Potential Cost-savings Associated With ANG-3777 For The Treatment Of Delayed Graft Function In Kidney Transplantation

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Background

Kidney transplantation requires high-cost, complex management in multimorbid patient populations. Medical technologies have the potential to reduce health care cost in at-risk populations, such as those with signs and symptoms of delayed graft function (DGF). ANG-3777, a small molecule hepatocyte growth factor (HGF) mimetic, offers an illustrative example, as Phase 2 clinical trials showed improvement in kidney function and reduced hospital length of stay (LOS). Modeling outcomes from these data provides a view to potential cost-savings of ANG-3777 in the kidney transplant DGF population.

Objectives

Model cost offsets associated with the use of ANG-3777 in patients with DGF following kidney transplant based on Phase 2 data (NCT01286727).

Methods

Study Design

A medical cost offset model based on results of a Phase 2, double-blind, randomized controlled trial of ANG-3777 from the perspective of a US integrated disease network with a 1-year time horizon.

Study Population

Adult patients ≥18 years undergoing kidney transplantation experiencing DGF as defined by urine output (UOP) <50 cc for the first 8 hours post-transplant.

Study Comparators

- ANG-3777: 2 mg/kg given as a 30-minute IV infusion within 36 hours post-transplant and at 24 and 48 hours
- Placebo (PBO)

Model Approach and Outcomes

The model assessed costs across 3-time horizons **(Figure 1)** calculated from several data sources, including the following **(Table 1)**:

- Transplant hospital days, graft failure rates, and eGFRs were collected from the Phase 2 trial
  - Graft failure in the ANG-3777 was inflated from an observed 0.0% to 5.58% arm to reflect epidemiologic norms for non-DGF patients [1]
- Months 2 to 12 hospitalizations and costs were based results from peer-reviewed literature, which were applied to the phase 2 data [1-5]
- Costs were generated via a Premier Hospital Database analysis and the 2018 United States Renal Data System (USRDS) annual data report [2]
  - Costs for 2017 were inflated to 2018 dollars and adjusted by 58% to reflect Medicare costs (from USRDS) vs IDN per USRDS Annual Data Report 2013 [3]
- Note: the cost of ANG-3777 is unknown and therefore not included in this analysis

Results

Component and Total Costs (Table 1, Figure 2):

- Initial hospital (Δ $12,239), readmissions (Δ $775), and graft failure costs (Δ $26,233) were higher in the placebo arm of the model
- Non-graft failure 7- to 12-month hospitalization costs were slightly higher in the ANG-3777 arm (Δ $85), due to the fact that fewer patients experienced graft failure
- The total calculated, per-patient, cost offset associated with ANG-3777 in the first year after transplantation was $39,162 **(Figure 2)**

Figure 1: Model Approach Schema

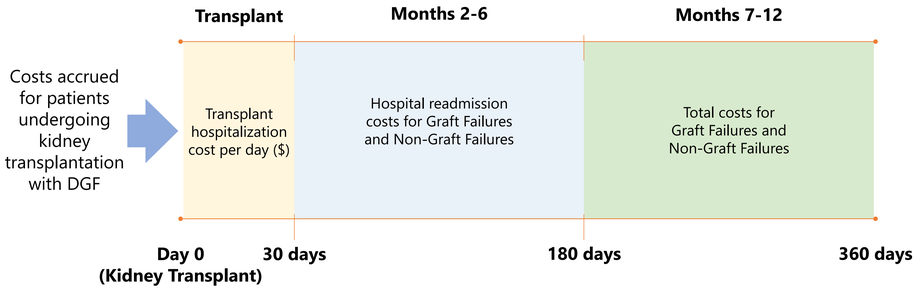
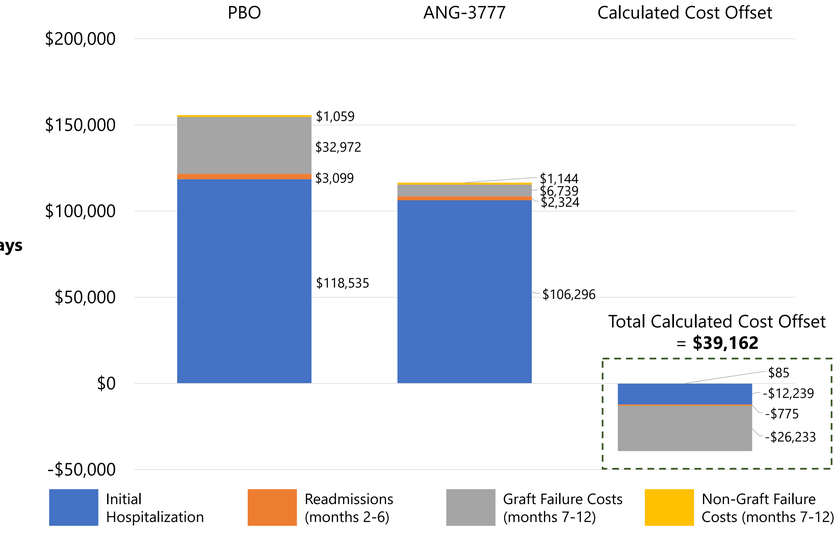


Table 1: Model Inputs and Results

Model Inputs and Data Sources	Placebo (PBO)	ANG-3777
MONTH 1		
Transplant hospitalization length of stay, mean (Phase 2 trial results)	11.4	7.6
Transplant hospitalization cost, mean (Mohan, 2019) [4]	$118,534	$106,296
MONTHS 2-6		
6-month eGFR, mean mL/min per 1.73 m^2 (Phase 2 trial results)	39.5	47.5
Readmissions, mean (Keong, 2016) [5]	40%	30%
Readmission costs, mean (Mohan, 2019) [4]	$7,748	$7,748
MONTHS 7-12		
Graft Failures		
Graft failure rate at 1 year (Phase 2 trial results)	1/9 (22.2%)	0/19 (0.0%)
Imputed graft failure rate, ANG-3777 (Butala, 2013) [1]	--	5.58%
Graft failure cost, mean (USRDS Annual Data Reports, 2013 & 2018) [2,3]	$162,482	$162,482
Non-Graft Failures		
Non-graft failure rate at 1 year (Phase 2 trial results)	8/9 (77.8%)	9/19 (100.0%)
Imputed non-graft failure rate, ANG-3777 (Butala, 2013) [1]	--	94.4%
Rehospitalizations, mean (Keong, 2016)* [5]	0.18	0.16
Rehospitalization cost, mean (Mohan, 2019) [4]	$7,748	$7,748
RESULTS		
Initial transplant hospitalization	$118,535	$106,296
Readmissions, months 2-6	$3,099	$2,324
Graft failure costs, months 7-12	$32,972	$6,739
Non-graft failure costs, months 7-12	$1,059	$1,144
TOTAL COSTS	**$155,665**	**$116,504**

**Rehospitalization rates from 7-18 months were adjusted to reflect 7-12 months to fit the model time horizon*

Figure 2: Calculated Annual Per-Patient Cost Offset Between ANG-3777 and Placebo



Discussion

- Each year, over 20,000 individuals in the US receive a kidney transplant [6], with approximately 25% of those experiencing DGF [1,7]. DGF patients have higher short- and long-term costs and are more likely to experience graft failure and death [1,8]. On an annual basis, treatment with ANG-3777 may prevent graft failures and lower total costs.
- Limitations of the model include a conservative under-estimation of the clinical impact of ANG-3777, a one-year time horizon, and no explicit consideration for treatment-emergent adverse events or health-related quality of life.
- Additionally, from months 0-6, only hospitalization costs were included in this model. Outpatient, dialysis, or pharmacy costs are not included for either patient group. Therefore this analysis looks at the cost offset due to hospitalizations and graft failure costs.

Conclusions

Phase 2 clinical study data demonstrate that patients treated with ANG-3777 have shorter transplant hospitalization stays, higher eGFR at 28 days and 6 months, and lower incidence of graft failure. Applying standard costs based on direct and eGFR-derived hospitalization rates produced a potential cost-savings of $39,162 supporting further and expanded investigation of ANG-3777.

REFERENCES: [1] Butala, NM et al. Transplantation. 2013;95(8):1008-1014; **[2]** USRDS Annual Data Report 2018; **[3]** USRDS Annual Data Report 2013, **[4]** Mohan 2019 **[5]** Keong, FM et al. Kidney Int Reports. 2016;1(4):269-278; **[6]** Hart, A et al. Am J Transplant. 2019;19:19–123. **[7]** Matas, AJ et al. Am J Transplant. 2014;14:11-44. **[8]** Helfer, MS et al. Jornal brasileiro de nefrologia. 2019;41(2): 231-241.