# The Adoption of Generic Immunosuppressant Medications Among Kidney and Liver Transplant Recipients: Analysis of the Colorado All Payer Claims Database

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## Background / Objective

**Background**

- In 2016, 19,062 kidney and 7,841 liver transplants were performed in the United States (OPTN 2017).
- To reduce rejection and graft loss, organ transplant recipients must have access to immunosuppressants and must adhere to their prescribed regimen.
- The most widely used immunosuppressants in the United States are tacrolimus and mycophenolate mofetil (OPTN 2014).
- Generic products have been approved by the FDA since 08/2009 for tacrolimus (TAC), since 07/2008 for mycophenolate mofetil (MMF) and since 08/2012 for mycophenolate sodium (MPS).
- Substitution of generic for brand-name immunosuppressants has increased in solid organ transplantation following the expiration of brand-name patents.

**Objective: To describe the trends in brand and generic immunosuppressant use among kidney and liver transplant recipients.**

## Methods

**Sample:** Kidney and liver recipients transplanted between 1989 and 2013 who had prescriptions filled for TAC, MMF and/or MPS in Colorado between 01/2009 and 09/2014

**Data sources:**

- Scientific Registry of Transplant Recipients (SRTR) to identify kidney and liver transplant recipients
- Colorado All-Payer Claims Database (APCD) to obtain pharmacy claims for immunosuppressants

**Statistical analysis:**

- National Drug Codes (NDC) from pharmacy claims were used to differentiate generic vs. brand immunosuppressants.
- Percentages of patients using brand and generic TAC, MMF, and MPS were plotted by month to illustrate trends over time. For liver patients, only TAC was plotted as MMF and MPS were not commonly prescribed.
- The Wilson score method was used to produce 95% confidence intervals for estimated percentages.

## Acknowledgements/ Project Information

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## Results

Figure 1: Percent of patients dispensed generic vs. brand-name immunosuppressants over time. Each vertical line marks a generic FDA approval date. The first vertical line indicates the first generic approval date. The shaded bands indicate 95% Wilson score confidence intervals.

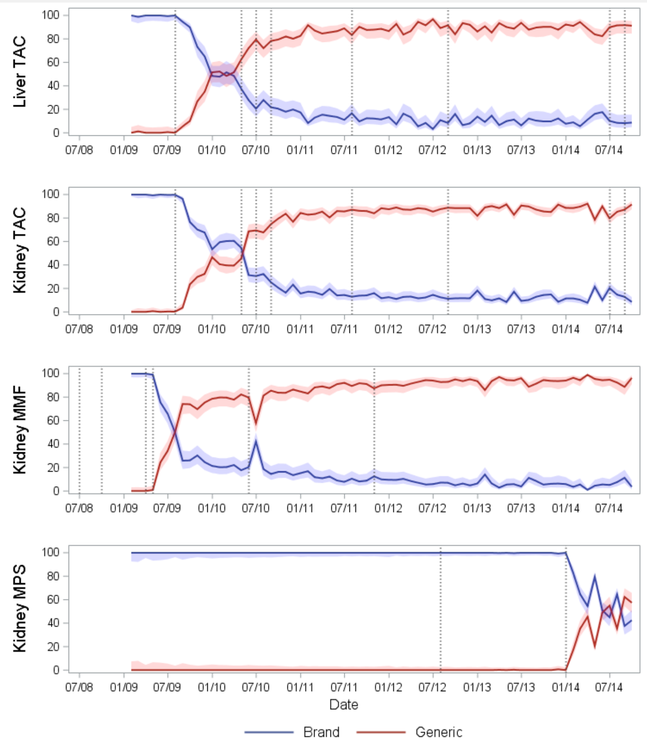


Table 1: Demographics and Clinical Characteristics of Study Subjects

| | % (n) or Median (IQR) | |
|---|---|---|
| | Kidney (n=1150) | Liver (n=402) |
| Male | 56.3% (647) | 61.7% (248) |
| Recipient Race | | |
| White | 61.8% (711) | 71.4% (287) |
| Black or African American | 10.5% (121) | 3.5% (14) |
| Hispanic/Latino | 23.6% (271) | 20.9% (84) |
| Asian/Other | 4.1% (47) | 4.2% (17) |
| Age, Median (IQR) | 47 (33-58) | 50 (39-57) |
| Recipient BMI | | |
| <18.5 | 8.2% (89) | 7.8% (31) |
| 18.5-24.9 | 37.7% (412) | 37.9% (151) |
| 25.0-29.9 | 31.6% (345) | 31.9% (127) |
| ≥30 | 22.5% (246) | 22.4% (89) |
| Had Kidney/Liver Transplant Before | 9.1% (105) | 2.7% (11) |
| Human Leukocyte Antigen Mismatch: 1-6 vs. 0 | 88.9% (1013) | |
| Donation Type | | |
| Donation after Cardiac Death | 6.5% (74) | 3.6% (14) |
| Donation after Brain Death | 50.0% (567) | 90.2% (349) |
| Living Related Donation | 25.6% (290) | 6.2% (24) |
| Living Unrelated Donation | 17.8% (202) | |
| Recipient Diagnosis (Kidney) | | |
| Diabetes | 21.3% (244) | |
| Hypertension related | 13.0% (149) | |
| Lupus/Nephritis | 32.1% (367) | |
| Polycystic kidneys | 11.2% (128) | |
| Other | 22.3% (255) | |
| Recipient Diagnosis (Liver) | | |
| Acute Hepatic Necrosis | | 4.2% (17) |
| Cholestatic Liver Disease/Cirrhosis | | 17.4% (70) |
| Non-Cholestatic Cirrhosis | | 45.8% (184) |
| Hepatitis C | | 37.8% (152) |
| Malignant Neoplasms | | 23.1% (93) |
| Metabolic Diseases | | 3.7% (15) |
| Other Liver disease | | 10.4% (42) |

## Summary / Conclusions

- In the kidney cohort, generic TAC use increased to 75% within one year of the approval of the first generic product (August 2009) and to 86% by the end of the second year. TAC trends were similar in the liver cohort (78% and 90% by the end of the first and second year, respectively).
- Use of both generic MMF and MPS did not begin until after approval of the second generic product. After this transition began, usage of generic products increased to 82% within a year for MMF and to 55% within 9 months for MPS.
- Overall, the use of generic immunosuppressants in transplantation increased rapidly after the introduction of the first few generics and has greatly exceeded brand-name product usage.
- Generic TAC uptake was slightly more gradual than that of MMF and MPS. This difference in practice may have been a consequence of providers' hesitancy to switch to generic TAC due to a narrower therapeutic window and greater apprehension regarding the efficacy of the generic product.

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