovascular outcomes that should be reported in all HD trials.

MATERIALS AND METHODS

Study design

We conducted an international online survey to assess the absolute and relative importance of cardiovascular outcomes for use in all HD trials. The survey was administered online and was available in English and Chinese languages.

Outcome inclusion

We identified cardiovascular outcomes based on a systematic review of cardiovascular outcomes reported in contemporary trials [12]. Composite outcomes were excluded from the survey but were deconstructed into respective components. Surrogate cardiovascular outcomes (e.g. left ventricular mass) and biomarkers (e.g. troponin) were not included, as they are unlikely to be meaningful to patients, may not be validated in this population and may not automatically translate into health benefits [15]. The selection of outcomes was further informed by comments on the topic of CVD in HD from patients and caregivers in a previously published international Delphi survey [14], as well as from discussions among the Expert Working Group [16]. Ten outcomes were included in the survey and were accompanied by a plain language definition (Supplementary data, Box 1).

Survey

The survey was translated into Chinese by a professional translator and cross-checked by a bilingual health professional (HP) to ensure the true meaning was interpreted. The survey was piloted on six participants in each language and included patients, caregivers and healthcare professionals.

The absolute importance of each cardiovascular outcome was assessed using a Likert scale, where each outcome was scored from 1 to 9 (Item S1). A score of 7–9 indicated that the outcome was of ‘critical importance’, 4–6 indicated ‘important but not critical’ and 1–3 indicated ‘limited importance’. Participants were given an option to choose ‘uncertain’ and could provide additional comments. To ascertain the relative importance of outcomes, a best–worst scale (BWS) survey was used. Each participant was presented with five choice sets each consisting of 5 of the 10 outcomes that were varied across the choice sets. For each choice set, participants were asked to choose which was the most and which was the least important outcome. The combination of outcomes across the choice sets was determined using a balanced incomplete block design [17]. The BWS is a preference elicitation method based on the theory underpinning discrete choice experiments but involves less cognitive burden and provides better discrimination between outcomes than the Likert scale and greater information retrieval [18–20]. The survey was completed from October 2016 to December 2018 using LimeSurvey.

Participant recruitment

Adult patients >18 years of age, caregivers/family members, nephrologists, cardiologists, allied health members, policy-makers, researchers and industry representatives with interest or experience in HD were eligible to participate in this survey. To ensure broad representation, multiple recruitment strategies were used. Patients and caregivers were invited via the SONG Initiative database and patient organizations worldwide were invited using standardized invitation fliers and via opt-in snowball sampling, which included the use of social media. HPs were recruited through professional organizations via standardized e-mail invitations or newsletters to their membership list, investigator networks and via the SONG database. Participants registered their e-mail on the SONG website to receive an e-mail invitation with a unique survey link. All participants provided informed consent. This study was approved by the ethics board of the University of Sydney (2015-228).

Data analysis

For each cardiovascular outcome the absolute importance was assessed by calculating the mean, median and proportion of participants who rated the outcome as critically important (scores of 7–9 on the Likert scale). The relative importance was determined using a multinomial logistic regression model and expressed as a mean relative importance score determined from the regression coefficients for each outcome. As the regression coefficients have the same underlying scale, preference scores can be adjusted to any convenient scale to aid interpretation. Absolute importance scores were calculated separately for patients/caregivers and HPs, while relative importance scores were calculated using interaction terms in the regression model. Mean differences in absolute (Likert) and relative (BWS) importance scores between stakeholder groups and respective 95% confidence intervals (CIs) were calculated. The software packages Excel (version 16.0; Microsoft, Redmond, WA, USA), Stata/SE version 14.0 (StataCorp, College Station, TX, USA) and NLOGIT version 6 (Econometric Software, Plainview, NY, USA) were used to analyze the data.

All free-text comments from the survey responses were extracted. Comments in Chinese were translated by two independent translators and all comments were imported into HyperRESEARCH software (version 3.7; ResearchWare, Randolph, MA, USA). Using thematic analysis, investigator E.O. conducted line-by-line coding of the text to inductively identify themes that reflected the reasons for their prioritization. The thematic analysis was cross-checked by a second investigator (A.T.).

RESULTS

In total, 676 participants completed the survey: 127 (19%) were patients/caregivers (112 patients and 15 caregivers) and 549 (81%) were healthcare professionals; the majority were nephrologists (63%). The majority of participants completed the survey in English [530 (78.4%)] with 146 (21.6%) completing the Chinese survey. The characteristics of patients/caregivers and HPs are shown in Tables 1 and 2, respectively. Of the total cohort, 315 (46.6%) were male. Participants were from 53 countries with the majority from China (26%), Europe (23%) and Australia/New Zealand (19%). The majority (78%) of the patient/caregiver participants had experienced a cardiovascular event.

Absolute importance

All cardiovascular outcomes were considered critically important (7–9 on the Likert scale) by patients/caregivers and HPs, with mean scores >7, with the exception of 'valve replacement', which was given a mean absolute importance score of 6.8 (95% CI 6.7–7.0) by HPs. Based on mean scores, the top three highest-rated outcomes by all participants were 'heart attack' [8.34 (95% CI 8.24–8.43)], 'sudden cardiac death' [8.34 (95% CI 8.29–8.40)], and 'heart failure' [8.24 (95% CI 8.15–8.33)]. The three outcomes rated highest by patients/caregivers, based on mean scores, were 'heart attack' [8.25 (95% CI 8.04–8.48)], 'stroke' [8.18 (95% CI 7.93–8.43)] and 'heart failure' [8.15 (95% CI 7.95–8.35)] (Table 3). For HPs, the top three outcomes were 'sudden cardiac death' [8.41 (95% CI 8.29–8.52)], 'myocardial infarction' (MI) [8.35 (95% CI 8.24–8.50)] and 'heart failure' [8.26 (95% CI 8.16–8.37)] (Table 3). All four of these outcomes were rated as critically important (Likert scores 7–9) by >87% of both patients/caregivers and HPs (Figure 1).

Relative importance

Patients/caregivers ranked 'sudden cardiac death', 'heart attack', 'stroke' and 'heart failure' as the most important outcomes with mean preference scores of 6.2 (95% CI 4.8–7.5), 5.9 (4.6–7.2), 5.3 (4.0–.6) and 4.9 (3.6–6.3), respectively (Figure 2). The CIs for the top four outcomes overlapped, suggesting little or no difference in relative importance. HPs ranked the same four outcomes as most important and again with similar relative importance with the exception of 'sudden cardiac death', which was ranked as the most important outcome with a mean importance score of 9.0 (95% CI 8.7–9.3) (Table 3). The least important outcome to patients/caregivers was 'angina', with a mean preference score of 1 (95% CI −0.32–2.32), and for HPs it was the reference outcome 'valve replacement', with a mean preference score of 1.53.

Subgroup analysis

The mean differences in absolute importance scores between patients/caregivers and HPs for the four highest-rated outcomes 'sudden cardiac death', 'heart attack', 'stroke' and 'heart failure' were similar ($P > 0.05$). There were too few Chinese patients/caregivers to enable us to perform reliable subgroup analysis between the patient/caregiver groups by language. However, differences in importance scores between English- and Chinese-language surveys were evident in the HP group (Figure 3). The top four most important outcomes for both English- and Chinese-language participants were 'sudden cardiac death', 'heart failure', 'heart attack' and 'stroke'. However, for Chinese-language participants, there was little or no difference in the relative importance of 'stroke' and the next most important, 'clots/thrombosis'. In contrast, for English-language participants, there was a clear difference between the relative importance of stroke and the next most important outcome, revascularization. Differences in absolute mean scores were evident for all outcomes ($P < 0.05$) with the exception of 'sudden cardiac death' and 'peripheral vascular disease' (PVD) ($P > 0.05$). The relative preferences for English- and Chinese-language participants were generally similar (Figure 3), with the exception of 'stroke' and 'PVD', both of which were considered less important by HPs who completed the survey in Chinese ($P < 0.05$).

Themes

Free-text comments relating to the outcomes were provided by 33 participants in the English survey and 11 Chinese participants. From the free-text comments, we identified five themes underpinning the prioritization of outcomes: 'clinical equipoise

Table 1. Characteristics of patients and caregivers [$N = 127$ (19%)]

Characteristics	*n* (%)	Characteristics	*n* (%)
Participant type and language survey		Employment status	
Patient		Full time	22 (19.3)
English	105 (82.7)	Part time/casual	26 (22.8)
Chinese	7 (5.5)	Student	3 (2.6)
Caregiver/family member		Not employed	4 (3.5)
English	9 (7.1)	Retired	50 (43.9)
Chinese	6 (4.7)	Other	9 (7.9)
Gender[a]		Education	
Male	58 (45.7)	Did not complete high school	17 (14.6)
Female	67 (52.8)	High school graduate	14 (12.1)
Age group (years)[a]		Professional certificate/diploma	22 (19.0)
18–30	7 (5.6)	Undergraduate degree	39 (33.6)
31–40	16 (12.8)	Postgraduate degree	24 (20.7)
41–50	19 (15.2)	Experience of CVD[b]	
51–60	26 (20.8)	None	46 (36.8)
61–70	43 (34.4)	Abnormal heart rhythm	30 (24.0)
71–80	12 (9.6)	Thrombosis	18 (14.4)
>80	2 (1.6)	Angina	17 (13.6)
Country		Other	13 (10.4)
Australia	42 (33.6)	Heart bypass or stent	11 (8.8)
UK	22 (17.6)	PVD	8 (6.4)
USA	22 (17.6)	Heart attack	7 (5.6)
China	13 (10.4)	Heart failure	5 (4.0)
Canada	9 (7.2)	Stroke	3 (2.4)
New Zealand	9 (7.2)	Heart valve replacement	3 (2.4)
Denmark	6 (4.8)	Cardiac arrest	1 (0.8)
India	1 (0.8)		
Spain	1 (0.8)		
Marital status			
Single	14 (13.2)		
Married	67 (63.2)		
Living with partner/*de facto*	7 (6.6)		
Partner (not living with)	4 (3.8)		
Widowed	7 (6.6)		
Divorced	5 (4.7)		
Separated	2 (1.9)		

[a] Total numbers do not add up to the total number of participants due to undisclosed responses.

[b] More than 1 CVD event experienced by individual patients, 116 events experienced by 99 patients/caregivers.

and potential for intervention', 'specific or attributable to HD', 'the severity or impact on the quality of life', 'strengthen knowledge and education' and 'inextricably linked burden and risk'. Additional comments representative of each theme are provided in Supplementary data, Table S1.

Clinical equipoise and potential for intervention

Both professionals and patients believed that outcomes with the potential for intervention were more important: 'I've rated higher for conditions where intervention could save a life or prevent serious incapacity' (HP). HPs felt that outcomes with clinical equipoise should be prioritized for research: 'I would have rated arrhythmia higher if I could, particularly atrial fibrillation, as this is a significant area of equipoise' (HP). Patients considered the ability to control the outcome with lifestyle intervention: 'the heart is a problem but with controlled food there is a better outcome that is more affordable' (patient).

Specific or attributable to HD

Outcomes specific to patients on HD were deemed to be particularly important: 'I chose sudden cardiac death as I believe it is a particular problem in dialysis patients' (patient). Patients and HPs noted that patients on dialysis and also the transplant waiting list were particularly vulnerable since a cardiovascular event may prevent access to transplantation: 'outcomes that affect suitability for transplantation are of critical importance' (HP). This was also reinforced by patients/caregivers: 'we are put on hold on the transplant list until the heart issues are fixed' (caregiver). Some indicated that cardiovascular outcomes may present differently in people on HD: 'traditional cardiac vessel occlusion is not the issue in most cases' (HP). Participants considered that outcomes directly attributable to HD were of critical importance and needed to be recognized: 'I believe the heart damage and other side effects of dialysis are not only preventable, but severely understated' (patient). They also considered the increased risk of CVD associated with medications prescribed for patients on dialysis: 'for dialysis patients, heart disease [because of medication] is something we have to deal with' (patient/caregiver).

Severity or impact on quality of life

Participants believed that outcomes that had a debilitating and broader impact on quality of life were important. One

Table 2. Characteristics of HPs [$N = 549$ (81.2%)]

Characteristics	*n* (%)	Characteristics	*n* (%)
Language of survey		Number of trials as investigator	
English	416 (75.8)	0	232 (43.0)
Chinese	133 (24.2)	1–5	219 (40.6)
		6–10	50 (9.3)
Gender		11–15	11 (2.0)
Male	257 (46.8)	>15	27 (5.0)
Female	292 (53.2)		
		Participant type	
Age group (years)		Nephrologist	348 (63.4)
18–30	38 (6.9)	Nurse	105 (19.1)
31–40	130 (23.7)	Researcher	32 (5.8)
41–50	176 (32.1)	Physician (other, e.g. psychiatrist)	22 (4.0)
51–60	152 (27.7)	Nephrologist in training	16 (2.9)
61–70	43 (7.8)	Other	14 (2.6)
71–80	10 (1.8)	Surgeon	7 (1.3)
		Dietician	7 (1.3)
Country		Policymaker	7 (1.3)
China	164 (29.9)	Social worker	5 (0.9)
Australia	85 (15.5)	Pharmacist	5 (0.9)
Other European countries	71 (12.9)	Cardiologist	4 (0.7)
UK	44 (8.0)	Psychologist	4 (0.7)
USA	39 (7.1)	Industry/private sector	3 (0.5)
Canada	31 (5.6)	Radiologist	2 (0.4)
New Zealand	18 (3.3)		
South America	17 (3.1)	Experience with HD (years)[a]	
Other Asian countries	17 (3.1)	≤10	194 (35.3)
India	16 (2.9)	11–20	187 (34.1)
Malaysia	16 (2.9)	21–30	97 (17.7)
Middle East and Russia	14 (2.6)	>30	61 (11.1)
Poland	12 (2.2)		
Africa	5 (0.9)	Other roles[a]	
		Government, policy making	77 (14.0)
		Funding (government, charity)	63 (11.5)
		Clinical practice guidelines	1 (0.2)

[a] Total numbers do not add up to the total number of participants due to undisclosed responses.

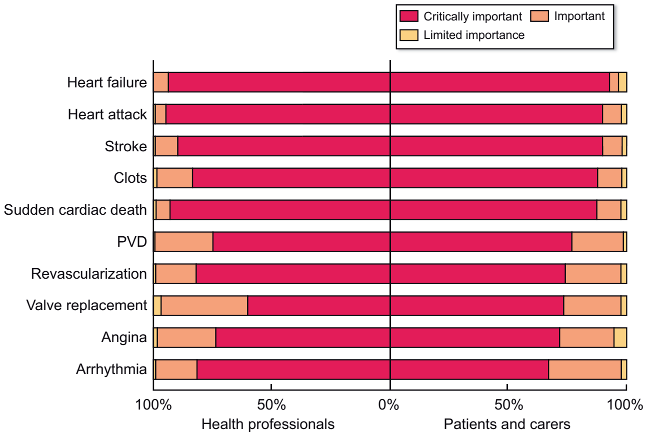

FIGURE 1: Absolute importance: proportion of patients/caregivers (right) and HPs (left) considering outcomes as critically important, important or of limited importance. Critically important (black), 7–9 points on Likert scale; important (dark gray), 4–6 points on Likert scale; limited importance (light gray), 1–3 points on Likert scale.

Table 3. Summary of importance scores for patients/caregivers and HPs

Outcomes	Median Likert score		Mean Likert score		Mean difference Likert score		Proportion (%) critically important (Likert score 7–9)		Mean BWS score	
	Patients/caregivers	HPs	Patients/caregivers	HPs		P-value	Patients/caregivers	HPs	Patients/ caregivers	HPs
Sudden cardiac death	9	9	8.1	8.4	−0.3	0.03	87.9	93.1	6.2	9.0
Heart attack	9	9	8.3	8.4	−0.1	0.45	90.3	94.4	5.9	7.7
Stroke	9	9	8.2	8.1	0.1	0.64	89.9	89.6	5.3	6.0
Heart failure	9	9	8.2	8.3	−0.1	0.34	93.2	93.5	4.9	6.8
Thrombosis	8	8	7.9	7.7	0.2	0.13	88.4	83.4	3.3	3.6
Valve replacement	8	7	7.4	6.8	0.6	<0.001	73.5	59.8	3.0	1.5
Revascularization	8	8	7.6	7.6	0.0	0.99	74.0	81.3	3.0	4.0
PVD	8	8	7.5	7.3	0.1	0.34	76.9	74.5	1.8	2.3
Arrhythmia	7	8	7.2	7.6	−0.3	0.02	67.0	81.2	1.3	3.4
Angina	7	8	7.2	7.4	−0.2	0.2	72.1	73.4	1.0	2.8

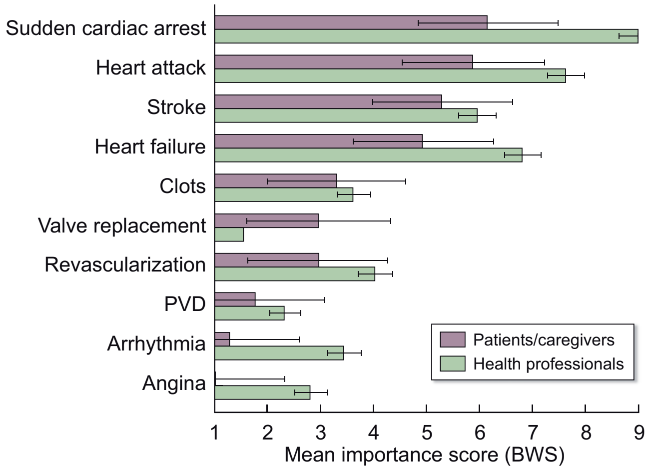

FIGURE 2: Mean relative importance scores of patients/caregivers and HPs based on the BWS. Ordered by the mean preference scores of patients/caregivers (bars with 95% CIs). Bars represent the mean preference score with 95% CI.

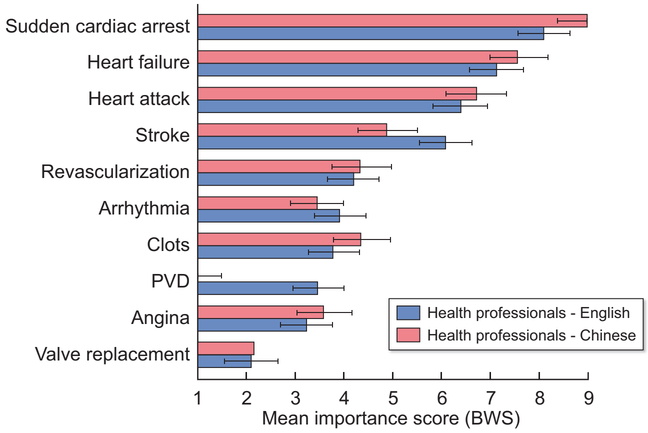

FIGURE 3: Mean relative importance scores of HPs by survey language based on the BWS. Bars represent the mean preference score with 95% CI.

patient stated that their experience of multiple cardiovascular events while on dialysis continued to 'greatly impact on my life with good kidney function [following transplant]'. Some HPs prioritized the outcomes based on the impact they observed or believed it had on the patients: 'I used my sense as to how much patients tend to be impacted by each outcome and how frequently we see each outcome in patients on HD in prioritizing between outcomes'.

Strengthen knowledge and education

Patients and HPs prioritized outcomes based on the consideration of knowledge and education about specific cardiovascular outcomes in HD: 'cardiovascular pathology as a long term disease requires both patients and medical team continuous education' (HP). Patients believed that some CVD outcomes were missed or overlooked: 'left ventricular hypertrophy is often forgotten by HPs and leads to complications for patients in dialysis' (patient/caregiver). Patients wanted to highlight the need for education regarding CVD so they could gain control and employ self-management: 'it is important to educate the patients. If the patient knows what is going on with their body, they can manage to prevent unnecessary complications' (patient/caregiver).

Inextricably linked burden and risk,

HPs often prioritized outcomes that were highly prevalent in the HD population: 'my view of importance was influenced in part by frequency' (HPs). Participants agreed that cardiovascular outcomes were critical: 'all are important and matter, both independently and as variables within the sphere of each other' (HP) and that 'in many cases they [outcomes] cannot be arbitrarily separated' (HP). Patients expressed similar concerns regarding the importance of all outcomes: '[it is] very difficult to choose what is the most important and in need of the most study. . .It would seem that we need to know more about this cardiac problem so that we can find ways to prevent this devastating problem' (patient).

DISCUSSION

All cardiovascular outcomes were judged as critically important by stakeholders. Prioritization was given to sudden cardiac death, heart attack, heart failure and stroke by patients/caregivers and HPs, and these outcomes were consistently the most important across both survey languages. Prioritization of outcomes was also consistent based on the Likert scale and the BWS. Participants prioritized outcomes for many practical reasons and selected outcomes because of their prevalence in HD patients or perceived causation by HD. Participants also wanted to ensure that outcomes that had the most impact on quality of life and the highest likelihood of improvement from interventions were ranked most highly.

Sudden cardiac death and MI were highly prioritized outcomes by all stakeholders. Other studies that have focused on patient preference elicitation, albeit in the general population, have prioritized similar outcomes [21]. Interestingly, participants in this general population study added that when patients are involved in outcome selection and trial design, they are more likely to comply with the intervention [21]. Sudden cardiac death was ranked highest by all stakeholders, which aligns with the disproportionately high rate of sudden cardiac death in the HD population [22–24]. There are a number of risk factors specific to people on HD that influence the high prevalence, namely large and regular shifts in fluid and electrolytes and a high prevalence, of left ventricular hypertrophy and vascular calcification [25]. The patterns of arrhythmias in HD patients differ from those in the general population and it is likely that the pathophysiology of sudden cardiac death is also different in HD [24]. It is possible that a number of participants had witnessed an acute CVD event or potentially a sudden cardiac death in the dialysis unit. There is no research specific to dialysis units to determine what effect these experiences might have on the attitudes of patients or HPs toward this outcome. Nonetheless, there are a number of psychological sequelae after witnessing an unsuccessful resuscitation attempt [26] and these sequelae are likely to affect the relative priority placed on certain outcomes such as sudden cardiac death.

Heart failure and MI were similarly important to all stakeholders in this survey. Heart failure is clinically difficult to define in the dialysis population, as symptoms often overlap with those due to excess extracellular fluid as opposed to cardiac dysfunction *per se*. The cause of heart failure can be multifactorial but is often secondary to ischemic heart disease. Both heart failure and MI have far-reaching consequences on quality of life and survival [27]. All-cause mortality of dialysis patients with acute MI at 2 years is 58%, and this is 20% higher than in people with end-stage kidney disease with no acute MI [28]. The incidence and mortality rates after an acute MI event in the HD population exceed that of the general population by >20 times [29]. There is increasing evidence that prevention, diagnosis and treatment of MI in the HD population are inferior to that found in the general population, resulting in poorer short-term and long-term prognosis [30–32]. Furthermore, HD patients are often excluded from large-scale trials of primary and secondary prevention therapies for ischemic heart disease [7, 33].

This large international survey included respondents from 53 different countries and involved a broad spectrum of stakeholders, including a large number of patients and caregivers. Using the Likert scale and BWS allowed us to determine absolute importance as well as prioritization of the outcomes relative to each other. Prioritization is necessary to ensure that the most important and relevant outcomes are incorporated into a core outcome set. We were able to translate the survey into only one language other than English due to resource limitations, which may have led to ascertainment bias, but the participants were from a large number of countries covering a broad geographic and socioeconomic range. The survey was administered online to ensure efficient dissemination and to minimize data transfer errors; however, we recognize this restricted participation to those with access to the internet and computer literacy.

The results of this survey will contribute to our initiative to develop core outcome measures for CVD for use in trials of people on HD. Utilizing this survey will ensure that the core outcome set is representative of the shared priorities of patients, caregivers, clinicians, researchers, policymakers and relevant stakeholders. After achieving consensus on the use of these core outcomes, it will be necessary to develop definitions that are valid for the HD population to ensure that trialists are able to report the outcomes consistently following an agreed standardized approach.

SUPPLEMENTARY DATA

Supplementary data are available at ndt online.

ACKNOWLEDGEMENTS

We would like to thank all the participants that completed the survey. We would also like to thank the SONG Steering Committee and SONG Coordinating Committee for advice and comments. We thank the following organizations for their support: International: Cochrane Kidney and Transplant, Dialysis Outcomes and Practice Patterns Study (DOPPS), International Society of Nephrology (ISN), Kidney Disease: Improving Global Outcomes (KDIGO), PKD International, Transplantation Society (TTS) and World Transplant Games Federation; Australia/New Zealand: Australian and New Zealand Society of Nephrology (ANZSN), Australian Kidney Trials Network (AKTN), Christchurch Kidney Society, Kidney Health Australia (KHA), Caring for Australasians with Renal Impairment, Kidney Health New Zealand (KHNZ), PKD Foundation of Australia, Renal Society of Australasia (RSA) and Transplant Australia; Canada: Kidney Foundation of Canada (KFOC), Canadian Society of Nephrology (CSN) and Canadian Society of Transplantation (CST); Europe: British Kidney Patient Association, British Renal Society (BRS), European Kidney Patients Federation (EKPF), European Kidney Transplant Association (EKITA), European Society of Transplantation (ESOT), European Renal Best Practice (ERBP), UK National Kidney Federation, Polycystic Kidney Disease Charity, Société Francophone de Transplantation and Renal Association; America: American Association of Kidney Patients, Home Dialysis Central, National Kidney Foundation of Southern California and Sociedad Latinoamericana de Nefrología e Hipertensión.

FUNDING

This project is supported by a National Health and Medical Research Council (NHMRC) program grant (1092597) and project grant (1098815). E.O. receives support from the NHMRC Medical Postgraduate Scholarship (1114189). A.V. receives grant support from the Royal Australasian College of Physicians (Jacquot Research Establishment Award) and the Princess Alexandra Research Foundation. A.T. is supported by NHMRC Research Fellowships (1106716). W.H. is supported by a UK Medical Research Council–Kidney Research UK Professor David Kerr Clinician Scientist Award. The funding organization had no role in the design and conduct of the study; collection, management, analysis and interpretation of the data or preparation, review or approval of the manuscript.

CONFLICT OF INTEREST STATEMENT

None declared. The results presented in this article have not been published previously in whole or part, except in abstract format.

(See related article by Briggs. Patient-centeredness and the Pareto principle: getting at the matter of what matters to our patients. *Nephrol Dial Transplant* 2020; 35: 1647–1648)

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Received: 22.10.2019; Editorial decision: 17.12.2019

Nephrol Dial Transplant (2020) 35: 1769–1778
doi: 10.1093/ndt/gfz039
Advance Access publication 11 March 2019

One-year safety and efficacy of intravenous etelcalcetide in patients on hemodialysis with secondary hyperparathyroidism

David A. Bushinsky[1], Glenn M. Chertow[2], Sunfa Cheng[3], Hongjie Deng[4], Nelson Kopyt[5], Kevin J. Martin[6], Anjay Rastogi[7], Pablo Ureña-Torres[8], Marc Vervloet [9] and Geoffrey A. Block[10]

[1]Department of Medicine, Division of Nephrology, University of Rochester School of Medicine, Rochester, NY, USA, [2]Department of Medicine, Division of Nephrology, Stanford University, Stanford, CA, USA, [3]Clinical Development, Amgen Inc., Thousand Oaks, CA, USA, [4]Biostatistics, Amgen Inc., Thousand Oaks, CA, USA, [5]Department of Medicine, Division of Nephrology, Lehigh Valley Hospital, Allentown, PA, USA, [6]Department of Internal Medicine, Division of Nephrology, Saint Louis University School of Medicine, St Louis, MO, USA, [7]Department of Medicine, Division of Nephrology, University of California, Los Angeles, Los Angeles, CA, USA, [8]Department of Nephrology and Dialysis, Ramsay-Générale de Santé, Clinique du Landy, Saint Ouen, France and Necker Hospital, University of Paris Descartes, Paris, France, [9]Department of Nephrology and Amsterdam Cardiovascular Sciences, VU University Medical Center, Amsterdam, The Netherlands and [10]Denver Nephrology, Denver, CO, USA

Correspondence and offprint requests to: David A. Bushinsky; E-mail: david_bushinsky@urmc.rochester.edu

ABSTRACT

Background. Secondary hyperparathyroidism (sHPT), a common complication of chronic kidney disease, is characterized by elevated serum parathyroid hormone (PTH). Etelcalcetide is an intravenous calcimimetic that increases sensitivity of the calcium-sensing receptor to calcium and decreases PTH secretion. This open-label extension (OLE) trial evaluated the long-term effects of etelcalcetide for sHPT treatment in patients receiving hemodialysis.

Methods. This 52-week, multicenter, single-arm OLE enrolled patients from three parent trials: two randomized, double-blind, placebo-controlled trials and one open-label, single-arm, 'switch' study from cinacalcet to etelcalcetide. The primary endpoint was to investigate the nature, frequency, severity and relation to treatment of all adverse events (AEs) reported throughout the trial. Secondary endpoints included the proportion of patients with >30% reduction from baseline in PTH and the percentage change from baseline in PTH, albumin-corrected calcium (Ca), phosphate (P) and the calcium–phosphate product (Ca × P).