



The Clinical, Economic, and Humanistic Outcomes of a Renal Pharmacist

Alvin Fong, PharmD
PGY-1 Pharmacy Resident
Kaiser Permanente Medical Center - Riverside, CA

IRB Approved

Disclosure Statement and Speaker's Non Commercialism Agreement

Alvin Fong, PharmD

Disclosure

- Potential conflicts of interest: None
- Sponsorship: None
- Proprietary information or results of ongoing research may be subject to different interpretation
- Speaker's presentation is educational in nature and indicates agreement to abide by non-commercialism guidelines provided

Learning Objectives

Target Audience: Pharmacists

- By the end of the talk:
 - Evaluate the clinical impact of a renal pharmacist service on immunosuppressant level monitoring
 - Evaluate the economic impact of a renal pharmacist service on immunosuppressant level monitoring
 - Describe the humanistic impact of a renal pharmacist service centered on physicians' and patients' overall experience

Kaiser Permanente (KP) Riverside Service Area

- Serve over 510,000 members in Riverside County (includes Coachella Valley)
- Hospitals Medical Centers: Riverside + Moreno Valley
- 15 Outlying Medical Offices
- Pharmacy Services
 - 2 Inpatient Pharmacies
 - 3 Oncology Infusion Centers
 - 15 Outpatient Pharmacies
 - 14 Ambulatory Care Services
 - 1 Drug Education/Drug Use Management Formulary Service



Pre-test Assessment



True or False

1. T / F Kidney transplants comprise nearly 60% of all transplants done in 2019
2. T / F Year after year, there are less transplants that are being done as patients are generally healthier
3. T / F A pharmacist is unable to manage immunosuppressant therapy appropriately

Presentation Outline

Background

Study Hypothesis & Objective

Methodology

Results

Study Limitations and Challenge

Future Implications

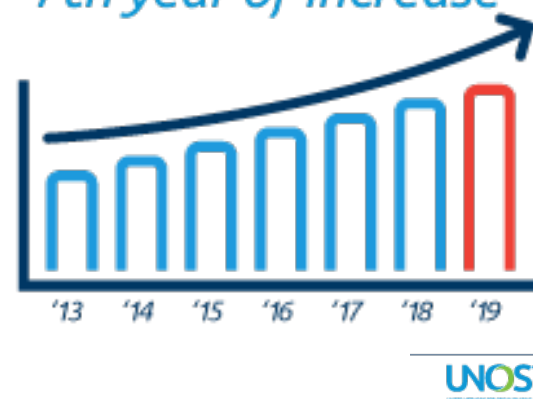
Resident's Learnings

Conclusion

Background

- 39,717 total organ transplants in 2019; 7th consecutive record breaking year¹
- Nearly 60% of the transplants done in 2019 were kidney transplants (23,401)¹
- >100,000 patients currently on the kidney transplant waitlist²
- 30% of kidney transplant patients will experience some form of rejection²

8.7% increase
in transplants
from 2018* to 2019
7th year of increase



¹UNOS. Transplant Living: Kidney. 2020

²UNOS. Data: Transplant Trends. 2020

Background: History of the Renal Pharmacist at KP Riverside

1998

Erythropoietin Alfa
(EPO) and Iron



2005

Tacrolimus and
Cyclosporine



2020

Integral member of
Nephrology

Background:

Ambulatory Care Renal Pharmacist Service

Purpose

- Provide assistance to physicians in outpatient tacrolimus or cyclosporine therapy
- Provide assistance to physicians in outpatient erythropoietin alfa (EPO) therapy
- Provide education, teaching, and consultation to patients and providers

Why this study?

- Outcomes of transplant management not studied
- Growing population of transplant patients
- Business plan for expansion of service

Study Hypothesis and Objective

Hypothesis:

- A renal pharmacist has a positive impact on the clinical, economic, and humanistic outcomes of kidney transplant patients compared to usual medical care

Objective: To measure the following outcomes:

- Clinical: Percentage of tacrolimus and cyclosporine drug levels within target range
- Economic: Cost avoidance of reduced graft rejection rates
- Humanistic: Patient and physician satisfaction questionnaire

Methodology:

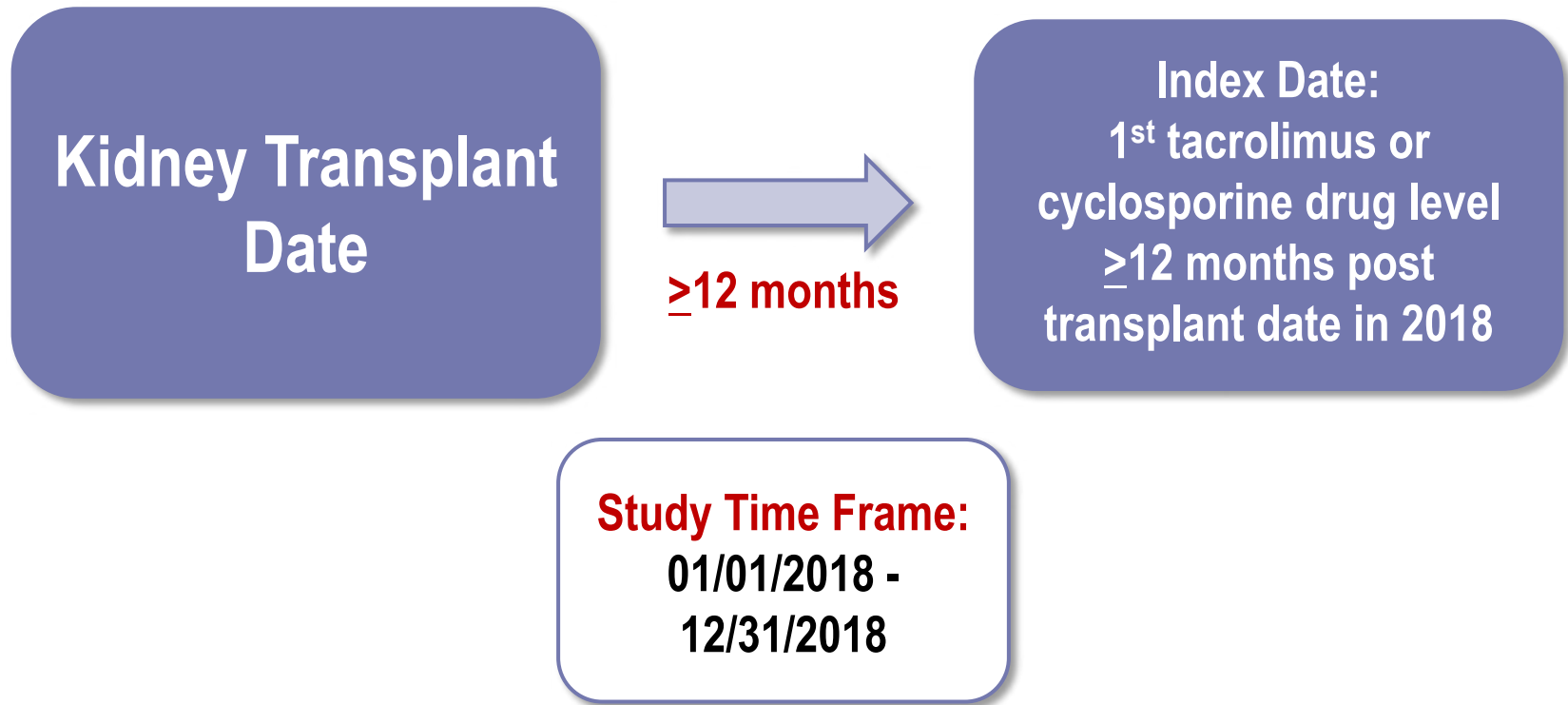
- **Study Design:** Multi-center, retrospective study

Study Group	Control Group
<ul style="list-style-type: none">• Kidney transplant patients• Taking tacrolimus or cyclosporine• Managed by renal pharmacists (KP Riverside Service Area)	<ul style="list-style-type: none">• Kidney transplant patients• Taking tacrolimus or cyclosporine• Managed by usual medical care (KP San Bernardino County Service Area)

- **Study Time Frame:** 01/01/2018-12/31/2018

Methodology:

Timeline



Target range differences in patients stabilize ≥12 month post-transplant

Methodology:

Inclusion and Exclusion Criteria



Inclusion

- ≥ 18 years old
- Kaiser Permanente membership
- Kidney transplant patient in KP Riverside and KP San Bernardino County (KPSBC) Service Area
- Taking tacrolimus or cyclosporine ≥ 12 months before index date

Exclusion

- Loss of Kaiser Permanente membership
- Simultaneous pancreas and kidney transplant (SPK)
- Simultaneous liver and kidney transplant (SLK)

Methodology:

Study Population: 2018

**Study Group Patients
(KP Riverside)**

N = 280

n = 257

n = 178

SPK/SLK exclusion



Transplants after
12/31/17 removed



Total sample size

**Control Group Patients
(KP San Bernardino
County)**

N = 324

n = 304

n = 214

Methodology:

Study Outcomes and Statistical Analyses

Primary Outcome

- % of drug levels in therapeutic range
 - Tacrolimus (5 - 7 ng/ml)
 - Cyclosporine (75 - 125 µg/ml)

Secondary Outcomes

- Graft rejection rates (Scr >2 mg/dL)
- Potential cost avoidance in graft rejections
- Patient and physician satisfaction questionnaire

Statistical Analyses

Chi-square test

Descriptive data

Power analysis: 149 drug levels needed to detect a 12.5% difference in number of drug levels in therapeutic range

Baseline Characteristics

	Study Group (KP Riverside) n = 178	Control Group (KPSBC) n = 214	P-Value
Average Age	57.1 ± 12.4	46.4 ± 14.0	0.090
Sex: Male	104 (58.4%)	118 (55.1%)	0.513
Cadaveric Donor	110 (61.8%)	133 (62.2%)	0.943
Living Related Donor	41 (23.0%)	50 (23.4%)	0.938
Living Non-related Donor	27 (15.2%)	31 (14.5%)	0.850
Comorbid Conditions			
Heart Failure	21 (11.8%)	36 (16.8%)	0.160
Diabetes	112 (62.9%)	128 (59.8%)	0.529
Hypertension	171 (96.6%)	211 (98.6%)	0.114
History of MI	8 (4.5%)	14 (6.5%)	0.380

Results: Primary Outcome

Percent of drug levels within therapeutic range

n = drug levels in 2018 (≥ 12 months post transplant date)

	Study Group n = 1029	Control Group n = 1120	Difference	P-Value
Tacrolimus (5 - 7 ng/ml)	40.3%	38.4%	+1.9%	0.358*
1.9% difference ~ 22 more drug levels could potentially be in target range				

*Chi-Square Test (X^2)

	Study Group n = 193	Control Group n = 176	Difference	P-Value
Cyclosporine (75 - 125 μ g/ml)	61.1%	38%	+23.1%	<0.001*
23.1% difference ~ 41 more drug levels could potentially be in target range				

*Chi-Square Test (X^2)

Results: Secondary Outcome

Graft Rejection Rates

n = transplant patients

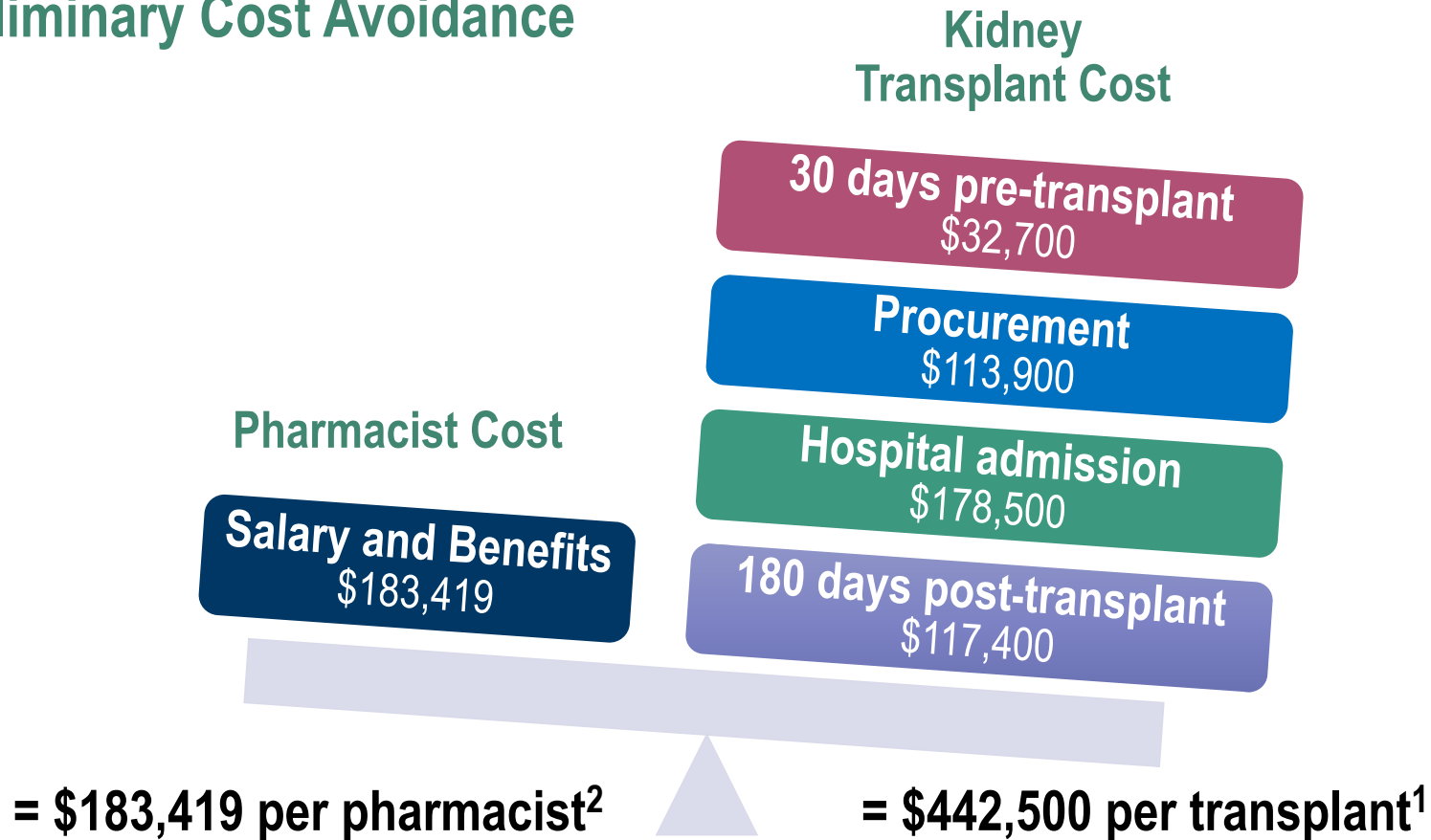
	Study Group n = 178	Control Group n = 214	Difference	P-Value
Graft Rejection (SCr >2 mg/dl)	15 (8.4%)	25 (11.7%)	-3.3%	0.289*

*Chi-Square Test (X²)

3.3% difference ~ 7 graft rejections that could potentially be avoided

Results: Secondary Outcome

Preliminary Cost Avoidance



3.3% difference ~ 7 graft rejections that could potentially be avoided
Potential Cost Avoidance: \$3,097,500¹

¹UNOS. Transplant Living: Transplant Costs. *Milliman Research Report*. 2020

²Salary. Salary Calculator. *Pharmacist Salary with Benefits*. Accessed on 19 April 2020

Results: Secondary Outcomes

Patient Satisfaction Questionnaire:

- n = 102 out of 530 (19%)
- Time: Nov 2019 – Feb 2020

Question	Strongly Agree/Agree	Disagree/Neutral	Strongly Disagree	Not Applicable
Pharmacist regularly contacted me about my lab results in a timely manner	94 (92%)	5 (5%)	1 (1%)	2 (2%)
Informed me about my lab results and adjusted regimen to reach target goal	93 (91%)	5 (5%)	1 (1%)	3 (3%)
Answered all of my medication related questions	95 (93%)	4 (4%)	0 (0%)	3 (3%)
Played an important role in the management of my medications	93 (91%)	5 (5%)	1 (1%)	3 (3%)
Overall, I am satisfied with the service provided by the renal pharmacist	97 (95%)	3 (3%)	0 (0%)	2 (2%)

Results: Secondary Outcomes

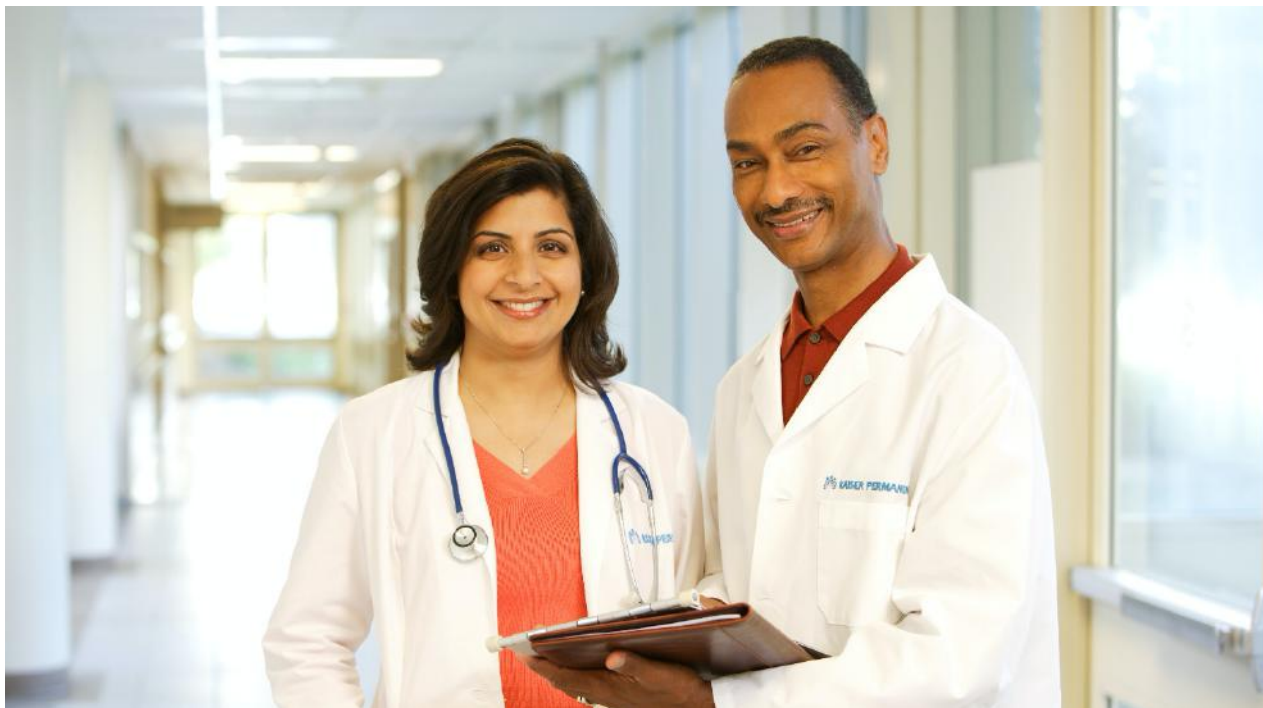
Physician Satisfaction Questionnaire:

- n = 9 out of 12 (75%)
- Time: Dec 2019

Question	Strongly Agree/Agree	Disagree/Neutral	Strongly Disagree	Not Applicable
Pharmacist appropriately manages EPO and hemoglobin levels	9 (100%)	0 (0%)	0 (0%)	0 (0%)
Appropriately manages immunosuppressant regimens	9 (100%)	0 (0%)	0 (0%)	0 (0%)
Answers any questions regarding medications, pharmacology, and PK	9 (100%)	0 (0%)	0 (0%)	0 (0%)
Plays an integral role in the renal transplant and nephrology team	9 (100%)	0 (0%)	0 (0%)	0 (0%)
Overall, I am satisfied with renal pharmacist's level of service	9 (100%)	0 (0%)	0 (0%)	0 (0%)

Results: Secondary Outcomes

Physician Satisfaction Questionnaire:



*They are so reliable, competent & efficient.
I am so blessed to have them.*

Results: Outcomes Summary

Tacrolimus

- Renal pharmacist group had 1.9% more drug levels in target range (p=0.358)

Cyclosporine

- Renal pharmacist group had 23.1% more drug levels in target range (p<0.001)

Graft Rejection Avoidance

- 3.3% less graft rejections (p=0.289)
- ~7 less rejections
- ~\$3.1 million in potential savings

Limitations and challenges

Study Limitations

- Retrospective study
- Investigator bias

Challenges

- Determining index date
- Obtaining data from two different Service Areas



Future



- Present outcomes to:
 - Local P&T Committee
 - Utilization Management Committee,
 - Kaiser Permanente Riverside Group Leaders
 - Nephrology Department
- Return on investment analysis to be used as a business plan

Resident's Learning

- Renal pharmacist workflow and components
- Role of a pharmacist in transplant and CKD management
- Study methods and designs



Conclusion



Clinical

Improved
outcomes



Humanistic

Patient and
physician
approved



Impact

Provide
exceptional
patient care

Conclusion



Pre-test Assessment Answers

True or False

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