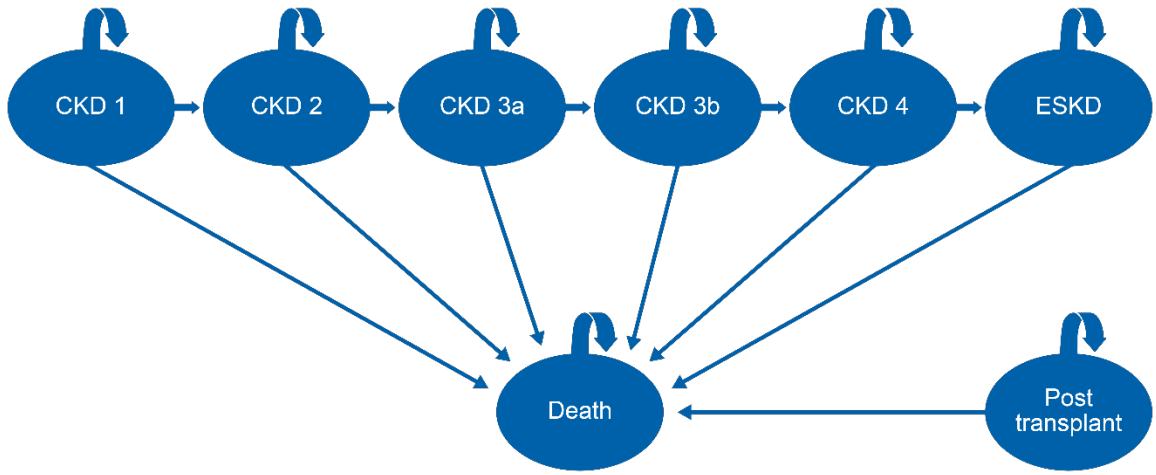
Quantifying Spillover Impacts: Effect of Novel Therapies for IgA Nephropathy on Patients Awaiting Kidney Transplant

SUPPLEMENTARY METHODS

Markov Model for IgAN Progression

- The Markov model simulated the reduction in the number of patients with IgAN entering the US kidney transplant waitlist due to IgAN interventions using a hypothetical cohort of adult patients with IgAN
  - The clinical outcomes of patients with IgAN treated with iptacopan, dapagliflozin, delayed-release budesonide, sparsentan, or atrasentan, plus nonspecific therapy and supportive care, were compared with patients treated with nonspecific therapy and supportive care alone
  - The model utilized a lifetime horizon of 70 years and 3-month cycles
- Following a previously published IgAN value assessment,[1] the Markov model structure utilized CKD staging, which defines IgAN progression through seven discrete and mutually exclusive health states, plus death (**Supplementary Figure 1**)
  - In each cycle, patients could remain in their current health state, transition to a more severe health state, or die
  - Patients progressed sequentially through all health states except for death, which could occur at any time

Supplementary Figure 1. Markov Model Structure



Patients with kidney failure were assumed to receive dialysis.
CKD, chronic kidney disease; ESKD, end-stage kidney disease.

Supplementary Table 1. Spillover Model Inputs

Parameter	Value	Source
Clinical inputs		
Annual mortality of general population	Varies by patient age	SSA[2]; Authors' calculation
Quarterly transition probabilities (%)		
CKD 1 to CKD 2	7.1	Ramjee L et al. (2023)[1]
CKD 2 to CKD 1	0.6	Ramjee L et al. (2023)[1]
CKD 2 to CKD 3a	3.3	Ramjee L et al. (2023)[1]
CKD 3a to CKD 2	1.8	Ramjee L et al. (2023)[1]
CKD 3a to CKD 3b	5.1	Ramjee L et al. (2023)[1]
CKD 3b to CKD 3a	1.3	Ramjee L et al. (2023)[1]
CKD 3b to CKD 4	2.0	Ramjee L et al. (2023)[1]
CKD 4 to CKD 3b	1.3	Ramjee L et al. (2023)[1]
CKD 4 to ESKD	2.0	Ramjee L et al. (2023)[1]
ESKD to post transplant	1.39	Kent S et al. (2015)[3]; Authors' calculation
Initial patient distribution (%)		
CKD 1	3.0	Ramjee L et al. (2023)[1]
CKD 2	34.0	Ramjee L et al. (2023)[1]
CKD 3a	39.0	Ramjee L et al. (2023)[1]
CKD 3b	24.0	Ramjee L et al. (2023)[1]
CKD 4	0.0	Ramjee L et al. (2023)[1]
ESKD	0.0	Ramjee L et al. (2023)[1]
Relative risk of death due to CKD (HR)		
CKD 1	1.000	Go AS et al. (2004)[4]
CKD 2	1.000	Go AS et al. (2004)[4]
CKD 3a	1.200	Go AS et al. (2004)[4]
CKD 3b	1.800	Go AS et al. (2004)[4]
CKD 4	3.200	Go AS et al. (2004)[4]
ESKD	5.900	Go AS et al. (2004)[4]
Post transplant	4.699	Harding JL et al. (2021)[5]; Authors' calculation
Kidney waitlist characteristics		
No. of organ arrivals per year	27,332	OPTN (2023)[6]
No. of total waitlist arrivals per year	44,561	OPTN (2023)[6]
No. of patients with IgAN arriving to waitlist per year	2004	OPTN (2023)[6]
Time to candidate removal (years)	5.239	Dennen S et al. (2021)[7]
US IgAN prevalence (%)	0.033	Lerma EV et al. (2023)[8]
US IgAN incidence (%)	0.003	Rout P et al. (2024)[9]

Parameter	Value	Source
Clinical inputs		
US population	333,300,000	US Census Bureau (2024)[10]
Treatment efficacy (HR)	0.526	Delay in progression due to recent innovations[11-15]
Utilities		
Quality of life (HUI-3 global utility index)		
CKD 1	0.670	Gorodetskaya I et al. (2005)[16]
CKD 2	0.670	Gorodetskaya I et al. (2005)[16]
CKD 3a	0.670	Gorodetskaya I et al. (2005)[16]
CKD 3b	0.670	Gorodetskaya I et al. (2005)[16]
CKD 4	0.550	Gorodetskaya I et al. (2005)[16]
ESKD	0.540	Gorodetskaya I et al. (2005)[16]
LYs[a]		
With transplant	14.66	Jena AB et al. (2019)[17]; Cleemput I et al. (2004)[18]; Authors' calculation
Without transplant	7.96	Jena AB et al. (2019)[17]; Cleemput I et al. (2004)[18]; Authors' calculation
QALYs[a]		
With transplant	11.39	Jena AB et al. (2019)[17]; Cleemput I et al. (2004)[18]; Authors' calculation
LY and QALY gains discount rate (%)	2.0	Cohen JT (2024)[19]
Willingness to pay for a QALY (US$)	150,000	ICER (2023)[20]

[a]Literature values discounted at a rate of 3.5%. Values were undiscounted assuming a uniform distribution of LYs and constant universal discounting method.

CKD, chronic kidney disease; ESKD, end-stage kidney disease; HR, hazard ratio; HUI-3, Health Utilities Index-3; ICER, Institute for Clinical and Economic Review; IgAN, immunoglobulin A nephropathy; LY, life-year; OPTN, Organ Procurement and Transplantation Network; QALY, quality-adjusted life-year; SSA, Social Security Administration; US, United States.

SUPPLEMENTARY RESULTS

Supplementary Table 2. Benefits of IgAN Interventions According to Scenario Analyses

Scenario	Reduction in annual kidney demand	QALY gains			Monetized QALYs (US$)		Spillover benefit as share of total value (%)	Baseline value
		Direct health benefit	Spillover benefit	Total benefit	Spillover benefit	Total benefit		
Treatment utilization (% of patients)								
100% treated with atrasentan	716	1.470	0.440	1.909	65,964	286,397	23.0	20% for each treatment
100% treated with delayed-release budesonide	471	0.934	0.287	1.221	43,104	183,140	23.6	
100% treated with dapagliflozin	1255	2.812	0.781	3.594	117,184	539,038	21.7	
100% treated with iptacopan	511	1.017	0.312	1.329	46,749	199,328	23.5	
100% treated with sparsentan	537	1.073	0.328	1.401	49,161	210,076	23.4	
Willingness to pay per QALY (US$)								
$50,000	669	1.362	0.410	1.772	20,495	88,599	23.1	150,000
$100,000	669	1.362	0.410	1.772	40,990	177,197	23.1	
$200,000	669	1.362	0.410	1.772	81,981	354,395	23.1	
$500,000	669	1.362	0.410	1.772	204,952	885,986	23.1	
Current waitlist size								
−20% (N=71,945)	669	1.362	0.407	1.769	61,038	265,348	23.0	N=89,931
+20% (N=107,907)	669	1.362	0.413	1.775	61,925	266,235	23.3	
Median time on waitlist								
−20% (4.191 years)	669	1.362	0.425	1.787	63,730	268,040	23.8	5.239 years
+20% (6.287 years)	669	1.362	0.396	1.758	59,336	263,647	22.5	
Annual arrival rate of candidate								
−20% (N=35,649)	669	1.362	0.529	1.891	79,394	283,704	28.0	N=44,561
+20% (N=53,473)	669	1.362	0.334	1.696	50,068	254,378	19.7	
Baseline	**669**	**1.362**	**0.410**	**1.772**	**61,485**	**265,796**	**23.1**	**As above**

IgAN, immunoglobulin A nephropathy; QALY, quality-adjusted life-year; US, United States.

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ABBREVIATIONS

CKD, chronic kidney disease; ESKD, end-stage kidney disease; HR, hazard ratio; HUI-3, Health Utilities Index-3; ICER, Institute for Clinical and Economic Review; IgAN, immunoglobulin A nephropathy; LY, life-year; OPTN, Organ Procurement and Transplantation Network; QALY, quality-adjusted life-year; SSA, Social Security Administration; US, United States.