Symptom Tracking using TempusPRO™ in Patients with Pharmacogenetic Testing From a Real-World Dataset

Joseph D. Stanton[1], Marcus Badgeley[1], Nicole Sweeny[1], Hailey Lefkofsky[1], Kyle Lapidus[1], Joel Dudley[1]
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INTRODUCTION

Patients with neuropsychiatric illness have inconsistent responses to medications. Pharmacogenomic testing (PGx) helps identify patients who may better respond to certain medications or carry a greater risk of adverse events. Mobile health apps, like TempusPRO™, administer measurement-based care (MBC) to track symptom severity longitudinally and in real-time. Here, we combine PGx and MBC tools into a single platform to further improve patient care.

METHODS

TempusPRO™ data was collected from 1,184 patients between January 5th, 2021 and July 4th, 2022 for whom Tempus nP PGx testing had been ordered and ordering clinicians had elected to add on this optional MBC service.

The Total Cohort consisted of all patients who completed any assessment. The Repeat Cohort contains patients who completed at least one assessment multiple times. Those who repeated questionnaires before and after PGx testing are called the PGx Cohort.

The primary aim was to assess whether patients who received PGx testing reported decreasing symptom severity scores in the PGx Cohort. We normalized symptom severity scores to be between 0-1. We compared symptom severity across all assessments and on individual assessments completed by ≥20 patients. User experience (UX) was measured by analyzing patient engagement and retention with the Total Cohort. Interaction effects between symptoms and UX were evaluated in the Repeat Cohort.

RESULTS

Table 1. Distribution of Cohorts and Diagnosis.

Cohort	n (pts)	n (qs)	n (repeated)
Total Cohort	1184	6269	1973
Repeat Cohort	635	5347	1051
PGx Cohort	359	3541	619

Diagnosis	n (%)
MDD	217 (63)
GAD	187 (55)
ADHD	73 (21)
Bipolar	34 (10)

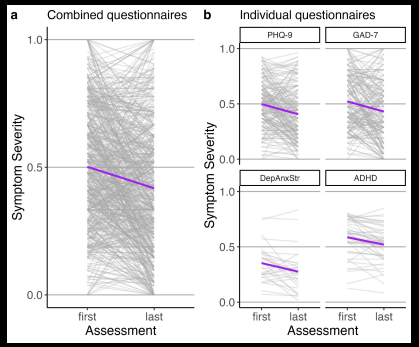

Figure 1. Symptom severity comparison before and after PGx testing (PGx Cohort). Symptom severity decreased following PGx combined with TempusPRO™ monitoring (-8%, matched-pair t-test P=4e-16). Symptom severities decreased on all 6 individual questionnaires tested.

Table 2. Individual Assessment Symptom Severity Changes.

Assessment	n (pts)	n (qs)	estimate	p.value	confidence interval
all combined	359	619	-0.08	3e-16	-10% to -6%
PHQ-9	172	172	-0.09	1e-6	-13% to -6%
GAD-7	178	178	-0.09	4e-5	-14.% to -5%
ADHD	48	48	-0.07	1e-4	-10% to -3%
GAD-2	31	31	-0.17	2e-2	-31% to -3%
DepAnxStr	29	29	-0.08	8e-3	-13% to -2%
PHQ-2	38	38	-0.06	2e-1	-16% to -3%

Figure 2. User Experience (Total Cohort). Overall, average user engagement was 5.3 assessments over a 47-day retention period. Patients who received PGx were found to have higher engagement and retention versus patients without PGx (6 vs 4 assessments, 55 vs 26 days, wilcoxon ranked sum test P=7.8e-08 P=3.8e-06).

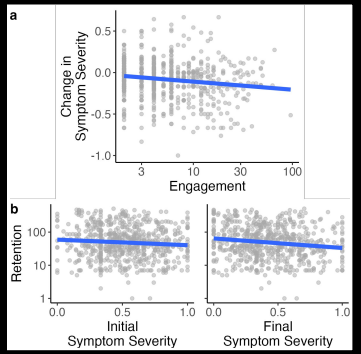

Figure 3. Interactions between user engagement and symptoms (Repeat Cohort). Symptoms improved more with higher engagement (Wilcoxon rank-sum test p=4e-5). Higher symptom severity was associated with shorter retention (p=.047 and p=.0002 for initial and final symptom severity).

CONCLUSIONS

Digital, out-of-office, MBC can quantify symptom trajectories from real-world data following PGx testing. We observed symptom improvements for general mental health, mood, and attention assessments. This was a retrospective cohort study; controlled trials would be required to investigate the effect of individual treatment components.

ACKNOWLEDGEMENTS

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The primary aim was to assess whether patients who received PGx testing reported decreasing symptom severity scores.

METHODS

TempusPRO™ data was collected from 1,184 de-identified patient records between January 5th, 2021 and July 4th, 2022. Tempus nP PGx testing had been ordered and clinicians had elected to add the optional MBC service. Analyses were conducted in three main groups:

1. Total Cohort: all patients who completed any assessment.
2. Repeat Cohort: patients who completed ≥1 assessment multiple times.
3. PGx Cohort: Those who repeated questionnaires before and after PGx testing.

We normalized symptom severity scores to be between 0-1, then compared scores across all assessments and on individual assessments completed by ≥20 patients. User experience (UX) was measured by analyzing patient engagement and retention in the Total Cohort. Interaction effects between symptoms and UX were evaluated in the Repeat Cohort.

RESULTS

Table 1. Distribution of Cohort

Cohort	n (pts)	n (qs)	n (repeated)
Total Cohort	1184	6269	1973
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PGx Cohort	359	3541	619

pts=Patients, qs=Questionnaires

Table 2. Distribution of Diagnoses

Diagnosis	n (%)
Major Depressive Disorder	217 (63)
Generalized Anxiety Disorder	187 (55)
Attention Deficit Hyperactivity Disorder	73 (21)
Bipolar	34 (10)

Figure 1. Symptom Severity Comparison Before and After PGx Testing (PGx Cohort)

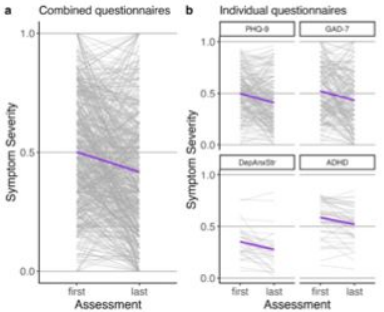

Fig 1. Symptom severity decreased following PGx combined with TempusPRO™ monitoring (-8%, matched-pair t-test *P*=4e-16). Symptom severities decreased on all 6 individual questionnaires tested.

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CI=Confidence Interval, pts=Patients, qs=Questionnaires

Figure 2. User Experience (Total Cohort)

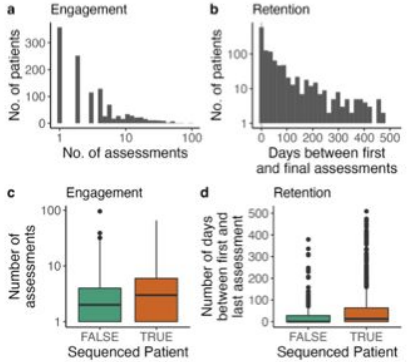

Fig 2. Overall, average user engagement was 5.3 assessments over a 47-day retention period. Patients who received PGx were found to have higher engagement and retention versus patients without PGx (6 vs 4 assessments and 55 vs 26 days, Wilcoxon rank-sum test *P*=7.8e-08 and *P*=3.8e-06, respectively).

Figure 3. Interactions Between User Engagement and Symptoms (Repeat Cohort)

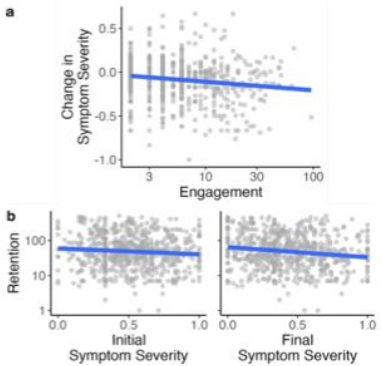

Fig 3. Symptoms improved with higher engagement (Wilcoxon rank-sum test *P*=4e-5). Higher symptom severity was associated with shorter retention (*P*=0.047 and *P*=0.0002 for initial and final symptom severity, respectively).

CONCLUSIONS

Digital, out-of-office, MBC can quantify symptom trajectories from real-world data following PGx testing. We observed symptom improvements for general mental health, mood, and attention assessments. Notably, symptom severity significantly decreased following PGx combined with TempusPRO™ monitoring.

As follow-up, controlled trials are required to investigate the effect of individual treatment components.

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