Health Economic Analysis of Rabbit Antithymocyte Globulin versus Basiliximab in Renal Transplantation – A German perspective

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Disclosures

Friedrich Thaiss

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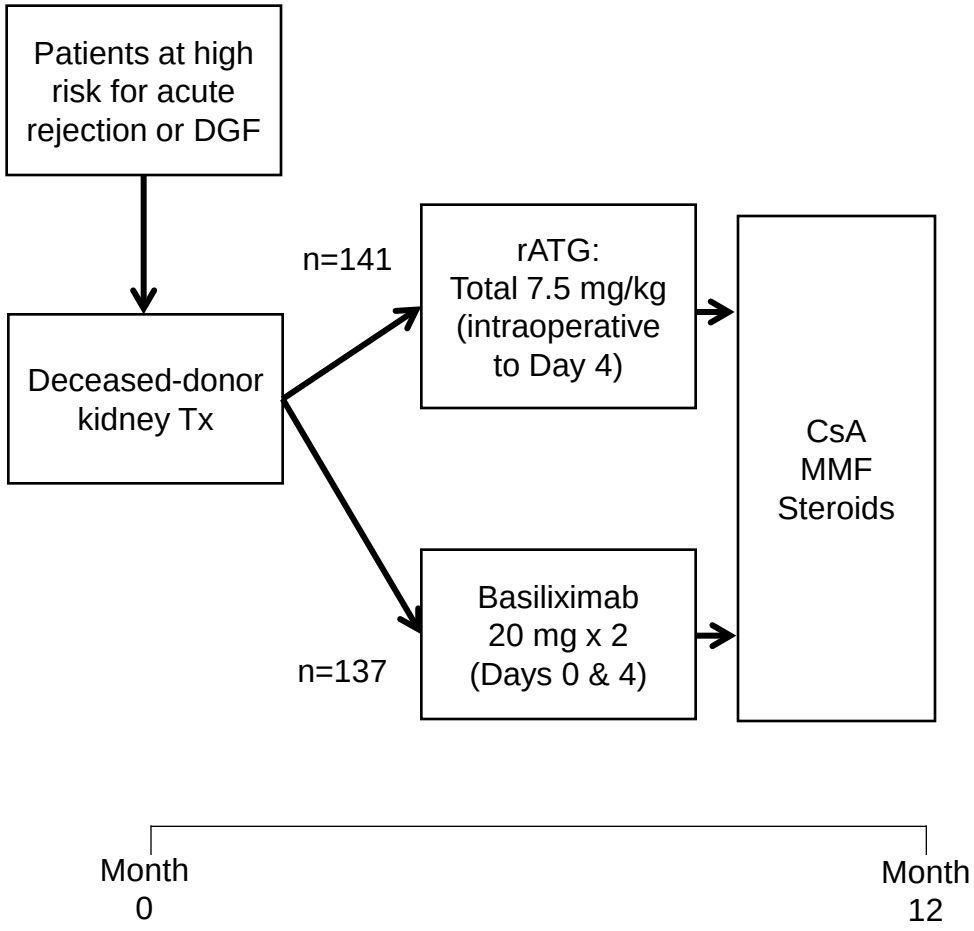
- Advisory board member:
  - Novartis, Sanofi

Introduction

- Induction therapy is widely used after kidney transplantation to prevent organ rejection.
- While several options for induction therapy are available, limited health economic comparisons between treatments exist.
- The objective of this study was to conduct a health economic comparison between two agents approved for induction therapy in kidney transplantation: rabbit ATG (rATG, Thymoglobulin®) and basiliximab (Simulect®).
- This study combined clinical outcomes data from an available dataset[1] with resource utilization and cost estimates from several German hospitals to calculate a health-economic perspective for the German setting.

1. Brennan DC *et al*. *N Engl J Med* 2006;355:1967–77

Brennan et al: A prospective, randomised, international trial[1]



	rATG	Basiliximab	P value
DGF	40.4%	44.5%	n.s.
Acute rejection	15.6%	25.5%	0.02
Antibody-treated acute rejection	1.4%	8.0%	0.005
Graft loss	9.2%	10.2%	n.s.
Death	4.3%	4.4%	n.s.
Infection	85.8%	75.2%	0.03
CMV infection	7.8%	17.5%	0.02

1. Brennan DC *et al*. *N Engl J Med* 2006;355:1967–77

Methods

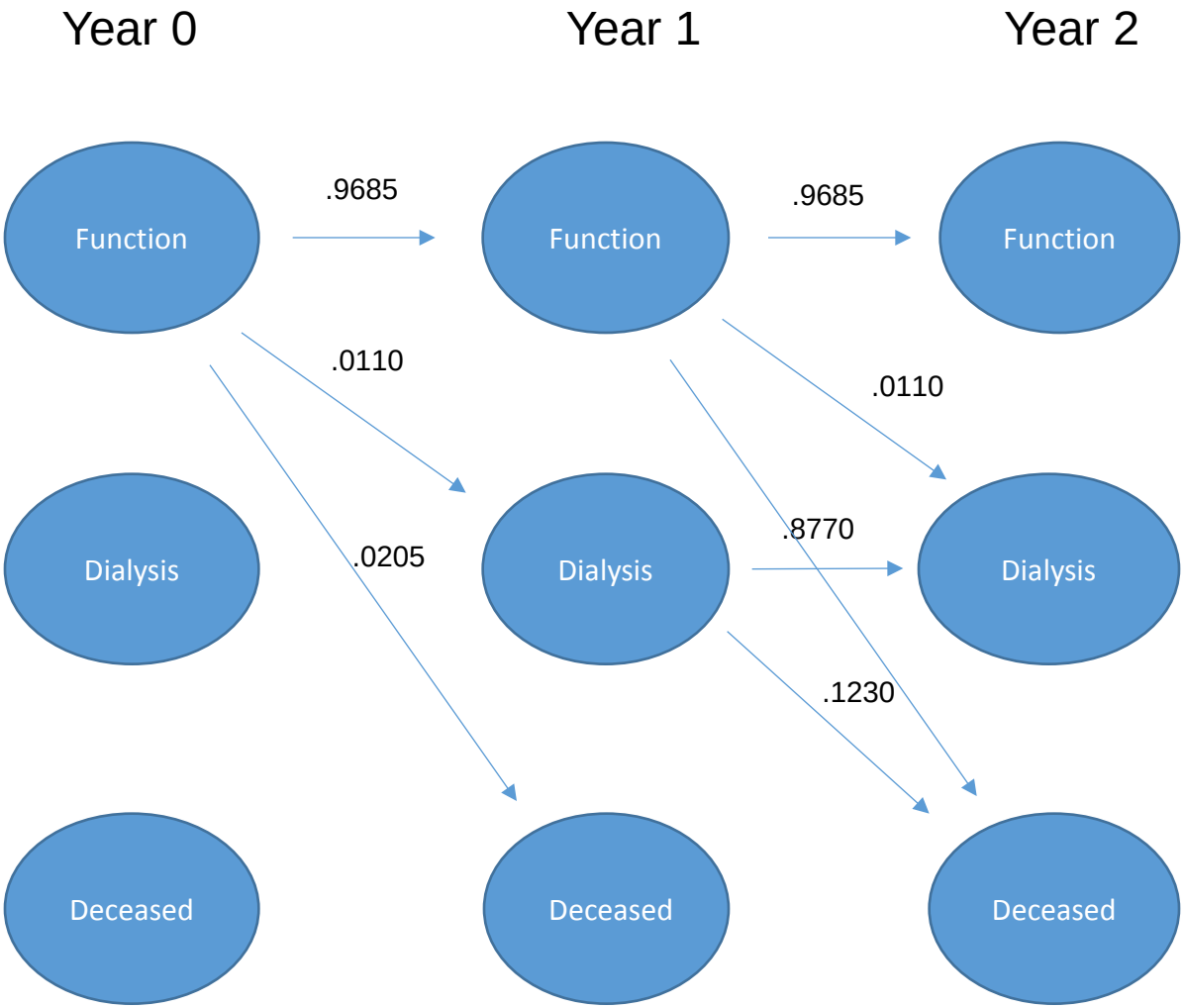
- Clinical events and outcomes occurring within 12 months of transplant were estimated using the original SAS Brennan database
- Resource utilization and costs were supplemented with data from three German hospitals
- Total treatment costs were estimated by multiplying resource utilization observations x mean hospital-reported charges
- Key inputs to the model included:
  - Drug costs, costs associated with avoidance of acute rejection, graft failure, use of dialysis, utility estimates, survival rates
- Statistical approaches applied:
  - Demographic characteristics: Chi Square & Student's t tests
  - DGF, graft failure & death: Chi Square test
  - Rejections & infections per patient: Wilcoxon rank sum test

Methods

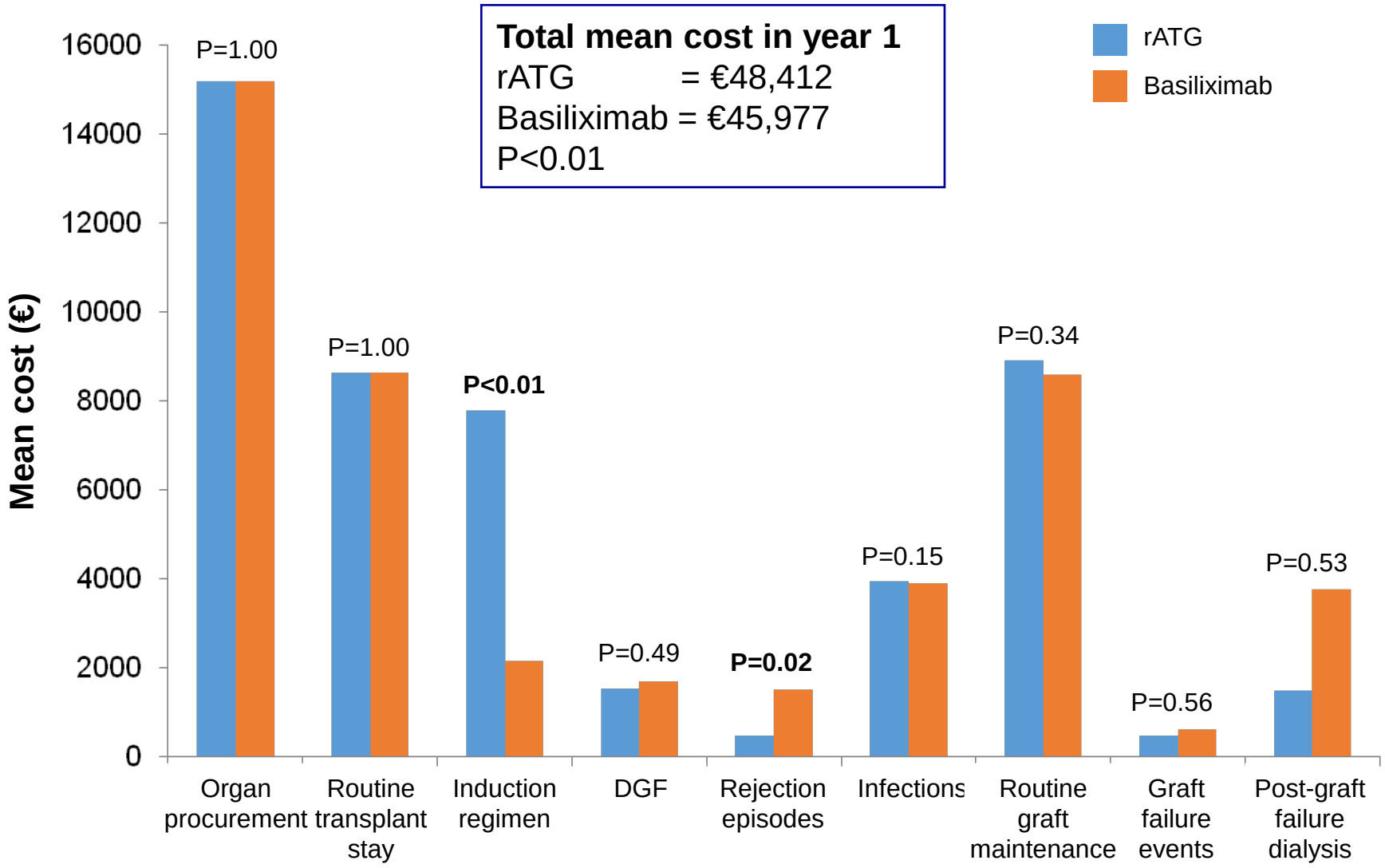
- A 4-state Markov model was used, with the following 3 cohorts:
  - Transplant patients receiving rATG
  - Transplant patients receiving basiliximab
  - Non-transplanted ESRD patients on dialysis
- In the model, patients are predicted to transition between 4 health states:
  - Never transplanted (0.68 utility)
  - Alive with functioning graft (0.84 utility)
  - Alive following graft failure (0.68 utility)
  - Deceased (0.0 utility)
- Estimates based on US Renal Data System data were used to model health state transitions
- Utility scores for calculating cost per quality-adjusted life year (cost/QALY) were obtained from the literature[1]
- Costs and QALYs over the 10-year time horizon were estimated using the Markov model

[1]*Matas A. American Journal of Transplantation* 2003; 4: 216–221

Model Schema with transition probabilities

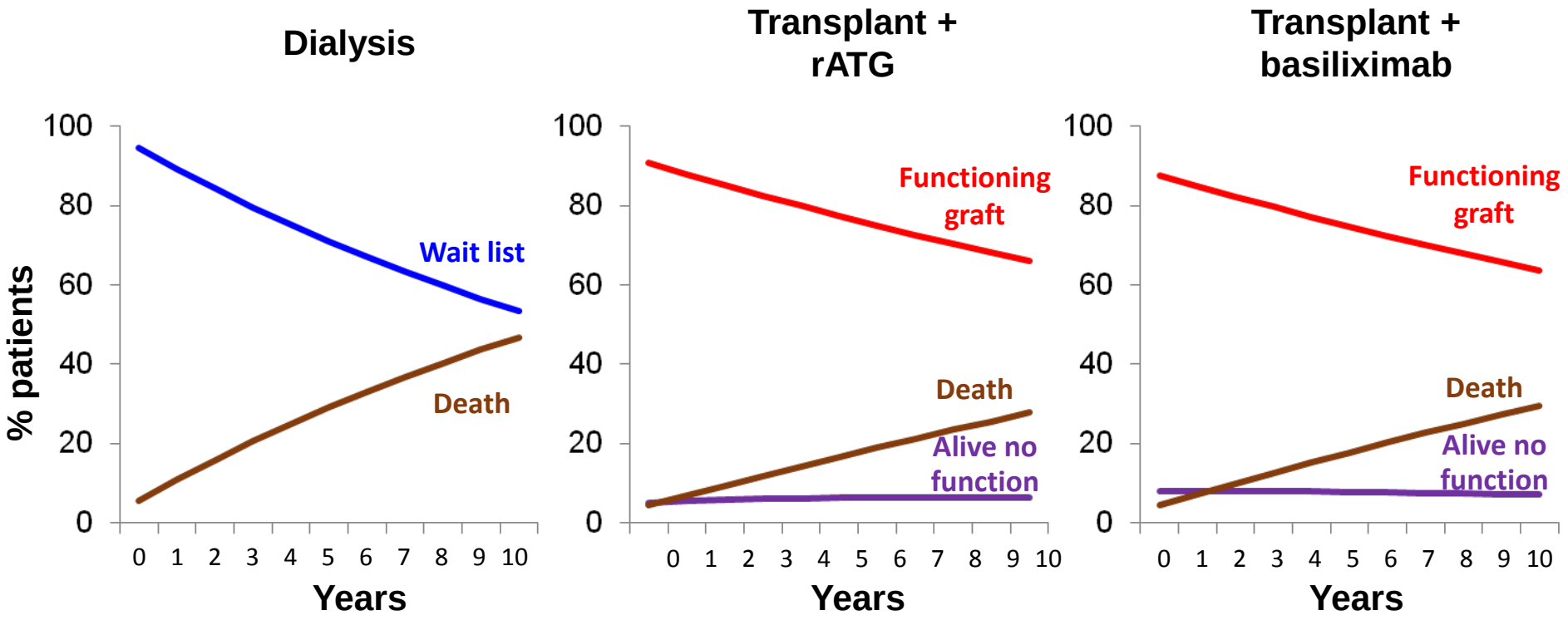


Results: Costs within year 1 post-transplant



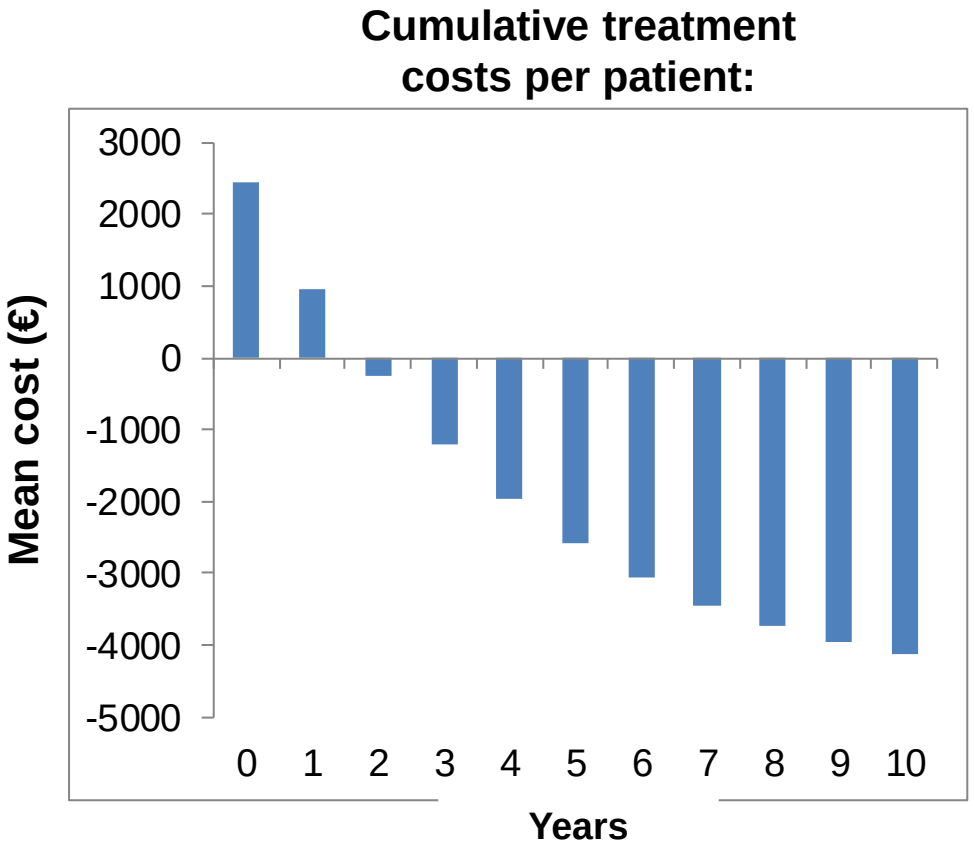
Wilcoxon Rank Sum test

Results: Patient health status to year 10



- Mortality is higher on dialysis than after transplant
- 10-year graft survival predicted to be ~2% higher with rATG versus basiliximab induction

Results: Cumulative incremental costs per patient @ 10 year time horizon



- From the end of year 2, costs are projected to be lower in the rATG cohort, reaching €4,132 per patient savings by year 10
- Cost savings over time for rATG vs basiliximab are driven by fewer patients returning to dialysis treatment (following graft rejection)

Results: Cumulative QALYs per patient @ 10-year time horizon

Difference in cumulative QALYs per patient rATG vs basiliximab

- rATG-treated patients are projected to enjoy a modest gain in total QALY benefit vs basiliximab, reaching 0.096 by year 10 per patient, for every 100 patients
  - 0.096 QALY benefits equates to more than a month in perfect health

- Compared with no treatment or dialysis, patients receiving either rATG or basiliximab accrue a substantial gain in quality-adjusted life years, equating to approximately 1.5 years in perfect health

	0	1	2	3	4	5	6	7	8	9	10
No Tx*	0.661	1.254	1.786	2.264	2.692	3.076	3.421	3.731	4.008	4.257	4.480
rATG	0.809	1.555	2.245	2.882	3.471	4.014	4.516	4.978	5.405	5.798	**6.161**
Bas	0.802	1.542	2.224	2.852	3.431	3.965	4.457	4.910	5.327	5.711	**6.065**

*No transplant / dialysis

Results: Costs(€)/QALY, 10 year time horizon

Costs/QALYs per patient over 10 years

- Both rATG and basiliximab interventions are dominant to no transplant/dialysis, meaning they provide both greater clinical benefit (QALY gain) at a lower cost
- Beginning end of year 2, rATG is dominant to basiliximab, by accruing greater clinical benefit (QALY gain) at lower cost
- Dominance is the strongest interpretation of cost-effectiveness analysis, where greater clinical benefit is provided at lower cost

	0	1	2	3	4	5	6	7	8	9	10
No Tx*	91, 284	91, 284	91, 284	91, 284	91, 284	91, 284	91, 284	91, 284	91, 284	91, 284	91, 284
rATG	59, 842	36, 842	29, 292	25, 601	23, 445	22, 051	21, 089	20, 392	19, 871	19, 470	19, 154
Bas	57, 328	36, 547	29, 683	26, 294	24, 290	22, 977	22, 056	21, 380	20, 865	20, 462	20, 140

*No transplant /dialysis

Summary

- The purchase cost of rATG induction is €4,055 higher than basiliximab
  - Reduced costs associated with DGF, rejection, graft failure and return to dialysis substantially reduced this difference by year 1
- After 10 additional years, rATG is associated with an additional 0.096 QALYs vs basiliximab, and a €4,132 reduction in cost per patient for every 100 patients treated
- According to this model, the cost per QALY gained is €91,284, €25,142 and €26,268 for ESRD with no dialysis, transplant with rATG and transplant with basiliximab, respectively

Conclusion

- rATG provides more QALYs with lower long-term costs than basiliximab
  - The QALY advantage is evident within 1 year
  - Cost reduction occurs during year 2, and grows thereafter
- Health economic modeling, including cost/QALY analysis, is valuable to reflect the long-term cost and consequences – including the patient benefit – that may be achieved with different immunosuppressive agents
- Improved long-term clinical outcomes may facilitate delivery of more cost-effective care
- Because ESRD funding is in the public domain, it is appropriate for healthcare institutions and individual countries to investigate if policy and reimbursement changes might result in more cost-effective care

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