SUPPLEMENTAL DIGITAL CONTENT (SDC)

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Table S1. Electronic search results from Ovid MEDLINE: Epub ahead of print, in-process & other nonindexed citations, Ovid MEDLINE Daily and Ovid MEDLINE, 1946 - June 12, 2019

Number	Search terms	Results
1	exp Kidney Transplantation/	91 925
2	Kidney transplant*.ti,ab,kw	38 936
3	Renal transplant*.ti,ab,kw	44 830
4	OR [1-3]	107 357
5	Dialysis/	12 544
6	exp Renal Dialysis/	109 445
7	dialys*.ti,ab,kw	110 484
8	dialyz*.ti,ab,kw	10 662
9	OR [5-8]	171 260
10	exp “Costs and Cost Analysis”/	225 305
11	exp Economics, Hospital/	23 615
12	exp Economics, Medical/	14 102
13	exp “Fees and Charges”/	29 742
14	Cost effect*.ti,ab,kw	124 263
15	Cost benefit.ti,ab,kw	11 166
16	Cost utility.ti,ab,kw	4306
17	Health econom*.ti,ab,kw	8783
18	Economic evaluat*.ti,ab,kw	11 345
19	OR [10-18]	353 278
20	4 AND 9 AND 19	649
21	Limit 20 to English-language studies	577
22	Limit 21 to studies that were published after December 31, 2000	361

Table S2. Electronic search from Classic + Embase, 1947 to 2019 June 12

Number	Search terms	Results
1	exp kidney transplantation/	154 076
2	Kidney transplant*.tw,kw	67 077
3	Renal transplant*.tw,kw	67 558
4	OR [1-3]	164 405
5	exp dialysis/	185 610
6	Dialys*.tw,kw	160 259
7	Dialyz*.tw,kw	14 438
8	OR [5-7]	247 843
9	exp economic evaluation/	289 732
10	exp “cost effectiveness analysis”/	141 895
11	exp “cost benefit analysis”/	81 202
12	exp “cost utility analysis”/	8910
13	Cost effect*.tw,kw	171 639
14	Cost benefit.tw,kw	15 121
15	Cost utility.tw,kw	7148
16	Health econom*.tw,kw	13 863
17	Economic evaluat*.tw,kw	16 332
18	OR [9-17]	379 215
19	4 AND 8 AND 18	955
20	Limit 19 to English-language studies	906
21	Limit 20 to studies that were published after December 31, 2000	778

Table S3. Electronic search from Scopus on June 12, 2019

Number	Search terms	Results
1	TITLE-ABS-KEY (“kidney” OR “renal” AND “transplant*”)	177 315
2	TITLE-ABS-KEY (“dialys*” OR “dialyz*”)	211 852
3	TITLE-ABS-KEY ((cost PRE/2 effective*) OR (cost PRE/2 utility) OR (cost PRE/2 benefit))	558 966
4	TITLE-ABS-KEY (“health econom*” OR “economic evaluat*”)	74 178
5	3 OR 4	612 023
6	1 AND 2 AND 5	848
7	Limit 6 to English-language studies	777
8	Limit 7 to studies that were published after December 31, 2000	579

Table S4. Electronic search from EconLit on June 12, 2019

Number	Search terms	Results
1	Kidney transplant	36

Table S5. Electronic search from HEED on June 12, 2019

Number	Search terms	Results
1	Kidney transplant	1

Table S6. Summary of primary outcomes from the 11 included studies

Author(s) year of publication	Description of patient population	Time horizon effect(s) method	Perspective country	Cost components	Main ICER that compares DDRT and dialysis (original currency, year)[a]
Kaminota 2001	Patients receiving dialysis, DDRT or LDRT	Lifetime DALY Trial-based	Payer Japan	Dialysis fee, transplant fee, operation fee for the procurement system.	Dominant for patients in the age groups of 20-29, 30-39 and 40-49 (JPY, 1995)
Roels et al. 2003	Patients receiving dialysis or DDRT	20 years QALY Model-based	Payer Germany	Direct medical cost of dialysis and transplant (surgery and maintenance)	Dominant (Euro, 2003)
Jassal et al. 2003	Elderly patients (age > 60) receiving in-center HD, DDRT or LDRT	Lifetime LY and QALY Model-based	Payer Canada	Direct medical cost of HD, transplant (workup, surgery, follow-up), and treatment of complications (acute rejection, complications, dialysis after transplant failure)	60-yr-old: wait time 2 vs. 4 years $60 237/QALY; $175 107/QALY 65-yr-old: depend on wait time, CVD & diabetes $14 910/QALY - $198 609/QALY 70-yr-old: wait time 2 vs. 4 years $79 360/QALY; $227.439/QALY 75-yr-old: wait time 2 vs. 4 years $99 553/QALY; $305 017/QALY 80-yr-old: wait time 2 vs. 4 years $137 999/QALY; $552 602/QALY 85-yr-old: wait time 2 vs. 4 years $231 158/QALY; $14 585 442/QALY (USD, 1999)
Mendeloff et al. 2004	Patients receiving dialysis or DDRT with varied quality and costs	Unstated QALY Model-based	Payer US	Direct medical cost of dialysis (HD or PD) and transplant (evaluation, procurement, hospital, physician, follow-up and immunosuppressant)	Worst case: $50 164/QALY Central case: Dominant Best case: Dominant (USD, 2004)
Whiting et al. 2004	Patients receiving dialysis vs. DDRT	20 years QALY Model-based	Payer Canada	Direct medical cost of dialysis and transplant (procurement, surgery, maintenance, graft loss, dialysis after failed graft)	Dominant (CAD, 1994)
Mutinga et al. 2005	50 000 patients of Caucasian, African American, Asian, and other races were	20 years QALY	Payer US	Medicare payments for dialysis; Medicare payments for transplant plus 20% copayments (representing	Caucasian, African American and Asian: dominant (under both matching schemes)

	simulated to receive dialysis or DDRT (with/without HLA-B matching)	Model-based		patient and secondary insurance payments) and an acquisition fee of $31 625 per kidney.	Other races: 2390/QALY (with HLA-B mismatching); $2480/QALY (without HLA-B mismatching) (USD, 2000)
Quinn et al. 2007	1000 patients were simulated to receive HD, PD, or DDRT under an equal or restricted access of DDRT (patients>=60 yrs had no access)	25 years LY and QALY Model-based	Payer Canada	Direct medical cost of HD, PD, and transplant (maintenance with a functioning graft)	Dominant for age groups of <20, 20-39 and 40-59 under both equal and restricted access Dominant for age group of 60+ under equal access (CAD, 2001)
Dominguez et al. 2011	16.5 million patients were simulated to receive HD, PD or DDRT	20 years QALY Model-based	Payer Chile	Direct medical cost of dialysis and transplantation (procurement, maintenance, immunosuppressant, graft rejection/dialysis)	Dominant (USD, 2009)
Ong et al. 2015	Patients were simulated to receive DDRT, LDRT, kidney-pancreas transplant, or dialysis	5 years QALY Model-based	Payer Singapore	Direct medical costs of dialysis and transplant (surgery, hospitalization, outpatient visits, drugs, and posttransplant follow-up)	S$52 656/QALY (SGD, 2010)
YaghoubiFard et al. 2016	32 HD recipients, 29 DDRT recipients, and 68 LDRT recipients	Lifetime DALY Model-based	Patient and hospital Iran	Direct medical costs of dialysis and transplantation (equipment, salaries, tariffs); indirect costs paid by patients (travel, accommodation, absence from work)	Patient's perspective: $65 253/DALY Hospital's perspective: $68 341/DALY (USD, 2012)
Axelrod et al. 2018	20 000 patients were simulated to receive dialysis, DDRT (standard criteria, high-KDPI, and PHS increased-risk) and LDRT	10 years QALY Model-based	Payer US	Direct medical costs of dialysis and transplantation (professional charges, hospitalization, graft failure, death) stratified by KDPI and immunologic/blood type compatibility.	Standard (low-KDPI): $83/QALY High-KDPI: $32 871/QALY PHS increased-risk: $7944/QALY (USD, 2016)

[a]We reported the original ICERs provided by each study using the original currency and base year. Adjusted ICERs (using USD and inflated to 2018 values) were reported in the text and in Table 1 for ICERs > 0.

[b]Deceased-donor renal transplant dominates dialysis if it improves health outcomes (i.e., more effective) at a reduced cost than dialysis.

ICER, incremental cost-effectiveness ratio; HD, hemodialysis; PD, peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis; DDRT, deceased-donor renal transplantation; LDRT, living-donor renal transplantation; LY, life years; QALY, quality-adjusted life-years; DALY, disability-adjusted life years; KDPI, Kidney Donor Profile Index; PHS, (US) Public Health System.

Table S7. Summary of secondary outcomes from the 11 included studies

Author(s) Year of publication	Key drivers of ICER examined in the study objectives, secondary analyses, or embedded in the study cohort	Discount (annual)	Parameters identified in the sensitivity analyses that influenced the original ICER
Kaminota 2001	Patient age	3% both	Age weight modulation factor in the calculation of DALYs
Roels et al. 2003	Investment of donor initiative programs (Donor Action)	5% both	Success rate of Donor Action
Jassal et al. 2003	Patient age (elderly>60), comorbidity, wait time, and type of dialysis (exclusive in-center HD)	3% both	Utility of life quality after transplantation
Mendeloff et al. 2004	Cost of dialysis and in/after the first year of transplant; utility of life quality associated with dialysis and transplantation	3% both	-- (no sensitivity analyses were conducted to compare DDRT versus dialysis)
Whiting et al. 2004	Investment of donor initiative programs (Donor Action)	5% both	Number of additional donors generated by Donor Action and time frame
Mutinga et al. 2005	Patient race and matching algorithm (eliminating HLA-B from allocation scheme)	5% both	-- (no sensitivity analyses were conducted to compare DDRT versus dialysis)
Quinn et al. 2007	Access to transplant (equal access for all age groups vs. eliminate access for patients with age>60)	5% both	-- (robust)
Dominguez et al. 2011	--	8% both	-- (no sensitivity analyses were conducted)
Ong et al. 2015	Comorbidity (diabetes)	3% both	-- (no sensitivity analyses were conducted to compare DDRT vs. dialysis)
YaghoubiFard et al. 2016	Patient-borne cost (both patient's and hospital's perspective were analyzed) and type of dialysis (exclusive HD)	3% both	-- (robust)
Axelrod et al. 2018	Risk factor of deceased donor (risk based on KDPI and presence of viral diseases)	3% both	-- (robust)

ICES, incremental cost-effectiveness ratio; HD, hemodialysis; DALY, disability-adjusted life year; PD, peritoneal dialysis; HLA, Human Leukocyte Antigen; KDPI, Kidney Donor Profile Index.

Table S8. Critical appraisal results for the 11 included studies using the Drummond checklist

No	Checklist items	Kaminota[1]	Roels[2]	Jassal[3]	Mendeloff[4]	Whiting[5]	Mutinga[6]	Quinn[7]	Dominguez[8]	Ong[9]	YaghoubiFard[10]	Axelrod[11]
1	Was a well-defined question posed in answerable form?	P	Y	Y	P	Y	Y	Y	P	Y	P	Y
2	Was a comprehensive description of the competing alternatives given?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3	Was the effectiveness of the programme or services established?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4	Were all the important and relevant costs and consequences for each alternative identified?	P	N	Y	Y	Y	Y	N	Y	P	N	P
5a	Were costs measured accurately in appropriate physical units?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y
5b	Were consequences measured accurately in appropriate physical units?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6a	Were the cost valued credibly?	P	Y	Y	Y	Y	Y	Y	Y	Y	P	Y
6b	Were the consequences valued credibly?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7a	Were costs adjusted for differential timing?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
7b	Were consequences adjusted for differential timing?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
8	Was an incremental analysis of costs and consequences of alternatives done?	N	Y	Y	Y	Y	N	N	Y	P	P	N
9	Was allowance made for uncertainty in the estimates of costs and consequences?	P	Y	Y	Y	P	Y	Y	N	Y	P	Y
10	Did the presentation and discussion of study results include all issues of concern to users?	P	P	Y	Y	Y	Y	Y	P	Y	N	Y
	Total points (out of 10 points)	6.75	8.5	10	9.5	9.5	9	8	8	9	5.75	8.5
	Average point (between 0 and 1)	0.68	0.85	1.00	0.95	0.95	0.90	0.80	0.80	0.90	0.58	0.85
	Risk of bias (Low-, Medium-, or High-risk)	H	M	L	L	L	L	M	M	L	H	M

Only the first author's last name was shown in the first row. "P" represents "partial score" where half of the assigned weight (1 or 0.5) is included. Discussion of the appraisal results is presented on the next page. Low-risk studies have an average score between 0.9-1.0 (inclusive), medium-risks are between 0.7-0.9 (exclusive), and high-risk are those scored equal to or below 0.70.

SDC Discussion: Appraisal results using the Drummond checklist

1. Was a well-defined question posed in answerable form?

All the included studies had a clear research question in answerable form. Additionally, all of them assessed both the costs and the effects of deceased-donor renal transplant (DDRT) and dialysis, respectively. Most studies collapsed the dialysis category into one although there are different dialysis modalities (e.g., peritoneal dialysis, home hemodialysis, in-center hemodialysis and hemodialysis in a satellite unit). All studies clearly stated the perspective chosen in their analysis, of which 10 studies adopted a healthcare payer's perspective and one[10] assumed a patient's perspective.

For the purpose of this review, we strictly required that studies defined their patient population to be people with end-stage renal disease (ESRD) who are potential candidates for both DDRT and dialysis. This restriction implied that studies must explicitly state that they considered patients maintaining on dialysis who were either enlisted for a DDRT or were healthy enough to be considered a DDRT. Nine studies[2-7,9,11] specified the patient population accordingly. The remaining studies[1,8,10] that targeted the general dialysis vs. DDRT recipients are at risk of producing biased results since those on dialysis who are not awaiting a transplant are generally expected to use health care differently and are sicker than their listed counterparts. This creates heterogeneity between patient populations. Furthermore, one study did not specify the time horizon of their analysis.[4] Nevertheless, we did not attempt to pool the data across studies.

We noted that 6 studies[1,3,8,10,11] investigated the cost-effectiveness of DDRT over dialysis as their main research objective.

2. Was a comprehensive description of the competing alternatives given?

All studies acknowledged dialysis as a comparator of DDRT. Three[3,9,10] further defined the type of dialysis examined to be hemodialysis[9] or in-center hemodialysis[3,10], and one[7] mentioned both hemodialysis and peritoneal dialysis but did not report separate results. The remaining studies[1,2,4-6,8,11] did not specify the type of dialysis examined. Four studies[1,9-11] mentioned other types of renal transplant and reported separate results for DDRT, including 4[1,9-11] that examined living-donor renal transplants, 1[9] that considered simultaneous pancreas-kidney transplants, and another 1[11] that assessed DDRTs from high-risk donors. In practise, there is a "do nothing" option in managing ESRD, ie, conservative renal management. However, for the purpose of this review, we focused on studies that compared DDRT and dialysis. As stated previously not all alternatives for dialysis and a kidney transplant were provided in most studies.

3. Was the effectiveness of the programme or services established?

Due to the infeasibility of randomized controlled clinical trials in the current context, all of the included studies relied on observational data to inform effectiveness estimation. Five studies[1,6,9-11] established effectiveness by using person-level deidentified administrative record, including those retrieved from the United States Renal Data System (USRDS)[6,11], the Scientific Registry of Transplant Recipient (SRTR)[11], as well as clinical data housed at national or hospital database[1,9,10]. The remaining 6 studies[2-5,7,8] relied entirely on previous literature or governmental reports with proper referencing and justifications of their choice.

4. Were all the important and relevant costs and consequences for each alternative identified?

One study[10] included patient-borne costs of dialysis and DDRT, including the tariffs paid by patients and the costs of travel, accommodation, and loss of salary due to work absence. The remaining 10 studies[1-9,11] all took a health payer's perspective and thus identified only the direct

medical cost associated with dialysis and DDRT. These studies may be subjected to bias due to neglecting payments made by patients or their families.

Two studies[2,7] did not provide sufficient explanations to the cost components in their analysis by using lump sum cost estimates for DDRT under just 3 categories: nephrectomy (surgery), year on, and follow-up after year 1. Furthermore, while the majority of studies acknowledged a higher transplant cost during the first postoperative year and lower costs for maintenance phase thereafter, one study[10] failed to recognize this pattern, making it to be at risk of overestimating the total transplant cost. Costs associated with transplant workup (including organ procurement) and graft failure (including nephrectomy and dialysis reinitiation fee) were not investigated by 6 studies[1,2,7,9-11] and 5 studies[1,2,4,7,10], respectively, who were likely to produce biased results that favoured transplantation by underestimating the total transplant costs.

5a. Were costs measured accurately in appropriate physical units?

Most studies measured each cost component by multiplying the unit cost to the quantity of resource used. One study[10] did not provide any unit cost estimate but used a lump-sum estimate for the total cost of transplant and dialysis, respectively. The same study also relied entirely on hospital payment record and patient interviews to arrive at their cost estimations, which lacks accuracy given the small sample of patients examined (32 dialysis recipients and 29 DDRT recipients).

5b. Were consequences measured accurately in appropriate physical units?

Quality-adjusted life-years (QALY) were used in the majority of the studies,[2-9,11] followed by life-years (LY)[3,7] and disability-adjusted life-years (DALY).[1,10] Two studies[3,7] evaluated both QALY and LY, but did not report discounted LYs. QALYs were computed by multiplying the number of LYs in 1 health state by the corresponding utility measures that were obtained from

published literature. DALYs were calculated as the sum of years of life loss (YLLs) and years lived with disability (YLDs). The disability weight was estimated based on a questionnaire emailed to 95 healthcare officials in a Japanese study[1] and results of a published study in an Iranian study,[10] both of which were credible sources.

6a. Were the cost valued credibly?

All costs were valued in monetary units. US Dollars were the most common currency (used by 6 studies[3,4,6,8,10,11]), followed by a variety of international currencies (including Canadian Dollars,[5,7] Japanese Yen,[1] Singapore Dollars,[9] and Euros[2]). All studies identified the year of their currency. Costs were constructed by microcosting methods using actual person-level healthcare utilization data extracted from well-validated administrative databases, including Medicare of the US.[6,11] Three studies used patients files provided by hospital[1,10] or other national insurance database.[9] The remaining studies[2-5,7,8] derived cost data using governmental reports (on medical procedure prices) and previous literature. One study[10] that considered patient payments for dialysis and DDRT obtained cost estimates by interviewing patients and their families.

One study[1] used the total national expenditure for dialysis and the proportion of inpatient dialysis to estimate individual dialysis cost, but did not specify how they calculated the annual cost after transplantation. Another study[10] did not provide aby explanation on the type of hospital costs evaluated for patients in their cohort.

6b. Were the consequences valued credibly?

Outcomes were measured in LYs in all papers and then adjusted to QALYs[2-9,11] or DALYs[1,10] in some occasions. Five studies[1,6,9-11] established LYs using person-level data (eg, survival time after DDRT) in conjunction with appropriate statistical analysis (eg, survival curve).

The remaining studies[2-5,7,8] relied entirely on published data for LYs. For utility, all studies used previous literature with proper justifications of their choice.

7a. Were costs adjusted for differential timing?

All studies applied discounting to costs. A wide range of annual discount rates was used, including 3%,[1,3,4,9-11] 5%,[2,5-7] and as high as 8%.[8]

7b. Were consequences adjusted for differential timing?

All studies applied discounting to future effects with proper justifications of the chosen discount rate.

8. Was an incremental analysis of costs and consequences of alternatives done?

For the purpose of this review, we strictly defined incremental analysis to consist of a computation of an incremental cost-effectiveness ratio (ICER) that compared DDRT and dialysis. Cost-effectiveness (or cost-utility) ratios (CERs or CURs or average CER or average CUR) that estimated the unit cost per outcome gained by DDRT or dialysis were not accepted as an incremental measure. Calculation of ICER was unnecessary for 5 studies[1,2,5,7,8] that concluded DDRT to dominate dialysis under all conditions. For the rest of the 6 studies, only 2[3,4] reported ICERs that were computed correctly. One study[9] wrongly claimed dialysis to dominate DDRT when DDRT was demonstrated to be more expensive but also more effective at producing QALYs. Another study[10] reported ICERs that were incorrectly computed, given their reported total respective costs and effects of DDRT and dialysis. Two studies[6,11] only reported the CURs of DDRT and dialysis so we calculated an ICER based on their estimates of the incremental cost/effect.

9. Was allowance made for uncertainty in the estimates of costs and consequences?

All but one study[8] performed sensitivity analyses to assess the robustness of their main results. Specifically, 8 studies[1-3,5-7,9,10] performed a 1-way sensitivity analysis that varied parameter inputs 1 at a time to identify significant modifiers of the main results. Since a high/low value must be assigned to each parameter in a 1-way sensitivity analysis, 5 studies[1-3,7,9] obtained their high/low estimates from previous literature, and 2[6,9] varied each base-case input value by some percentages (eg, up and down by 30%). Two studies[1,5] only assessed a limited number of parameters in the 1-ways sensitivity analysis and made no effort to verify if other parameters were also be impactful. Another study[10] did not present the low/high value for any parameter examined in their 1-way sensitivity analysis.

Furthermore, one study[11] performed extensive probabilistic sensitivity analyses in which all parameter inputs were varied simultaneously, each drawn from a predetermined statistical distribution with abundant justifications of the choice. Another study[4] conducted a series of sensitivity and scenario analysis that was not typical in economic evaluations (ie, not in the form of 1-way, 2-way, or probabilistic sensitivity analyses). However, through their extensive search in the literature and appropriate use of statistical techniques we agree that the robustness of their findings was established.

10. Did the presentation and discussion of study results include all issues of concern to users?

All studies have clearly stated the cost-effectiveness results based on the ICERs or CERs (or CURs) obtained from the analysis. One study[10] concluded DDRT to be more costly than dialysis but was still cost-effective without providing a willingness-to-pay threshold.

Eleven studies discussed their main findings in comparison with the results of prior literature. One early study[1] that possibly represents the first cost-effectiveness analysis of DDRT

vs. dialysis in the respective country (Japan) has limited ability to contrast their study findings with others.

Generalizability was discussed by 8 studies[3-7,9-11] who gave extensive discussions on the limitation of their analysis, especially on the heterogenous nature of data sources used to derive parameter inputs. Two studies[1,8] did not discuss the potential limitations of their analysis at all, and one[2] only briefly mentioned 2 weaknesses of their analysis while neglecting other important limitations that were potentially important.

Finally, all studies have provided in-depth discussion on the policy implications in public health, including allocations and access of DDRT,[1,6,7,10] investments in organ donation and procurement activities (eg, Donor Action),[2,4-6,8,10] care delivery for ESRD patients with other significant comorbidities (ie, diabetes and cardiovascular disease)[3,9] or advanced age,[3,7] and the use of suboptimal donor kidneys.[11]

References of the 11 studies included in the review

1. Kaminota M. Cost-effectiveness analysis of dialysis and kidney transplants in Japan. *Keio J Med*. 2001;50(2):100–108.

2. Roels L, Kalo Z, Boesebeck D, et al. Cost-benefit approach in evaluating investment into donor action: the German case. *Transpl Int*. 2003;16(5):321–326.

3. Jassal SV, Krahn MD, Naglie G, et al. Kidney transplantation in the elderly: a decision analysis. *J Am Soc Nephrol*. 2003;14(1):187–196.

4. Mendeloff J, Ko K, Roberts MS, et al. Procuring organ donors as a health investment: how much should we be willing to spend? *Transplantation*. 2004;78(12):1704–1710. doi:10.1097/01.TP.0000149787.97288.A2

5. Whiting JF, Kiberd B, Kalo Z, et al. Cost-effectiveness of organ donation: evaluating investment into donor action and other donor initiatives. *Am J Transplant*. 2004;4(4):569–573. doi:10.1111/j.1600-6143.2004.00373.x

6. Mutinga N, Brennan DC, Schnitzler MA. Consequences of eliminating HLA-B in deceased donor kidney allocation to increase minority transplantation. *Am J Transplant*. 2005;5(5):1090–1098. doi:10.1111/j.1600-6143.2005.00802.x

7. Quinn RR, Manns BJ, McLaughlin KM. Restricting cadaveric kidney transplantation based on age: the impact on efficiency and equity. *Transplant Proc*. 2007;39(5):1362–1367.

8. Domínguez J, Harrison R, Atal R. Cost-benefit estimation of cadaveric kidney transplantation: the case of a developing country. *Transplant Proc*. 2011;43(6):2300–2304. doi:10.1016/j.transproceed.2011.06.006

9. Ong SC, Lee VTW, Lim JFY, et al. Is simultaneous pancreas kidney transplant the most cost-effective strategy for type 1 diabetes patients with renal failure? *Proc Singap Healthc*. 2016:25(2);127–134. doi:10.1177/2010105815610137

10. YaghoubiFard S, Goudarzi R, Etminan A, et al. Cost-effectiveness analysis of dialysis and kidney transplant in patients with renal impairment using disability adjusted life years in Iran. *J Islam Repub Iran*. 2016;30:390.

11. Axelrod DA, Schnitzler MA, Xiao H, et al. An economic assessment of contemporary kidney transplant practice. *Am J Transplant*. 2018;18(5):1168–1176.

PRISMA 2009 Checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title page
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Abstract page
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	1-2
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	2
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	N/A
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	2-3
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	2
Search	8	Present full electronic search strategy for at least 1 database, including any limits used, such that it could be repeated.	Table S1-S5
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	5
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	5
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	5
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	5-6; Table S8
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	6
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	6

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	6; Table S8
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, metaregression), if done, indicating which were prespecified.	N/A
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	6; Figure 2
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 1 & Table S6-S7
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table S8
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 2 & Table S6
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	N/A
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Table 1 & Table S8
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, metaregression [see Item 16]).	N/A
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	12-13
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	14-15
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	13-14
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	Authorship page

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