



# Effectiveness of the Korean-Patient Placement Criteria for Alcohol Use Disorders: A Prospective Exploratory Study

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**Objective** Various patient placement criteria (PPC) have been developed to address alcohol use disorder (AUD), which has a high relapse rate and imposes substantial socioeconomic costs. Although research has shown PPC to be an effective tool, evidence supporting the Korean-PPC (K-PPC) is insufficient. This paper investigated whether treatment matching with the K-PPC was effective, based on variables related to AUD.

**Methods** In total, 524 participants were evaluated using the 6 dimensions of the K-PPC and levels of care (LoC) were recommended based on the results. Participants whose treatment matched with the recommended LoC were classified into the matched group, and those whose treatment did not match were classified into the mismatched group. Subsequently, treatment was planned according to the determined LoC, and a total of 3 follow-up evaluations were conducted at 1 month, 3 months, and 6 months.

**Results** There was no significant difference in the follow-up rate between the K-PPC matched group and the mismatched group. Of the variables measured by the 6 dimensions of the K-PPC, alcohol-related variables, depression, insight, and biomedical outcomes showed the most significant results (especially alcohol-related variables) from the baseline evaluation to the 6-month follow-up. In addition, the average adherence to the treatment program in the 6-month period was found to be higher in the matched group than in the mismatched group.

**Conclusion** The K-PPC could be effective for placing patients and providing treatment by matching patient characteristics. Enhancing treatment program retention can also have a positive effect on clinical outcomes.

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**Keywords** Alcoholism; Patients; Standards; Survival analysis.

## INTRODUCTION

Alcohol use disorder (AUD) is a psychiatric disorder with a high relapse rate. According to a survey conducted in Korea in 2015, the medical expenses due to AUD-related diseases and accidents, as well as the cost of productivity loss and the socioeconomic costs due to crime, amounted to \$58 million.<sup>1</sup> Several treatments have been developed to address this problem and most treatments have been shown to be effective.

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However, the relapse rate of AUD is higher than that of other disorders due to a lack of expertise in treatment programs, fixed treatment methods, and fragmented treatment systems, making it difficult to treat.<sup>2</sup>

To address these problems, a program that matched appropriate treatments to the characteristics of the patient was proposed.<sup>3</sup> The concept of matching includes treatment intensity (e.g., inpatient vs. outpatient), treatment services (e.g., social skill training, treatment for depression), and treatment modalities (e.g., cognitive behavioral treatment, motivation enhancement therapy, 12-step programs).<sup>4</sup> According to previous studies, the effect of matching treatment modalities and treatment services to patient characteristics was not significant or there was no effect at all.<sup>5,6</sup> Therefore, it would be more important to focus on treatment intensity, which can impact addiction severity, comorbid psychiatric disorders, and social stability.<sup>7-10</sup>

The key point of providing patients with different treatment intensities is that patient-matching treatment intensity is provided in addition to the existing treatment process. Several treatment guidelines have been developed for this and are representatively known as the Patient Placement Criteria of the American Society of Addiction Medicine (ASAM-PPC), which was developed and widely used in the United States.<sup>11</sup> This guideline presents 4 levels of care (LoC) for determining the severity of alcohol problems: 1) level 1, outpatient treatment, 2) level 2, intensive outpatient and partial hospitalization treatment, 3) level 3, medically monitored inpatient (residential) treatment, and 4) level 4, medically managed inpatient treatment. These LoC serve as channels for therapists and patients to communicate about alcohol problems, facilitating therapeutic communication.<sup>12</sup>

In Korea, the need for treatment guidelines to provide patients with the appropriate LoC has become evident in situations where treatment accessibility is poor due to a lack of treatment systems and poor communication between medical institutions and community centers. Therefore, we developed the modified Korean-Patient Placement Criteria (K-PPC), based on the ASAM-PPC,<sup>13</sup> to help address the treatment accessibility situation in Korea. In the K-PPC, a multidimensional evaluation of 6 areas related to AUD, such as addiction severity, physical condition, and the recovery environment is conducted, and the LoC is determined by algorithm. The LoC are divided into 5 levels: level 0.5 (early intervention including community programs), levels 1 and 2 (outpatient treatment), and levels 3 and 4 (inpatient treatment). Levels 1 to 4 are based on the same types of treatment, but with a higher intensity of treatment as the levels advance. After evaluation, patients are provided with the appropriate treatment at the indicated LoC.

The process of adapting existing treatment guidelines and applying them to a new system is complex and requires continuous evaluation, research, and scientific and political discussions. This study is the first of several steps to verify the effectiveness of the K-PPC. To support this, we hypothesized that patients matched with the LoC determined by the K-PPC would show better follow-up rates, treatment adherence, and results related to AUD than patients that were mismatched (i.e., received LoC other than the levels suggested by the K-PPC).

## METHOD

### Participants

Participants were recruited from 20 medical institutions and 11 community addiction management centers in Korea and included adults aged 19 years or older and men (scores  $\geq 10$ ) or women (scores  $\geq 6$ ) at high risk for AUD based on the Korean version of Alcohol Use Disorders Identification Test (AUDIT-

K). Cases with a confirmed history of brain damage, organic psychiatric disorder, or intellectual disability were excluded from the study. A total of 557 participants enrolled in the baseline evaluation, but 34 were excluded due to missing evaluation data and technical problems, leaving a final study sample of 524 participants. Over time, more participants dropped out or were excluded, setting the number of participants at 356, 244, and 161 in the 1-month, 3-month, and 6-month follow-ups, respectively.

### Procedure: assessments and process

This study was approved by the Chuncheon Hospital International Review Board (IRB no. 2019-02-010-002). All participants were referred to the study by researchers of the institution where they were currently receiving treatment and case management. Participants completed the AUDIT-K for screening and were interviewed to find out whether they met the exclusion criteria. If the exclusion criteria were not met and a consent form was completed, they were evaluated using the 6 dimensions related to AUD and matched to the LoC recommended by the K-PPC. Those who followed the recommended LoCs were categorized as matched group and those who did not were categorized as mismatched group. Each participant's treatment plan was also recommended by the K-PPC. The same procedure was repeated at the 1-month, 3-month, and 6-month follow-ups.

### Assessments: 6 dimensions

1) Dimension 1 (acute intoxication and/or withdrawal potential) investigated the participant's drinking status and drinking habits, evaluating the frequency/amount of drinking, alcohol dependence, and drinking-related problems, while identifying the degree of withdrawal symptoms. The AUDIT-K and the Clinical Institute Withdrawal Assessment for Alcoholism revised (CIWA-Ar) were used for evaluation. 2) Dimension 2 (biomedical conditions or complications related to the participant's drinking) assessed the participant's overall health status, including their medical and surgical history for the past 1 year. The results of dimension 2 were evaluated as high, middle, and low risk. 3) Dimension 3 (emotional/behavioral/cognitive conditions and complications) evaluated the current state of the participant's mental health, their psychiatric and family history, symptoms of depression, and suicidal thoughts. The Korean version of the Center for Epidemiological Studies Depression Scale (CES-D) was used for evaluation. A recent history of suicide attempts was evaluated based on answers to test questions. 4) Dimension 4 (readiness to change; formerly referred to as treatment acceptance/resistance) evaluated whether the participant was prepared for change and was adequately aware of their own problems. The degree to which they wanted

to change their drinking habits was assessed using the Readiness to Change Questionnaire (RCQ) and the Hanil Alcohol Insight Scale (HAIS). 5) Dimension 5 (potential for relapse, continued use, and continued problems) appraised the risk of recurrence in a participant who was maintaining sobriety/abstinence by assessing their recent treatment session attendance rate, medication adherence, reported cravings, and level of stress. The results of dimension 5 were evaluated as high, middle, and low risk. 6) Dimension 6 (recovery environment) evaluated the degree to which the participant's environment helped them maintain sobriety and abstinence from alcohol, and examined the family, occupational, recreational, interpersonal, religious, and socioeconomic support. The results in dimension 6 were evaluated as high-, middle-, and low-risk environments.

### K-PPC's LoC recommendations

In the K-PPC, the LoC were divided into 5 categories: 1) In level 0.5 (early intervention) the patient was at risk of alcohol-related problems, withdrawal symptoms were minimal, and medical and emotional problems were not obvious. Early intervention services were recommended, centered on a community center. 2) In level 1 (basic outpatient treatment), the patient was at high-risk for alcohol problems that required medical and clinical intervention, at least to help control drinking. Other psychiatric problems were not clear, and it was recommended that a wide variety of services be provided, including outpatient or community programs for recovery, motivation, and treatment strategies. 3) In level 2 (intensive outpatient treatment), physical withdrawal symptoms and emotional and environmental problems that increased the risk of recurrence existed but were sufficiently improved with outpatient treatment. For patients in minimally supportive environments, specialized outpatient care and community services were recommended, including medical examination and psychiatric counseling, psychopharmacological evaluation, drug management, and crisis management services. 4) In level 3 (basic inpatient treatment), withdrawal symptoms were severe during the short-term detoxification treatment period and severe cravings occurred during abstinence, requiring intervention and daily medical supervision. If the patient, until recently, had a supportive environment and maintained occupational functioning, detoxification, treatment of withdrawal symptoms, and short-term hospitalization were recommended. 5) In level 4 (intensive patient treatment) acute withdrawal symptoms that required medical supervision were seen, accompanied by internal and external psychiatric complications, severe addictive symptoms, and impaired functioning (activities of daily living and social functioning) despite active treatment. Recurrence was likely, so long-term alcohol treatment services and inpatient treatment were recommended.

### Treatments

The K-PPC included a list of recommended treatment programs (Supplementary Table 1 in the online-only Data Supplement) and guidelines for participation according to the LoC. Level 0.5 (early intervention) consisted of treatment programs based on community centers, with the goal of patient participation at least once every 2 weeks. Levels 1 to 4 consisted of treatment programs based on medical institutions and community centers, and the list of recommended treatment programs was the same. Level 1 (basic outpatient treatment) and level 2 (intensive outpatient treatment) were commonly based on outpatient treatment, with the goal of level 1 being participation in one treatment program at least once every 2 weeks. The goal of level 2 was participation in two or more treatment programs. Level 3 (basic inpatient treatment) and level 4 (intensive inpatient treatment) were based on inpatient treatment. The goal of level 3 was patient participation in 2 or more programs at least 3 times a week in addition to drug treatment. Level 4 required participation in three or more treatment programs in addition to drug treatment.

### Statistical analysis

Descriptive statistics were calculated for the entire sample. To evaluate the effectiveness of the K-PPC, the follow-up rate and treatment adherence were tested using Kaplan–Meier survival analysis and the log-rank test. The participants' demographic data and the nonparametric, categorical, and parametric data within the 6 dimensions of the K-PPC were analyzed using the Mann–Whitney U test, the chi-square test, and the independent sample t-test, respectively. The Alcohol Use Disorders Identification Test–Alcohol Consumption questions (AUDIT-C) and CIWA-Ar of dimension 1 and the CES-D of dimension 3 were analyzed by two-way mixed repeated analysis of variance (ANOVA) measures with time as a within variable and K-PPC match as a between variable. The Bonferroni test was used for post hoc analysis. Finally, analysis of the average participant adherence to all treatment programs was analyzed using the independent sample t-test. All analyses were two-sided, and p-values less than 0.05 were considered statistically significant. Statistical analyses were performed using SPSS version 23 (IBM Corp., Armonk, NY, USA).

## RESULTS

### Subject characteristics

The final sample consisted of 524 participants (73.6% male; ages 19–88 years). Table 1 shows the demographic data for the two baseline sample groups (the K-PPC matched group and the K-PPC mismatched group).

**Table 1.** Baseline demographic data for patients with AUD in the K-PPC matched and mismatched groups

Characteristics	Total (N=524)	Matched (N=266)	Mismatched (N=258)	U or $\chi^2$ or t	p
Age (years)	50.57±10.93	50.15±10.85	51.07±11.13	-0.85	0.399
Sex				0.20	0.652
Male	382 (72.9)	192 (72.2)	190 (73.6)		
Female	142 (27.1)	74 (27.8)	68 (26.3)		
Educational status				6.07	0.194
No formal education	6 (1.2)	4 (1.6)	2 (0.8)		
Elementary school	38 (7.8)	15 (6.1)	23 (9.6)		
Middle school	53 (10.9)	23 (9.4)	30 (12.5)		
High school	231 (47.6)	114 (46.5)	117 (48.8)		
College graduate or higher	157 (32.4)	89 (36.3)	68 (28.3)		
Work status				6.49	0.166
Full-time	55 (11.3)	29 (11.8)	26 (10.8)		
Part-time	43 (8.9)	14 (5.7)	29 (12.1)		
Unemployed/looking for work	327 (67.4)	169 (69.0)	158 (65.8)		
Student	3 (0.6)	2 (0.8)	1 (0.4)		
Other	57 (11.8)	31 (12.7)	26 (10.8)		
Marital status				1.98	0.739
Never married	150 (30.9)	79 (32.2)	71 (29.6)		
Married	166 (34.2)	81 (33.1)	85 (35.4)		
Separated	14 (2.9)	9 (3.7)	5 (2.1)		
Divorced	133 (27.4)	64 (26.1)	69 (28.7)		
Widowed	22 (4.5)	12 (4.9)	10 (4.2)		
Socioeconomic status				5.30	0.071
Low	257 (53.1)	117 (48.0)	140 (58.3)		
Middle	173 (35.7)	96 (39.3)	77 (32.1)		
High	54 (11.2)	31 (12.7)	23 (9.6)		
Medical care				4.15	0.245
Health insurance	283 (60.2)	147 (63.6)	136 (56.9)		
Medical care type 1	34 (7.2)	14 (6.1)	20 (8.4)		
Medical care type 2	151 (32.1)	70 (30.3)	81 (33.9)		
Other	2 (0.4)	0 (0)	2 (0.8)		
AUD treatment history				0.02	0.903
Last 3 months	374 (72.6)	177 (72.8)	170 (72.3)		
New	131 (27.4)	66 (27.2)	65 (27.7)		

Data are presented as mean±standard deviation or N (%). AUD, alcohol use disorder; K-PPC, Korean-Patient Placement Criteria; Medical care type 1, medical care for unemployed; Medical care type 2, medical care for employed

### Baseline differences between the K-PPC matched and mismatched groups

There were no demographic data differences between the K-PPC matched and mismatched groups. However, in the baseline evaluation, it was found that there was a significant difference between the two groups in the final appraisal of dimension 2 ( $\chi^2=12.56$ ;  $p=0.006$ ), the CES-D scores of dimension 3 ( $t=-6.66$ ;  $p=0.001$ ), and the HAIS scores of dimension 4 ( $\chi^2=18.80$ ;

$p=0.001$ ) among all measurements for the 6 dimensions of the K-PPC (Table 2). In the final evaluation of dimension 2, the low-risk (healthy) results in the matched group were higher (matched, 77 vs. mismatched, 51), while the high-risk (poor health) results were higher in the mismatched group (matched, 34 vs. mismatched, 58). The CES-D results in dimension 3 showed that the mismatched group experienced more depression than the matched group (matched, 20.41 vs. mismatched,

**Table 2.** Baseline status of the 6 dimensions of the K-PPC for the matched and mismatched groups

Variable	Matched (N=266)	Mismatched (N=258)	$\chi^2$ or t	p
Dimension 1				
AUDIT-K	26.58±9.89	26.74±8.49	-1.44	0.152
AUDIT-C	9.43±3.49	9.58±3.04	-0.54	0.591
CIWA-Ar	6.97±9.46	7.9±9.01	-1.14	0.255
Dimension 2				
Low risk (healthy)	77 (20.1)	51 (13.3)	12.56	0.006**
Middle risk (fair health)	80 (20.9)	82 (21.4)		
High risk (poor health)	34 (8.9)	58 (15.1)		
Dimension 3				
CES-D	20.41±14.36	28.99±14.99	-6.66	0.001***
Current suicidal ideation				
Yes	30 (6.2)	40 (8.3)	2.19	0.139
No	217 (44.8)	197 (40.7)		
Dimension 4				
RCQ				
Precontemplation	9 (1.7)	14 (2.7)	2.12	0.347
Contemplation	160 (30.8)	140 (27.0)		
Action	97 (18.7)	99 (19.1)		
HAIS				
Poor insight	51 (9.8)	88 (16.9)	18.80	0.001***
Fair insight	132 (25.4)	116 (22.3)		
Good insight	83 (16.0)	50 (9.6)		
Dimension 5				
Low risk	36 (6.9)	37 (7.1)	1.35	0.510
Middle risk	147 (28.3)	131 (25.2)		
High risk	80 (15.4)	89 (17.1)		
Dimension 6				
Low risk	44 (8.4)	34 (6.5)	1.33	0.514
Middle risk	154 (29.6)	159 (30.5)		
High risk	67 (12.9)	63 (12.1)		

Data are presented as mean±standard deviation or N (%). \*\*p<0.01; \*\*\*p<0.001. K-PPC, Korean-Patient Placement Criteria; AUDIT-K, Korean version of the Alcohol Use Disorders Identification Test; AUDIT-C, Alcohol Use Disorders Identification Test-Alcohol Consumption questions; CIWA-Ar, Clinical Institute Withdrawal Assessment for Alcohol revised; CES-D, Center for Epidemiological Studies Depression Scale; RCQ, Readiness to Change Questionnaire; HAIS, Hanil Alcohol Insight Scale

28.99). As for the HAIS results in dimension 4, the rate of good insight was higher in the matched group (matched, 83 vs. mismatched, 50), while the mismatched group had a higher rate of poor insight (matched, 51 vs. mismatched, 88).

### Analysis of the follow-up rate between the K-PPC matched and mismatched groups

A log-rank analysis for the follow-up rates of the matched and mismatched groups showed no statistically significant difference between the two groups (Figure 1). The independent sample t-test also showed no significant difference in the fol-

low-up rate between both groups at all time points (Table 3).

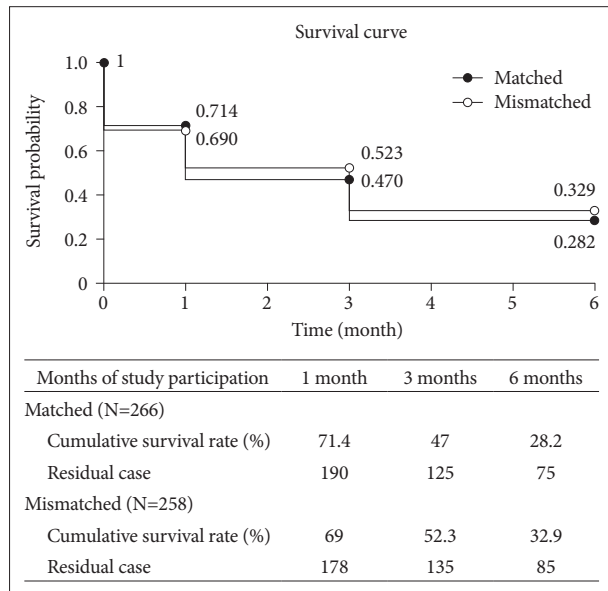
### Effects of the K-PPC match on the 6 dimensions

To examine the effect of the K-PPC match in the 6 dimensions, the AUDIT-C, CIWA-Ar in dimension 1, and the CES-D in dimension 3 were tested by two-way repeated measures mixed ANOVA, and the remaining variables were cross-analyzed. Since all 3 measurements did not satisfy the Mauchly sphericity test, the threshold of the F distribution was corrected using the epsilon of Greenhouse-Geisser. As a result, for AUDIT-C and CIWA-Ar in dimension 1, the main effect of the

group and the main effect of time showed a significant difference. That is, the K-PPC matched group (AUDIT-C, 4.4; CIWA-Ar, 3.25) had lower AUDIT-C and CIWA-Ar scores than

the mismatched group (AUDIT-C, 5.61; CIWA-Ar, 5.91). In the Bonferroni post hoc test to determine the main effect of time, both variables showed lower scores in the 1-month follow-up (AUDIT-C, 4.04; CIWA-Ar, 4.09), 3-month follow-up (AUDIT-C, 3.61; CIWA-Ar, 3.36), and 6-month follow-up (AUDIT-C, 3.43; CIWA-Ar, 2.91) than the baseline (AUDIT-C, 8.98; CIWA-Ar, 7.97). In the CES-D, the main effect of group, the main effect of time, and the interaction between group and time were significant. Thus, simple main effect analysis was conducted to examine the effect of interaction. As a result, it was found that the difference between the CES-D score at 3 months and the baseline and 1-month scores in the matched group was significant. In the mismatched group, a significant difference was found in the remaining time periods except for the difference between the 1-month and 3-month CES-D scores (Tables 4, 5, and Figure 2).

Group comparisons were performed at each evaluation time point for the variables in the 6 dimensions (the final appraisal in dimensions 2, 5 and 6, current suicidal ideation in dimension 3, and the HAIS & RCQ results in dimension 4). In dimension 2, as mentioned earlier, there was a difference between the two groups in the baseline evaluation, but no difference in all follow-up evaluations, and for current suicidal ideation in di-



**Figure 1.** Survival curves for follow-up of matched and mismatched groups.

**Table 3.** Comparison of follow-up rates between the K-PPC matched and mismatched groups

Variable	Matched (N=266)	Mismatched (N=258)	t	p
1-month follow-up rate (%)	83.65±23.50	82.95±23.75	0.340	0.734
3-month follow-up rate (%)	70.52±28.16	72.90±29.60	-0.944	0.345
6-month follow-up rate (%)	50.50±33.08	53.36±34.76	-0.964	0.335

Data are presented as mean±standard deviation. K-PPC, Korean-Patient Placement Criteria

**Table 4.** Comparison of the two groups for K-PPC dimension 1 (acute drinking/withdrawal status) and dimension 3 (emotional/behavioral/cognitive condition)

Variable		Matched (N=64)	Mismatched (N=82)	F <sub>group</sub>	F <sub>time</sub>	F <sub>group*time</sub>
Tool	Follow-up					
AUDIT-C	Baseline	8.53±3.96	9.49±2.76	6.28*	87.425***	0.312
	1-month	3.17±4.29	4.72±4.49			
	3-month	3.17±4.03	4.09±4.65			
	6-month	2.73±4.02	4.15±4.59			
CIWA-Ar	Baseline	6.00±8.55	9.93±9.52	8.746**	28.515***	1.485
	1-month	2.54±4.15	5.63±7.67			
	3-month	2.57±4.77	4.14±6.21			
	6-month	1.87±5.15	3.95±6.54			
CES-D	Baseline	16.75±14.08	32.39±14.41	35.668***	18.157***	5.093**
	1-month	15.69±12.82	24.35±14.73			
	3-month	12.95±10.68	23.38±13.61			
	6-month	13.02±12.34	20.48±13.71			

Data are presented as mean±standard deviation. \*p<0.05; \*\*p<0.01; \*\*\*p<0.001. K-PPC, Korean-Patient Placement Criteria; AUDIT-C, Alcohol Use Disorders Identification Test-Alcohol Consumption questions; CIWA-Ar, Clinical Institute Withdrawal Assessment for Alcohol revised; CES-D, Center for Epidemiological Studies Depression Scale

mension 3, more cases were found in the mismatched group at the 3-month follow-up (Table 6). There was no difference in the RCQ results between the two groups and, as mentioned above, the HAIS results differed at the baseline, 1-month, and 3-month follow-ups. Specifically, at the 1-month and 3-month follow-ups the matched group showed a higher incidence of “good insight,” while the mismatched groups had a higher incidence of “fair insight” (Table 7). In dimension 5, the two groups showed no significant difference in final appraisal results at all time points, and the final appraisal results in dimension 6 showed that the mismatched group had more “high-risk” cases at the 3-month follow-up (Table 8).

### Effect of K-PPC match on adherence to treatment programs

Finally, a comparison of adherence to the treatment programs recommended by the K-PPC showed a higher overall adherence by the matched group than by the mismatched group (Table 9 and Figure 3).

**Table 5.** Bonferroni post hoc test comparing AUDIT-C, CIWA-Ar, and CES-D scores across different time points and group types

Comparison	Mean difference	P
Group type (K-PPC matched vs. mismatched)		
AUDIT-C: K-PPC matched - mismatched	-1.21	0.012*
CIWA-Ar: K-PPC matched - mismatched	-2.66	0.003**
Time point (baseline vs. follow-up)		
AUDIT-C: baseline - 1-month follow-up	4.94	0.001***
AUDIT-C: baseline - 3-month follow-up	5.37	0.001***
AUDIT-C: baseline - 6-month follow-up	5.55	0.001***
CIWA-Ar: baseline - 1-month follow-up	3.88	0.001***
CIWA-Ar: baseline - 3-month follow-up	4.61	0.001***
CIWA-Ar: baseline - 6-month follow-up	5.08	0.001***

\*p<0.05; \*\*p<0.01; \*\*\*p<0.001. K-PPC, Korean-Patient Placement Criteria; AUDIT-C, Alcohol Use Disorders Identification Test-Alcohol Consumption questions; CIWA-Ar, Clinical Institute Withdrawal Assessment for Alcohol revised; CES-D, Center for Epidemiological Studies Depression Scale

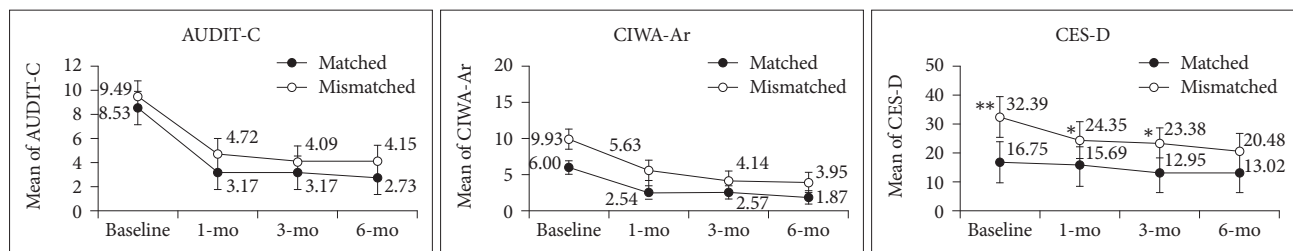
## DISCUSSION

To investigate the effectiveness of the K-PPC, this study explored three hypotheses: the K-PPC matched group would have 1) a higher follow-up rate, 2) improved clinical symptoms (variables for the 6 dimensions of K-PPC), and 3) higher ad-

**Table 6.** Comparison of the two groups for K-PPC dimension 2 & 3

Dimension	Follow-up	Matched	Mismatched	χ <sup>2</sup>	p
2 (biomedical condition)	Baseline			12.56	0.006**
	Low	24 (20.1)	24 (13.3)		
	Medium	42 (20.9)	35 (21.4)		
	High	7 (8.9)	26 (15.3)		
	1-month			1.00	0.607
	Low	74 (21.5)	67 (19.5)		
	Medium	82 (23.8)	74 (21.5)		
	High	21 (6.1)	26 (7.6)		
	3-month			3.32	0.191
	Low	46 (19.7)	40 (17.1)		
	Medium	53 (22.6)	75 (32.1)		
	High	8 (3.4)	12 (5.1)		
3 (suicidal ideation)	Baseline			2.19	0.139
	Yes	30 (6.2)	40 (8.3)		
	No	217 (44.8)	197 (40.7)		
	1-month			1.58	0.209
	Yes	12 (3.4)	18 (5.0)		
	No	170 (47.6)	157 (44.0)		
	3-month			6.29	0.012*
	Yes	3 (1.2)	14 (5.8)		
	No	111 (45.7)	115 (47.3)		
	6-month			0.11	0.743
	Yes	2 (1.2)	3 (1.9)		
	No	74 (46.0)	82 (50.9)		

Data are presented as N (%). \*p<0.05; \*\*p<0.01. K-PPC, Korean-Patient Placement Criteria



**Figure 2.** Mean score changes in the Alcohol Use Disorders Identification Test-Alcohol Consumption (AUDIT-C), Clinical Institute Withdrawal Assessment for Alcohol revised (CIWA-Ar), Center for Epidemiological Studies Depression Scale (CES-D) by group.

**Table 7.** Comparison of the two groups for K-PPC dimension 4

Dimension	Follow-up	Variables	Matched	Mismatched	$\chi^2$	p
4 (RCQ)	Baseline	P	9 (1.7)	14 (2.7)	2.12	0.347
		C	160 (30.8)	140 (27.0)		
		A	97 (18.7)	99 (19.1)		
	1-month	P	2 (0.6)	5 (1.4)	1.80	0.406
		C	72 (19.9)	73 (20.2)		
		A	111 (30.7)	99 (27.3)		
	3-month	P	3 (1.2)	3 (1.2)	0.13	0.939
		C	34 (13.4)	40 (15.7)		
		A	84 (33.1)	90 (35.4)		
6-month	P	3 (1.9)	2 (1.3)	5.54	0.063	
	C	26 (16.3)	17 (10.6)			
	A	45 (28.1)	67 (41.9)			
4 (HAIS)	Baseline	Poor	51 (9.8)	88 (16.9)	18.80	0.001***
		Fair	132 (25.4)	116 (22.3)		
		Good	83 (16.0)	50 (9.6)		
	1-month	Poor	32 (8.8)	40 (11.0)	7.85	0.020*
		Fair	83 (22.9)	94 (26.0)		
		Good	70 (19.3)	43 (11.9)		
	3-month	Poor	25 (9.8)	33 (13.0)	6.45	0.040*
		Fair	46 (18.1)	65 (25.6)		
		Good	50 (19.7)	35 (13.8)		
	6-month	Poor	17 (10.6)	18 (11.3)	1.81	0.405
		Fair	26 (16.3)	39 (24.4)		
		Good	31 (19.4)	29 (18.1)		

Data are presented as N (%). \* $p < 0.05$ ; \*\*\* $p < 0.001$ . K-PPC, Korean-Patient Placement Criteria; RCQ, Readiness to Change Questionnaire; P, precontemplation; C, contemplation; A, action; HAIS, Hanil Alcohol Insight Scale

herence to treatment programs compared to the mismatched group. Our results showed that the matched group did not show a higher follow-up rate, but that some dimensions did show improvement in symptoms and a higher adherence to treatment programs, thus partially substantiating the hypotheses.

The follow-up rate was 50.5% and 53.35% in the K-PPC matched and mismatched groups, respectively, indicating no statistically significant difference between the two groups. On average, both groups generally participated up to the 3-month follow-up. This differed from the results of previous studies for the following reasons.<sup>14,15</sup> First, in the previous study, participants were divided into three groups (matched, mismatched, and undermatched [with a lower actual placement level than the recommended placement level]), whereas in this study, the mismatched group and the undermatched groups were combined. Further studies assessing the effectiveness of the K-PPC are necessary to investigate whether similar results can be obtained using three groups as in the previous study.

The second difference was in the distribution of the actual LoC between the matched group and the mismatched group.

When comparing the LoC in 3 categories (community [level 0.5], outpatient [levels 1–2], and inpatient [levels 3–4]), the distribution of the recommended LoC was 8.6%, 46.9%, and 44.5% in the matched group and 0.4%, 18.7%, and 80.9% in the mismatched group, respectively. The distribution of the actual LoC was 1.9%, 29.7%, and 68.4% in the matched group, and 16.6%, 66.4%, and 17.0% in the mismatched group, respectively. In other words, the matched group was more likely to receive inpatient treatment than the outpatient treatment that was recommended, and the mismatched group was more likely to receive community treatment and outpatient treatment than the required inpatient treatment. Preliminary research has shown that undertreatment (receiving treatment at a lower LoC than the recommended LoC) results in poorer alcohol use-related improvement than receiving recommended treatment, but overtreatment (receiving treatment at a higher LoC than the recommended LoC) showed no difference in outcome.<sup>16</sup> Also, according to a study of inpatient treatment by Kim and Ahn,<sup>17</sup> only 8.3% of patients continued to visit the outpatient clinic for 6 months after inpatient

treatment, and this rate decreased significantly within 3 months. When this is considered in a comprehensive way, there may be differences from the previous study due to the possibility that the matched group was affected by the follow-up rate because of the high rate of overtreatment. Therefore, in follow-up studies, it is necessary to investigate the effective-

**Table 8.** Comparison of the two groups for K-PPC dimension 5 & 6

Dimension	Follow-up	Matched	Mismatched	$\chi^2$	p
5 (risk of relapse)	Baseline			1.35	0.510
	Low	36 (6.9)	37 (7.1)		
	Medium	147 (28.3)	131 (25.2)		
	High	80 (15.4)	89 (17.1)		
	1-month			4.51	0.105
	Low	49 (13.8)	37 (10.4)		
	Medium	101 (28.5)	94 (26.5)		
	High	33 (8.5)	44 (12.4)		
	3-month			3.74	0.154
	Low	36 (14.8)	32 (13.1)		
	Medium	62 (25.4)	68 (27.9)		
	High	16 (6.6)	30 (12.3)		
6 (recovery environment risk)	Baseline			1.33	0.514
	Low	44 (8.4)	34 (6.5)		
	Medium	154 (29.6)	159 (30.5)		
	High	67 (12.9)	63 (12.1)		
	1-month			0.23	0.892
	Low	45 (12.7)	40 (11.3)		
	Medium	106 (29.9)	104 (29.4)		
	High	29 (8.2)	30 (8.5)		
	3-month			6.25	0.044*
	Low	31 (12.9)	32 (13.3)		
	Medium	72 (29.9)	70 (29.0)		
	High	10 (4.1)	26 (10.8)		
6-month			3.13	0.209	
	Low	19 (11.8)	33 (20.5)		
	Medium	46 (28.6)	44 (27.3)		
	High	10 (6.2)	9 (5.6)		

Data are presented as N (%). \*p<0.05. K-PPC, Korean-Patient Placement Criteria

**Table 9.** Comparison of treatment program adherence in the two K-PPC groups

Variable	Matched (N=219)	Mismatched (N=160)	t	p
Treatment program adherence (%)	50.61±27.38	41.67±28.55	3.083	0.002**

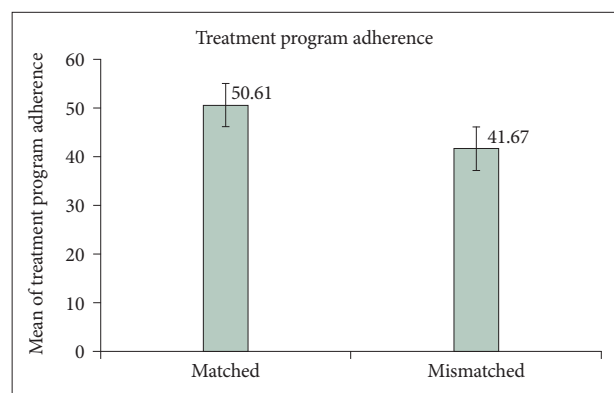
Data are presented as mean±standard deviation. \*\*p<0.01. K-PPC, Korean-Patient Placement Criteria

ness of PPC through detailed classification into matched, overmatched, and undermatched.

The adherence to all K-PPC recommended treatment programs was 50.61% (matched group) and 41.67% (mismatched group). This result can be interpreted to mean that compliance with the K-PPC treatment recommendation supports better attendance in treatment programs compared to those who do not comply. Various treatments for AUD are reported to be effective, but due to the many problems mentioned above, the relapse rate is higher than that of other mental disorders. In summary, since continuing treatment attendance reduced the relapse rate of AUD, complying with the K-PPC-recommended LoC should also help reduce the relapse rate of AUD.

Although there was no significant difference in the follow-up rates between the matched and mismatched groups, the adherence to treatment programs was confirmed to be higher in the matched group than in the mismatched group, affirming the study hypothesis. In addition, the matched group consistently showed greater improvement than the mismatched group in AUD-related outcomes as measured by the 6 dimensions of the K-PPC, not only at baseline but also over time. In fact, the results of the AUDIT-C and the CIWA-Ar in dimension 1 were better in the matched group than in the mismatched group and were better in all 3 follow-ups compared to the baseline. This means that the K-PPC was significantly effective in improving AUD-related variables, which supports prior research. Röhrig et al.,<sup>4</sup> reported that it was more effective to match treatment intensity to patient characteristics than to match treatment services to specific problems or treatment modalities to treatment content.

There was a difference in dimension 2 between the two groups



**Figure 3.** Average percentage of adherence to all treatment programs by group.

at baseline, with a higher proportion of high risk in the mismatched group. However, previous studies have shown that physical problems, such as chronic illness, do not have an impact on the readmission and abstinence of alcoholics.<sup>18,19</sup> The matched group had a higher rate of “good insight” than the mismatched group. Despite the high prevalence of AUD, poor insight is one reason for the low rate of seeking treatment and is the main reason for early treatment dropout.<sup>20-23</sup> In contrast, good insight is a strong predictor of motivation to start and continue treatment and of successful treatment outcomes.<sup>24,25</sup> Consequently, the higher rate of good insight in our matched group was related to the higher adherence to treatment in the matched group. In addition, the high CES-D scores in the mismatched group may have affected adherence to treatment programs. AUD and depression are frequently linked, with lower adherence to treatment programs when both conditions co-occur than when AUD occurs independently.<sup>26,27</sup> However, since the aim of this study was to investigate the overall effectiveness of the K-PPC, it is difficult to analyze the effect of each dimension of the K-PPC in detail on follow-up rates and treatment adherence. Thus, in subsequent studies, a more in-depth analysis of the effect of each area on follow-up rates and treatment compliance over time is needed.

The fact that an improvement in AUD-related outcomes was confirmed over time, even in the mismatched group, can be interpreted to mean that adherence to treatment itself can have a positive effect in the treatment of AUD. In dimension 2, which evaluated biomedical conditions, the number of matched participants evaluated as “low risk” and the number of mismatched participants evaluated as “high risk” were lower at baseline. However, there were no significant differences between the two groups at any follow-ups. Moreover, the CES-D showed a tendency to improve over time in the mismatched group. According to Lappan et al.,<sup>28</sup> high levels of treatment participation and retention are consistently related to positive discharge outcomes, while early discontinuation of treatment often incurs high initial costs without benefits over the course of the intervention. Based on these points, treatment retention alone has therapeutic meaning. Accordingly, a customized program that motivates participation in the K-PPC recommended LoC, as well as a short-term intervention that also improves treatment retention, can be expected to enhance the overall effectiveness of AUD treatment as well as lower the cost of treatment. Developing a short-term intervention program immediately after the K-PPC evaluation, such as the Screening, Brief Intervention, and Referral to Treatment tool, which conducts an evaluation and short-term intervention at the same time, will help increase compliance with the recommended LoC.

There are limitations to consider in the interpretation of our

results. Since this was a nationwide study, the case managers in charge of the study participants at each institution were diverse. In the K-PPC, there were questions that included an evaluation of the evaluators, so it was important for the evaluators to answer these questions objectively. For this reason, we tried to reduce the gap between evaluators by providing online education and evaluation manuals to case managers. Secondly, it is possible that treatment programs without limits or controls that were previously implemented in each institution may have affected the outcomes and confounded the treatment program proposed by the K-PPC. Thus, in subsequent studies, it is necessary to investigate whether similar results are obtained even when the corresponding effect is controlled. Finally, it was difficult to guarantee an equal proportion of matched and mismatched cases because extensive data had to be collected and placement of patients was required. As a result, there were differences in the proportions of the LoC in the matched group and the mismatched group that affected the follow-up rate results.

Despite these limitations, the results of this study suggest that the evaluation, placement, and treatment of patients with AUD according to the K-PPC can help solve the current treatment problems in Korea. However, because this was an exploratory study on the K-PPC, ongoing verification of the validity and effectiveness of the K-PPC will be necessary.

### Supplementary Materials

The online-only Data Supplement is available with this article at <https://doi.org/10.30773/pi.2023.0314>.

### Availability of Data and Material

The datasets generated or analyzed during the study are available from the corresponding author on reasonable request.

### Conflicts of Interest

Sung Won Roh, a contributing editor of the *Psychiatry Investigation*, was not involved in the editorial evaluation or decision to publish this article. All remaining authors have declared no conflicts of interest.

### Author Contributions

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