



## Assessment of the Effectiveness of Matrix Model Among Methadone Patients Using ATS in Ho Chi Minh City, Vietnam

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### Abstract

This study assessed the effectiveness of the application of the Matrix model in patients undergoing methadone treatment for Amphetamine-type substance (ATS) in Ho Chi Minh City. A total of 951 methadone patients were screened; 60 (16%) met the inclusion criteria and of those 51 (85%) completed 16 weeks of study procedures. Most of the participants were ATS users with moderate or higher risk of dependence. Compared to the non-intervention group, the intervention group showed a significant reduction in positive urine tests for methamphetamine (a decrease from 100% to 11% vs. a decrease from 100% to 98% for the non-intervention group,  $p < 0.001$ ) and for opiates (a decrease from 36.7% to 3.7% vs. a decrease from 43.3% to 29.2% for the non-intervention group). In the intervention group, the quality of life increased from 76.74 points to 85.5, the proportion of depression decreased from 43.3% to 18.5%, anxiety decreased from 30% to 11.1%, and stress decreased from 76.7% to 29.6%. In the non-intervention group, quality of life decreased from 75.2 points to 74.5 points, the proportion of depression decreased slightly from 40% to 36%, anxiety decreased from 33.3% to 24%, and stress decreased from 76.7% to 76.0%. The intervention group was significantly more likely to adhere to methadone treatment ( $p < 0.001$ ). The proportions of participants in the intervention group and non-intervention group who discontinued treatment were 10% and 20%, respectively. The study results suggested that the MATRIX model could help reduce ATS and opiate use and improve mental health as well as treatment adherence.

## Introduction

The United Nations Office on Drugs and Crime (UNODC) reported that, in 2019, there were about 68 million stimulants users – the second most widely used category of drugs after Marijuana, 38 million Amphetamine users, 18,1 million Cocaine users, and 22 million Ecstasy users. In Vietnam, according to a report by the Ministry of Public Security, in 2019, the increase in the illegal drug trade has led to an increase in the rate of stimulants use to 70-80% among drug users; especially in the central and southern provinces, drugs mainly used are stimulant drugs such as Amphetamine-type stimulants this (ATS), Cocaine and new stimulants (United Nations Office on Drugs and Crime – UNODC (2009). Drug abuse affects not only the family, community, social, economic, and political stability but also directly affects the user's health. UNODC also reported that HIV prevalence among those who do not inject ATS ranges from 1 to 18%, and among ATS injectors ranges from 3 to 28% (UNODC, 2019).

In Vietnam, the Methadone treatment for drugs addiction has been being implemented since 2008. As of December 31, 2019, the country has nearly 53,000 patients receiving Methadone treatment at 336 treatment facilities in 63 provinces/cities of Vietnam. Methadone treatment has been proven to be very effective in the world and Vietnam; which helps patients to reduce and to progress to stop using illegal drugs and to improve health conditions (reducing HIV infection and bloodborne diseases, improving and recovering physical and mental condition) (Vietnam Ministry of Health – Administration for HIV/AIDS Control (VAAC) 2019). Besides, Methadone treatment also helps many patients to get stable jobs. A 10-year evaluation report of the Methadone treatment program showed that the unemployment rate of opioid users treated with Methadone decreased from 30,4% to 6,9% in Nghe An and the employment rate in Can Tho increased from 53% to 69% after one year of treatment. However, the early successes of this program are at risk due to the issues of Amphetamine-type stimulant use (ATS). The most recent statistics show that nearly 40% of injecting drug users (IDUs) who are receiving methadone treatment have used crystal meth (Feelemyer et al., 2018). Using methamphetamine is related to the patient's non-participation in methadone treatment. In addition, it is associated with non-adherence to antiretroviral therapy in HIV patients receiving treatment, and using methamphetamine also contributes to increased mental health problems (Lauritzen & Nordfjærn, 2018). The lack of effective coping strategies for this condition in methadone facilities has resulted in an increase number of methadone patients being forced to compulsory rehab centers and therefore, disrupting their methadone treatment (Vietnam Ministry of Health, 2017).

There is currently no medication for ATS addiction, so, effective strategies and interventions will maximize resources to build a sound treatment system for substance use disorders (Feelemyer et al., 2018). Literature reviews have shown several effective interventions, including psychosocial therapy; the Screening, Brief Intervention, and Referral to treatment model (SBIRT); the Matrix model for methamphetamine use reduction interventions. Psychosocial interventions include Cognitive Behavioral Therapy (CBT) including or not including Motivational Interviewing (MI) and Contingency management (CM) (LE Minh Giang, 2018). However, the application of these methods in Vietnam is still very new and has not yet been systematically implemented, because there is no specific treatment program, and the staff at the methadone facilities do not have experience with ATS use. Therefore, it is necessary to have a treatment intervention program for methadone patients using ATS based on the group counseling approach such as the Matrix model. And it is very important and meaningful for the study to evaluate the effectiveness of the application of this model in treatment for methadone patient using ATS in Ho Chi Minh City”, which aims to (1) provide an overview of the possibility for application and scaling up the matrix model for ATS users in general, and ATS users outside the community in particular; and (2) propose a suitable treatment model to improve the quality of treatment among methadone patients using ATS group in Ho Chi Minh City.

## Methods

The research population are patients who have been treated with methadone at 2 methadone facilities of District 4 and 8 of HCMC, with the following selection criteria: (1) age  $\geq$  18 years old, (2) having ASSIST score  $\geq$  4 and urine test positive with MET, and (3) agreed to participate in the research and signed the informed consent.

The research applied Quantitative method, comparing results before and after intervention with a control group, from 01/2018 to 12/2019. 30 methadone patients from District 4 and 30 methadone patients from District 8 in HCMC were selected as samples of the research.

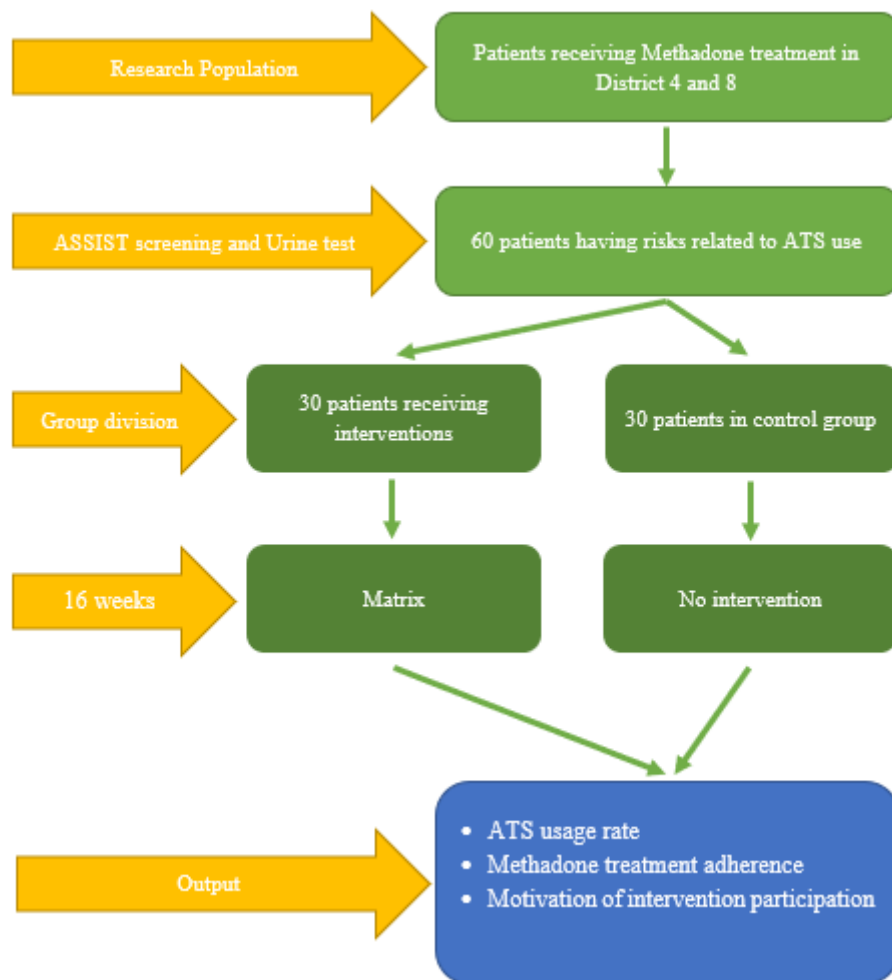


Figure 1. Intervention Process

Step 1: Patients screening based on research criteria.

Step 2: All sample (including patients met criteria and agreed to participate in the research) will be divided into 2 groups. One group received Matrix intervention in 16 weeks and another group received no interventions from the research.

Step 3: Separately assess the 2 groups after 16 weeks of intervention and conduct a follow-up after 1 and 3 months with 2 groups based on criteria and proposed research indicators.

### Intervention Description

Intervention group: Matrix model were applied to this group.

Matrix model refers to Group counseling (1 time per week) and Individual counseling (1 time per week), which aims to provide knowledge and capacities to control meth use.

Non-intervention group (control group): this group received no Group nor Individual counseling from Matrix model.

### Variables and Indicators

Information collected to assess the effectiveness of the intervention includes demographic information (age, gender, education level, marital status, employment status), ATS use situation, self-confidence in reducing ATS use, ASSIST score (UNODC, 2009), HIV Risk Assessment Battery (RAB), Patient Health Questionnaire (PHQ), Quality of Life Questionnaire (EQ-5D-5L) (UNODC, 2019), Depression, Anxiety and Stress Scale - 21 Items (DASS-21), Readiness to Change - Drugs (SOCRATEs-8D).

## Data collection methods and Tools

### Data Collection Methods

The research employed face-to-face interviews by using questionnaires with patients before the intervention (week 1) and at the end of the intervention process (week 16), follow-up after the intervention (weeks 20 and 32). The research team also extracted available data (each week) of urine test results.

### Data Collection Tools

Quantitative questionnaires with demographic information. ATS use characteristics: ASI-Lite questionnaire, Urine test for Heroin, and MET. Self-confidence assessment in reducing ATS use, questionnaires: ASSIST (UNODC, 2009), HIV Risk Assessment Battery (RAB), Patient Health Questionnaire (PHQ), Quality of Life Questionnaire (EQ-5D-5L) (UNODC, 2019), Depression, Anxiety and Stress Scale - 21 Items (DASS-21), Readiness to Change - Drugs (SOCRATES-8D).

### Data Analysis

Research data were collected by using tablets and the REDCap tool, then, transferred to the Stata 14.0/MP platform for cleaning and analysis. Mean/Median and percentage will be used to describe demography, substance use characteristics, risk behaviors, and intervention satisfaction. T-test (or Mann-Whitney test) and Chi-square test (or Fisher exact test) were used not only to compare patients' before-after intervention states but also to compare the outputs between 2 groups of patients participating in the research.

### Research Ethics

The research was conducted after getting the approval from the 2 methadone facilities in District 4 and 8, HCMC. Following the information security regulations, this research did not collect patients' personal information, and all data collected were assured to be confidential and only served for this research.

## Results and Discussion

### Research Subjects General Information

Table 1 describes patients' demographic, economic and social characteristics. The average age of the patients is 38 years old, and 90% of them were male. 45% have lower level of high school education and 63.3% are married. 40% of the patients enrolled in the research have paid jobs, 46.7% of patients are paid occasionally and 13.3% are not paid at all. 96.7% of the patients lives with their families; 63.3% have an average income of less than 5 million VND per month, and 18.3% have more than 5 million VND per month.

Table 1. Patients' demographic, economic, and social characteristics (N=60)

	Total (N=60)	District 4 (n=30)	District 8 (n=30)	p-value
	n (%)	n (%)	n (%)	
<b>Age (Mean ± SD)</b>	38,18±5,39	38,07±4,96	38,30±5,87	0,868
<b>Age group</b>				0,895
< 30	2(3,3)	1(3,3)	1(3,3)	
30-39	30(50)	16(53,3)	14(46,7)	
≥ 40	28(46,7)	13(43,3)	15(50)	
<b>Sex</b>				0,671
Male	54(90,0)	28(93,3)	26(86,7)	
Female	6(10,0)	2(6,7)	4(13,3)	

<b>Education level</b>				<b>0,020</b>
Lower than High school	27(45,0)	9(30,0)	18(60,0)	
High school and above	33(55,0)	21(70,0)	12(40,0)	
<b>Marital status</b>				<b>0,110</b>
Single	16(26,7)	11(36,7)	5(16,7)	
Married	38(63,3)	15(50,0)	23(76,7)	
Separated/Divorced	6(10,0)	4(13,3)	2(6,7)	
<b>Paid occupation</b>				<b>0,879</b>
Absolutely no	8(13,3)	5(16,7)	3(10,0)	
Sometimes yes	28(46,7)	14(46,7)	14(46,7)	
Absolutely yes	24(40,0)	11(36,6)	15(34,3)	
<b>Living</b>				<b>~1</b>
With family	58 (96,7)	29(96,7)	29(96,7)	
Alone	2(3,3)	1(3,3)	1(3,3)	
<b>Personal income</b>				<b>0,044</b>
0 - < 5 000 000 VNĐ	38(63,3)	15(50,0)	23(76,7)	
5 - < 10 000 000 VNĐ	11(18,3)	9(30,0)	2(6,7)	
≥ 10 000 000 VNĐ	11(18,3)	6(20,0)	5(16,7)	

### ATS Use Characteristics

The results from Table 2 describe ATS use characteristics before the intervention. The first time used meth of the participants was on average of 33 years old, 100% using meth from 1-2 times/day, the average cost per usage was 242,000 VND; 100% used meth by smoking, the meth use disorder at severe level accounted for 71.7%. The proportion of patients using meth with other substances: 11.67% using alcohol, especially 83.33% of patients using tobacco.

Table 2. ATS use characteristics before intervention (N=60)

	<b>Total (N=60)</b>	<b>District 4 (n=30)</b>	<b>District 8 (n=30)</b>	<b>p-value</b>
	<b>n (%)</b>	<b>n (%)</b>	<b>n (%)</b>	
First age using Meth (Mean±SD)	33,6±6,80	32,17±6,67	35,03±6,74	<b>0,103</b>
<b>Daily dose</b>				<b>1</b>
1-2 times	60(100)	30(100)	30(100)	
<b>Amount for using Meth/time</b>	243.666,67±15 2.376,719	270.666,67± 147.903,355	216.666,67 ± 154.436,313	<b>0,172</b>
<b>Way to use</b>				<b>1</b>
Smoking	60(100)	30(100)	30(100)	
<b>Meth use disorders based on DSM-5 standard</b>				
Mild (2-3 symptoms)	2(3,3)	1(3,3)	1(3,3)	<b>0,072</b>
Medium (4-5 symptoms)	15(25,0)	4(13,3)	11(36,7)	
Severe (≥ 6 symptoms)	43(71,7)	25(83,3)	18(60,0)	
<b>Additional substances</b>				
No additional substance	9(15,0)	9(30,0)	0(0)	
Heroin	0(0)	0(0)	0(0)	
Alcohol	7(11,67)	4(13,3)	3(10,0)	
Tobacco	50(83,33)	21(70,0)	29(96,67)	
Other	3(5,0)	1(3,3)	2(6,6)	

### Intervention effectiveness for ATS use

The percentage of positive urine tests for meth during 16 weeks of intervention is shown in Chart 1.

At baseline, 100% of the participants had a positive urine test. After 16 weeks, this percentage of the intervention group decreased dramatically to 11%, while, the percentage of the control group appeared to be unchanged and at 98%.

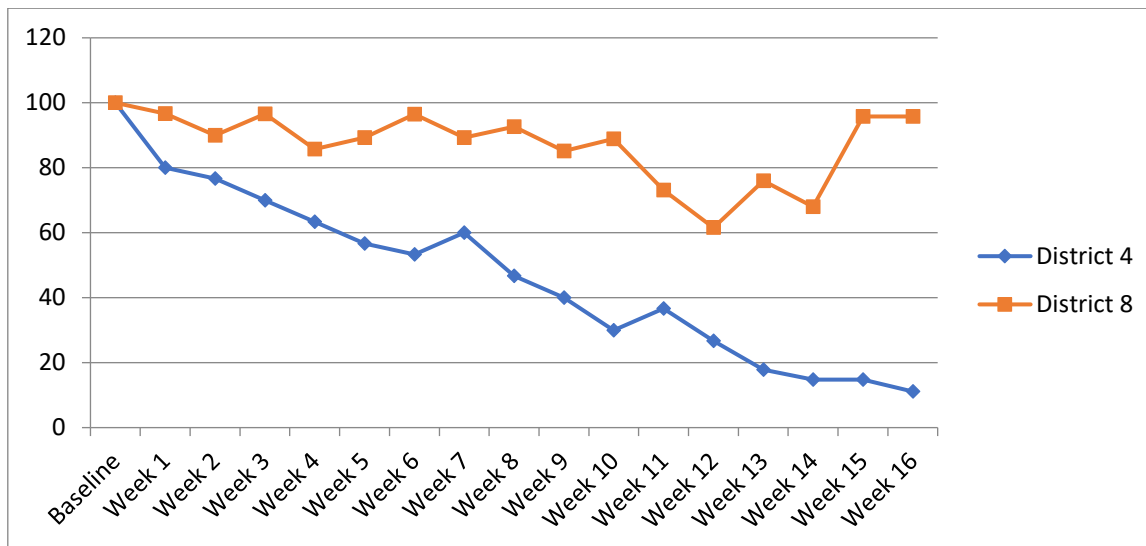


Figure 2. Percentage of positive urine test for meth during 16 weeks of intervention

The percentage of positive urine tests for opiates is shown in Chart 2. At the beginning of the research, 37% and 58% of the participants were opioid-positive in the intervention and control groups, respectively. After 16 weeks of intervention, the rate of positive urine tests for opiates decreased significantly and the difference between the 2 groups was 4% for the intervention group and 30% for the control group.

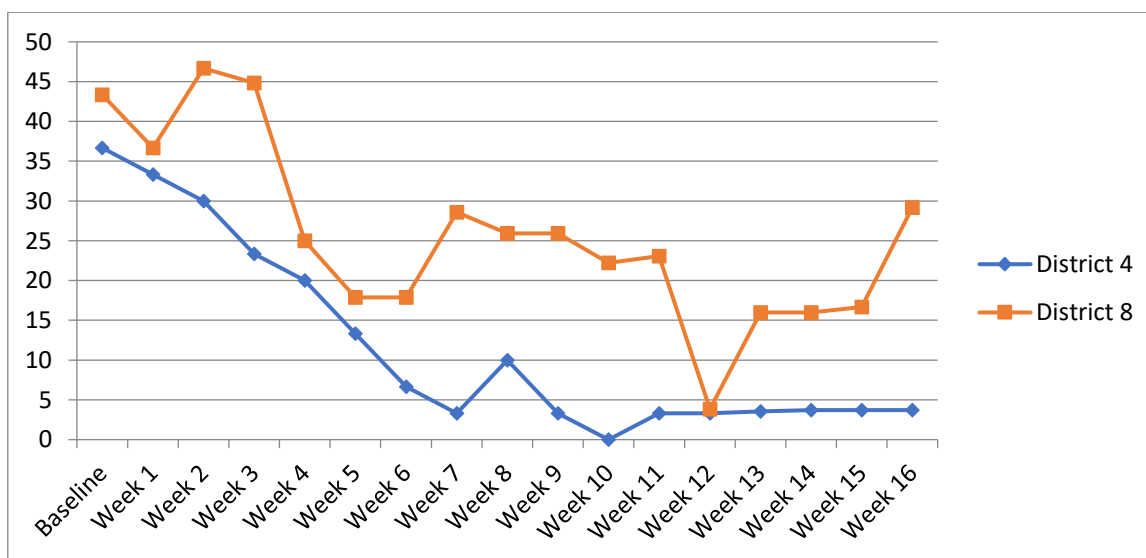


Figure 3. Percentage of positive urine test for opiates during 16 weeks of intervention

### Mental health issues before and after intervention

The risk of having mental health issues including depression, anxiety, and stress were all significantly reduced after 16 weeks in the intervention group, particularly effective among meth-users with intermediate-risk and above for anxiety (P=0.041) and stress (P=0.001). For

the control group, the degree of change before and after intervention was not much and was not statistically significant.

Table 3. Mental health issues before and after intervention (N=60)

Mental health issue	Intermediate risk and above District 4 (n=30)			Intermediate risk and above District 8 (n=30)		
	Before intervention	After intervention	p-value	Before intervention	After intervention	p-value*
	n (%)	n (%)		n (%)	n (%)	
<b>Depression</b>						
At risk	13 (43,30%,)	6(18,5%)	0,788	12 (40%)	11 (36,7%)	0,041
<b>Anxiety</b>						
At risk	9(30%)	3 (11,1%)	0,041	10(33,3%)	7 (24%)	0,788
<b>Stress</b>						
At risk	23(76,7%)	9(29,6%)	0,001	23(76,7%)	22(76%)	~1,00

### Effectiveness for treatment adherence

The results of Table 4 describe the treatment adherence rate of research participants of the 2 groups. All patients who came to receive the methadone had to sign in administrative papers to receive methadone and they must take the medication in front of the health workers, then they were allowed to leave. After leaving, both groups were followed up for 16 weeks. The Mean of follow-up time of the 2 groups was 105.12±2.57. The intervention group had a lower drop-out rate than the control group with the mean of (109.43±1,42 and 100.80±4.81), respectively. However, the lower rate was not statistically significant. The average weekly adherence rate was 78.15±17.45, and it was a statistically significant difference (P<0.001).

Table 4. Treatment adherence

Treatment adherence	District 4		District 8		Total		P	
	n	%	n	%	N	%		
Follow-up average time (day) (Mean±SD)	109,43±1,42		100,80±4,81		105,12±2,57		0,252*	
Drop-out patients	3	10,0	6	20,0	9	15,0		
Miss at least 1 dose/16 weeks	Yes	20	66,7	30	100,0	50	83,3	<0,001
	No	10	33,3	0	0,0	10	16,7	
Total drop-out doses	26		165					
Treatment adherence rate by week	94,55±5,83		61,74±4,64		78,15±17,45		<0,001	

\*Log rank

Matrix model interventions that integrate cognitive-behavioral evidence-based interventions have proven to be effective in the world. These interventions were tested and applied to methadone patients who have used ATS. The research in Ho Chi Minh City, Vietnam presented the effective results of this model . It showed the initial results in reducing illicit meth use, improving mental health issues, and patients' treatment adherence.

### Reducing ATS use

Amphetamine-type stimulants use frequency, during the 16-week intervention for the intervention group in District 4, showed that 100% of patients had positive urine test results for methamphetamine at the start of the intervention. After participating in group counseling activities in the first week, the positive rate decreased to 80%, the 2nd week decreased to 76.67%, the 3rd week decreased to 70%, by the 15th week to 23% and especially by the 16th



week, this rate decreased to 14%. These results show that if the MMT treatment is combined with group counseling activities, it will help patients to reduce the frequency and quantity of using methamphetamine, which is evidenced by the negative urine test results during treatment. Interestingly, the main purpose of the research was focusing on supporting MMT patients to reduce and stop using methamphetamine, but at the end of the research, we found that the interventions also helped patients to reduce other substances use such as Morphine use in the first week of intervention with the positive urine test rate of 33.33%, it decreased to 23.33% at the 3rd week; by the 10th week, this rate reduced to 0%; and at the 15th and 16th week this rate was 3.70%. This research showed the same results and consistent with other studies in the world on the effectiveness of behavioral interventions, which significantly helps to reduce the illicit meth use among methadone patients compared to current conventional treatments.

### **Mental health issues**

Intervention group's mental health condition was proven to be significantly better, compared to control group. This result is consistent with many previous research, which showed a significant improvement in psychiatric symptoms in meth reduction interventions (Stuart et al., 2020). The link between substance use and mental health can be explained by the following mechanisms:

Firstly, using meth can cause psychotic symptoms such as delusions and hallucinations under the influence of drugs, or depression in the period of discontinuation (Glasner-Edwards & Mooney, 2014). During the intervention, patients reduced their meth use, thus, also reduced psychotic symptoms. Secondly, stopping meth use helps to improve the patient's family and social relationships, thereby, helping them to improve their mood. Thirdly, behavioral intervention, although the goal is to reduce meth use, has an impact on the patient's overall mental state (Stuart et al., 2020). For example, participating in group counselling activities, patients receive encouragement and sharing from other patients in the group and from the counselor.

### **Treatment adherence**

Patients who both take MMT and use ATS lead to an increasing number of missed doses and non-adherence to treatment. The research results showed a statistically significant difference in the rate of patients' adherence to treatment between intervention and control group.

For the intervention group, the adherence rate was  $94.55 \pm 5.83$ , while the rate of the control group was  $61.74 \pm 4.64$ . For the control group, the rate of skipping dose always fluctuated at the lowest level of 33.33%, and the highest rate was up to 44.44%. Some patients even stopped taking MMT from 2 to 3 doses per week. For the intervention group, the rate of adherence was better, the number of patients who missed the dose at the first week of the intervention was 13.33%, at the 2nd week it decreased to 10%; with the same decrease was found at the 14th, 15th and 16th week. This shows the effectiveness of group counselling activities., And encouraging and reminding patients to adhere to treatment is very important.

This research was conducted with a small sample size so there may be limitations to avoid biases when assessing the effectiveness of the intervention. However, the initial results obtained from this pilot research would be the premise for further studies in the future in Vietnam

### **Conclusion**

The application of the Matrix model in MMT treatment patients using meth showed a significant reduction in methamphetamine use by 11% after 16 weeks of intervention, as well as a reduction in the rate of heroin use, significantly improving mental health condition and patients treatment adherence (the drop-out rate of intervention and control groups was 10% and 20%, respectively). Application of Matrix model showed the feasibility (85% of patients in



the intervention group participated in the full 16-week activities). This model is suitable, and it can be widely and feasibly applied in outpatient treatment facilities, especially Methadone facilities. The study advocates for outpatient treatment and flexibility in the application of Matrix interventions. This is very important as resources for addiction treatment are dwindling. More research is needed to evaluate the long-term effectiveness of this model as well as its expansion in the future.

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