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Health-related quality of life trajectories of methamphetamine-dependent individuals as a function of treatment completion and continued care over a 1-year period

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Abstract

This study applies a chronic illness framework to evaluate treatment outcomes among individuals dependent on methamphetamine (MA). Using growth curve modeling, health-related quality of life (HRQOL) trajectories of MA-dependent individuals ($N = 723$) were examined over a 1-year period. Results show greater improvements in mental HRQOL trajectories as a function of treatment completion and continued care, although fairly static trajectories in physical health status. Other factors affecting HRQOL trajectories included gender, psychosocial functioning, drug use severity, and health impairment. Results extend research on treatment evaluations for MA dependence, highlighting the importance of continued service utilization for improved quality of life outcomes.

Keywords

Methamphetamine; Health-related quality of life; Continued care

1. Introduction

There is considerable agreement throughout the substance abuse treatment community that for many individuals, addiction is a chronic relapsing disorder. Past studies have presented models for considering substance use disorders as chronic problems, including work by Anglin, Hser, and Grella (1997) related to “addiction” and “treatment” careers and McLellan, Lewis, O’Brien, and Kleber (2000) related to reconceptualizing addiction as a chronic health problem, similar to diabetes and hypertension. Research has established that substance use disorders progress through complex repeated cycles of cessation, abstinence,

and relapse that occur over a lengthy trajectory (Hser, Longshore, & Anglin, 2009) and that they require continuous monitoring and management over extended periods and perhaps the lifetime (Cacciola et al., 2008; McKay, 2005). Despite this research, the effectiveness of addiction treatments continues to be evaluated with regard to their ability to produce short-term symptom reductions (McLellan, McKay, Forman, Cacciola, & Kemp, 2005).

Measurement under a chronic illness framework intends to capture the full impact of a medical condition and recommended treatment(s) on an individual's quality of life (World Health Organization, 1995). Health-related quality of life (HRQOL) is a commonly used measure in outcome evaluations of chronic illnesses (Mendlowicz & Stein, 2000) because it provides an empirical assessment of how the patient perceives the burden of disease to be after treatment (Ware, Snow, Kolinski, & Gandek, 1993). Since the 1960s, substance abuse treatment outcome evaluations have mainly focused on three traditional outcome measures: substance use reduction, increased public safety/reduced crime, and increased productivity/social function (McLellan et al., 2005).

The examination of quality of life as an outcome measure in substance abuse treatment evaluations is relatively recent. Available studies are mostly descriptive in nature that use a quality of life instrument, such as the Short-Form Health Survey (SF-36, SF-20, and SF-12) or the Nottingham Health Profile to characterize the health status of a given substance-dependent population at treatment entry, most of which consists of opiate or alcohol users (e.g., Booth, Blow, & Cook, 2001; Freeman, 2003; Garg, Yates, Jones, Zhou, & Williams, 1999; Greenwell & Brecht, 2003; Gual et al., 2003; Kiritze-Topor et al., 2004; Kraemer et al., 2002; Morgan, Morgenstern, Blanchard, Labouvie, & Bux, 2003; Perneger, Giner, del Rio, & Mino, 1998; Richter, Eikermann, & Berger, 2004; Torrens et al., 1997).

Many treatment outcome studies do not consider the impact of continued treatment exposure on quality of life. This is limiting if a chronic illness model is to be applied to the treatment of addiction. Most research in support of a chronic illness model argues against the use of short-lived episodic interventions as well as outcome studies that limit the measurement of treatment effectiveness to single-episode evaluation designs (McLellan et al., 2005).

To date, there is limited research on quality of life outcomes in relation to treatment participation among populations dependent on methamphetamine (MA). Clinical and behavioral research on MA-dependent individuals indicates that they may be especially vulnerable to poor HRQOL outcomes. The chronic and long-term use of MA has been linked to substantial medical illness and disability, including cardiopulmonary consequences (chest pain, hypertension, shortness of breath, and tachycardia; Rawson, Gonzales, & Ling, 2006), impaired cognitive functioning (slower motor function, decreased memory and attention, and impulsivity; McKetin & Mattick, 1998; Semple, Zians, Grant, & Patterson, 2005), severe psychiatric comorbidity (psychosis, persecutory delusions, ideas of reference, persistent visual and auditory hallucinations, depression, anxiety, and suicidal ideation; Glasner-Edwards et al., in press; Glasner-Edwards et al., 2008; Meredith, Jaffe, Ang-Lee, & Saxon, 2005; Wells et al., 1989; Zweben et al., 2004), increased risky behaviors (transmission and infection of HIV; hepatitis A, B, and C; and other sexually transmitted infections; Gonzales et al., 2008; Rawson et al., 2008), and substantial criminal involvement

(Evans & Longshore, 2004; Farabee, Prendergast, & Cartier, 2002; Griffin, Rabkin, Remein, & Williams, 1998; Iguchi et al., 2002).

As the number of men and women entering treatment for MA dependence increases across the country (Substance Abuse and Mental Health Services Administration, 2008), it becomes important to understand how treatment and continued service efforts serve to improve their quality of life. Using data from a multisite, randomized clinical trial, the Methamphetamine Treatment Project (MTP; Rawson et al., 2004), this study applies a chronic illness model to examine change in HRQOL as a function of treatment completion and continued service exposure over a 1-year period, controlling for select covariates (Messina et al., in press; Messina & Grella, 2006).

2. Methods

2.1. Participants

The study sample consists of 723 MA-dependent individuals who participated in the MTP between 1999 and 2001. Individuals were eligible for the MTP if they met *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* criteria for MA dependence, used MA in the month prior to treatment admission, were a resident of the geographic location of the treatment program, and were proficient in English. During the MTP, individuals were randomly assigned to receive a standard cognitive-behavioral treatment (Matrix intervention) or treatment as usual (TAU) at eight different outpatient programs in California, Montana, and Hawaii (Huber et al., 2000).

2.2. Study attrition

Follow-up response rates for the MTP study were fairly high. Of the 978 original MTP participants (Rawson et al., 2004), 798 (81.6%) completed discharge interviews, 857 (87.6%) completed the 6-month follow-up interview, and 875 (89.5%) completed the 12-month follow-up interview. Based on missing data for the SF-36 measure, calculated attrition rates across follow-ups are as follows: baseline ($N = 723$); discharge (85.2%), 6 months (84.6%), and 12 months (86.3%).

2.3. Treatment conditions

The Matrix intervention, which uses a cognitive-behavioral model for treating addiction (Rawson et al., 1995), has evolved over the past 20 years from insights gained from clinical studies among cocaine, alcohol, opiate, and MA users. The model operates as an outpatient program using a 16-week psychosocial platform with group therapy sessions, family education, 12-step meetings, and routine urine testing (Obert, McCann, Brethen, Marinelli-Casey, & Rawson, 2000). The TAU intervention is composed of eight diverse outpatient cognitive-behavioral treatment approaches, ranging from individual or group-based counseling sessions using different intensities (i.e., once per week vs. thrice weekly) and lasting between 8 and 16 weeks (Galloway et al., 2000).

2.4. Measures

Data collection for MTP participants occurred a week before treatment admission (baseline), at treatment discharge (last day of treatment attendance), and at 6 and 12 months following treatment admission. Data used in this study were limited to information collected from the Short-Form Health Survey (SF-36) and the Addiction Severity Index (ASI) Fifth Edition (Calsyn et al., 2004; Curran & Booth, 1999). The SF-36 is a self-report HRQOL measure that consists of eight mental and physical health subscales (Ware & Sherbourne, 1992). The mental health subscales assess vitality, social functioning, role limitations due to emotional functioning, and emotional well-being, whereas physical health subscales assess physical functioning, role limitations due to physical functioning, bodily pain, and general health. Subscale scores are combined into two summary scales: the physical component summary (PCS) and the mental component summary (MCS). Scores are based on normative calculations from the U.S. general population, ranging from 0 (*worst possible health status*) to 100 (*best possible health status*; Ware, 1994).

The ASI is a psychometrically validated, multidimensional instrument primarily used for assessing individual functioning across seven composite scales: drug, alcohol, employment, family/social, legal, medical, and psychiatric (McLellan et al., 1992). These scales measure impairment, ranging from 0 (*no impairment*) to 1 (*severe impairment*). In addition, participants were asked about the extent to which they received treatment/services for alcohol and/or drug problems in the past month.

2.4.1. Study variables—Primary independent measures were treatment completion and continued care or service utilization. Treatment completion was defined as a client missing no more than two consecutive weeks of treatment and completing the proscribed treatment plan as documented by client records. Continued service utilization was defined as a client receiving treatment or other services for alcohol or drug problems during the follow-up interviews as measured by the ASI. HRQOL as measured by the SF-36 subscales and component summary scales are used as the main dependent measures.

Covariates controlled for in analyses were sociodemographic, psychosocial, drug severity, and health factors, as measured by the ASI, which have been shown to affect treatment outcomes (McKay & Weiss 2001; Prendergast, Podus, & Chang 2000). Sociodemographic covariates were gender, age, race, education, and employment. Psychosocial covariates were lifetime trauma (as indicated by any physical, emotional or sexual abuse), lifetime suicide (as defined by attempting suicide at least once in one's life), and interpersonal conflict (as measured by any family or social conflict in the past month). Drug severity covariates were frequency of MA and polydrug use in the past month, lifetime MA and polydrug use, and route of administration. Covariates of health include psychiatric and medical impairment scores. Treatment condition (Matrix vs. TAU) was also controlled for in analyses.

2.5. Statistical analysis

Analyses were based on a 2-tailed alpha at $p < .05$ for statistical significance. Bivariate analyses using chi-square and analysis of variance tests were first conducted to examine associations among independent, dependent, and covariate variables. Growth curve analysis

using hierarchical linear modeling (HLM) was then performed to understand the relationship between treatment utilization (as measured by completion and continued service exposure) and HRQOL trajectories over time, at baseline, discharge, and 6- and 12-month follow-ups, controlling for select covariates based on observed bivariate associations to independent and dependent measures. The HLM analyses consisted of a three-level model and only included participants who provided complete data for at least three time points. Because the percentage of missing data for each of the variables used in analysis was small (i.e., less than 20%), list-wise deletion was used in growth modeling analyses. Level 1 accounts for potential variation in HRQOL trajectories by repeated time observations; Level 2 accounts for potential variation in HRQOL trajectories by select covariates; and Level 3 accounts for potential variation in HRQOL trajectories by treatment site. The study was conducted under the review and approval of the Institutional Review Board (IRB) of the University of California, Los Angeles, as well as the local IRBs for each participating treatment clinic.

3. Results

3.1. Sociodemographic factors

Among the MA-dependent sample ($N = 723$), half were women (51.5%), and most were Caucasian (63%). The remainder were Latino/Hispanic (18%), Asian/Pacific Islander (14.1%), African American (1.9%), or Native American/ Alaskan Indian (3.0%). The average age of the participants was 31.4 years ($SD = 8.03$), ranging from 18 to 60. Most (73.3%) of participants were employed (full-time or part-time) and had at least a high school education (77.7%).

3.2. Psychosocial factors

At treatment admission, most participants reported experiencing past trauma as indicated by lifetime sexual, physical, or emotional abuse (78.8%). About a third reported past histories of suicide attempts in their lifetime (33.7%). Almost half of the participants reported interpersonal conflict with family members (45.3%), and a third reported conflict in other social relations (33.3%).

3.3. Drug severity

The frequency of MA use among participants at treatment admission averaged 12 days ($SD = 9.0$); polydrug use averaged 5 days ($SD = 7.0$). The average lifetime use of MA was 7.4 years ($SD = 6.0$) and 6.6 years ($SD = 7.0$) for polydrug use. The most common route of administration for MA was smoking (65.2%), followed by injection (24%) and intranasal use (10.2%). Roughly half (49.6%) of the participants had been in substance abuse treatment previously.

3.4. Health factors

As indicated by ASI composite scores, the degree of psychiatric impairment among the participants at treatment entry was moderate, with scores averaging 0.31 ($SD = 0.30$), and mild for medical functioning, with scores averaging 0.23 ($SD = 0.21$).

03.5. Treatment factors

Approximately 30.3% of the participants completed treatment, and 84.2% reported receiving additional treatment or services (i.e., narcotics or alcoholics anonymous) for alcohol and/or drug problems during the 6- and 12-month follow-up interviews. There were no significant treatment site effects observed after explicitly controlling for this in the linear growth models. Fit for quadratic growth models was explored during sensitivity analysis; however, the resulting models had worse fit compared to the linear growth models and did not improve the study results.

3.6. HRQOL normative comparison

Using calculated z scores and 95% confidence intervals, mean differences in health status perceptions were estimated between a normative U.S. population and the MA-dependent sample at admission (Ware et al., 1993). As shown in Table 1, on average, the MA-dependent sample reported substantially lower health status perceptions, especially along the mental health domain compared with the normative U.S. population. In terms of specific differences, scores were lowest for the vitality, social functioning, and emotional well-being sub-scales as well as the overall mental health component summary. The physical health subscales that were lowest relative to the U.S. norms were general health and physical role limitations (role-physical), with no differences in overall physical health status as measured by the PCS.

3.6.1. Mental health subscale trajectories—As shown in Fig. 1, growth analyses indicate significant improvements in mental health status trajectories over time, as measured by the four subscales ($p < .05$). Rates of change or growth (i.e., improvements) relative to baseline status were lowest for vitality and emotional well-being subscales ($B = 0.79$ and $B = 0.74$) and highest for the role-emotional (i.e., experiencing role limitations due to emotional problems) and the social functioning subscales ($B = 1.44$ and $B = 1.08$, respectively). Mental health status trajectories matched U.S. norms at the 12-month follow-up for the vitality and role-emotional subscales but not for the social functioning and emotional well-being subscales.

3.6.2. Physical health subscale trajectories—Fig. 2 presents the overall pattern of physical health status trajectories over time as measured by the physical health subscales. Results indicate significant improvements in role-physical and general health over the follow-up time points relative to their status at baseline admission (growth change at $B = 0.50$ and $B = 0.76$, respectively). The physical functioning subscale, however, remained relatively stable over time, estimated at $B = 0.14$. Furthermore, 12-month scores for most of the physical health subscales (with the exception of bodily pain) exceeded the U.S. norms.

3.6.3. Overall HRQOL trajectories—Using the MCS and PCS scales, growth analyses indicated similar trends to the results obtained from the subscales. Improvement was most notable for mental health status trajectories compared to physical health status. Specifically, mental health status improved over time by roughly 25% (growth rate of $B = 0.84$), whereas physical health status changed by only 5% (growth rate of $B = 0.20$), with both exceeding U.S. norms at 12 months posttreatment.

3.7. Treatment association with HRQOL trajectories

3.7.1. Mental health status—Using the MCS as the primary outcome measure, growth trajectories for mental health quality of life were modeled for four types of clients: (a) clients who completed treatment and engaged in some type of continuing care for alcohol/drug use problems, (b) clients who completed treatment and did not engage in continuing care, (c) clients who did not complete treatment but engaged in some type of continuing care for alcohol/drug use problems, and (d) clients who did not complete treatment and did not engage in continuing care, controlling for select covariates. As shown in Table 2, growth curve linear analyses showed that MA-dependent clients who completed treatment and continued to receive treatment or other services for alcohol or drug problems during the follow-up period had the highest rate of change or improvement in mental HRQOL over the 12-month period ($B = .80, p < .001$), whereas clients who did not complete treatment and did not engage in continuing care had the lowest rate of change in their growth trajectories ($B = .18, p > .05$), signifying no change in the outcome across time. In terms of relative effect sizes, the change in the expected value of MCS scores at 12 months based on the predicted values of the final growth model indicates that at the 12-month follow-up, the MCS scores for those who completed treatment and had continuing care improved by 9.6 points compared to a change of 2.16 points for those who did not complete treatment and had no continuing care (using baseline scores as a reference). This 7.4 point difference is substantial, showing the importance of both successful treatment adherence (i.e., treatment completion) and subsequent continued care.

Employment was also associated with improvements in mental health status trajectories ($B = 2.51, p < .001$), such that MA users who reported being employed during the follow-up period had higher growths in mental health status over time than those who reported unemployment. Several covariates served to reduce the growth in mental health status trajectories over time, including female gender ($B = -2.12, p < .001$), high school education or higher ($B = -1.27, p < .05$), lifetime history of trauma ($B = -1.98, p < .05$) or suicide ($B = -3.77, p < .001$), higher frequency of MA use in the past month ($B = -1.84, p < .001$), polydrug use ($B = -1.62, p < .05$), injection of drugs ($B = -2.70, p < .001$), and psychiatric baseline impairment ($B = -11.23, p < .001$), as compared to their respective counterparts. Treatment condition (Matrix or TAU) did not have any differential effects on mental health status trajectories over time. The overall growth model accounted for roughly 49% of the variance in mental health status growth rates, with a relatively low degree of site clustering ($\rho = .043$).

3.7.2. Physical health status—Using the PCS as the main outcome measure, growth modeling analyses show a fairly small growth rate ($B = 0.23, p < .05$) in physical health status over the 12-month period from baseline. There was no association of treatment completion or continued treatment/service utilization during the follow-up period with physical health status improvement over time. Rather, the only factor that showed significance in the growth model was medical impairment at treatment admission ($B = -8.07, p < .001$), which reduced growth or improvement in physical health status trajectories. The overall growth model accounted for 23% of the variance in physical HRQOL growth rates over time, with a relatively low degree of site clustering ($\rho = .018$).

4. Discussion

In support of a chronic illness model, the results of this study indicate that MA-dependent individuals who are successful at adhering to a proscribed treatment regimen (through completion) and continue to receive treatment or services for substance-related problems (during a 12-month follow-up period) have better quality of life outcomes, especially mental health, than those who do not complete treatment or continue to utilize treatment/services. Previous studies have established that treatment “completion” serves as an important indicator of “success” or treatment “effectiveness” (Prendergast et al., 2000), although because completion from short-lived episodic interventions may limit our ability to understand long-term symptom reduction among substance abusers, understanding the role of continued treatment or service utilization on long-term outcomes is imperative (McKay, 2005). One outcome measure that is particularly useful in public health evaluations for measuring the extent to which the burden of chronic disease is improved as a result of treatment exposure is HRQOL (Ware et al., 1993).

Results reveal differential patterns of health status improvement among MA-dependent individuals. Factors that can jeopardize improvements in clients’ quality of life outcomes through treatment include higher education, unemployment, lifetime trauma and suicidal histories, interpersonal conflict, continued MA use, polydrug use, and medical and psychiatric impairment. Results also revealed that women MA users were more prone to having poorer health status outcomes than males, which is similar to findings by other addiction-related studies examining HRQOL (Garg et al., 1999; Greenfield et al., 2007) as well as studies investigating gender differences in psychiatric functioning among substance users (Brecht, Greenwell, & Anglin, 2005; Glasner-Edwards et al., 2008; Grella & Joshi, 1999).

Findings related to the physical health status of MA users are largely inconsistent with the existing literature, which indicates that MA dependence is associated with substantial medical morbidity and disability (Rawson et al., 2006). Neale (2004) has reported that drug users in general often have very low physical health expectations and so perceive their physical health to be good even when they are not well. Similarly, the finding in this study that having a higher level of education is associated with poorer health status outcomes than having a lower level of education is not supported by the larger literature (e.g., Puigdollers et al., 2004). One possible speculation for this result may be that drug use among highly educated persons can lead to a lower perceived health status in terms of clients not being able to maintain previous health standards nor fulfill the goals they set out to accomplish prior to their drug use.

Improvements in drug use severity, as measured by reduced MA use frequency and polydrug use during the follow-up period are especially important factors to consider when examining improvements in quality of life symptoms or outcomes over time. As shown by the growth analyses, significant improvements in mental health status trajectories were observed among individuals who reported less MA and polydrug use during follow-up periods. This finding is consistent with the pharmacology of MA and its psychotropic effects

(i.e., increased use is associated with more psychological comorbidities; Meredith et al., 2005; Zweben et al., 2004).

4.1. Limitations

The data used in this study are based on self-report, which may affect the potential for over- or underreporting for certain measures among drug users. Further, because the MA-dependent sample was treatment seeking, the generalizability of the results to non-treatment-seeking MA users is limited. Caution should also be taken when interpreting the study outcomes related to physical health given that the health status SF-36 instrument is generic in nature and has not been validated with MA-dependent populations. For instance, it may be that the SF-36's physical measures are not sensitive enough to detect physical health problems among MA users and may need to be further tested and adapted for this population. In addition, this study is limited in its ability to fully examine the relation between continued care and health status outcomes. Although continued treatment and service exposure was assessed, it does not serve as a specific continuing care intervention because the types of treatment or services received during the follow-up period are unknown. Hence, the association of improved outcomes to a specific type of continuing care approach or social support activity cannot be discussed. Lastly, this study only examines a limited set of covariates and does not consider other important factors that may affect long-term health status outcomes, including homelessness and criminal involvement.

5. Conclusion

Findings from this study extend research on the applicability of a chronic illness model for substance use disorders, demonstrating that treatment completion in conjunction with continued treatment or service exposure greatly improves long-term quality of life outcomes among MA-dependent individuals. Results also identified subsets of MA users that may be at high risk for poor long-term health outcomes; the needs of these groups should be considered when developing continuing care approaches for MA-dependent users. Overall, study results support the necessity to develop and provide continuing care models tailored to the unique needs of MA-dependent individuals to promote good health. Future research should look into the specific patterns of continued treatment as well as the reasons MA-dependent individuals reenter treatment to better understand risk factors and effective methods for engaging users in successful recovery.

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Fig. 1.

Mean mental health trajectories from baseline (0) to 12-month follow-up ($N = 723$). *VT, SF, RE, and EWB subscales were significantly different at $p < .05$ from baseline and each follow-up point.

Fig. 2.

Mean physical health trajectories from baseline (0) to 12-month follow-up ($N = 723$). *RP and GH subscale scores significantly different at $p < .05$ from baseline to 12-month follow-up points.

Table 1

HRQOL of MA-dependent sample (reference to U.S. normative population)

Variables	MA sample (<i>N</i> = 723), baseline <i>M</i> (<i>SD</i>)	Normative population (<i>n</i> = 2,474), <i>M</i> (<i>SD</i>)	Mean difference	95% confidence interval
Vitality	53.8 (21.5)	60.9 (21.0)	-7.1	-8.0 to -6.2 *
Social functioning	61.8 (28.7)	83.3 (22.7)	-21.5	-20.8 to -22.2 *
Role emotional	68.8 (42.8)	81.3 (33.0)	-12.5	-11.8 to -13.2 *
Emotional well-being	63.3 (21.6)	74.7 (18.1)	-11.4	-10.6 to -12.2 *
MCS	39.2 (13.1)	50.0 (10.0)	-10.8	-9.7 to -11.9 *
Physical functioning	86.8 (19.3)	85.2 (23.3)	1.6	-0.8 to 2.4
Role physical	72.5 (38.7)	81.0 (34.0)	-8.5	-7.6 to -9.4 *
Bodily pain	72.8 (25.9)	75.2 (23.7)	-2.4	-3.3 to -1.5 *
General health	65.5 (20.8)	72.0 (20.3)	-6.5	-5.5 to -7.5 *
PCS	50.6 (9.0)	50.0 (10.0)	0.6	-0.8 to 2.0

*
p < .05.

Table 2

Growth model of mental HRQOL trajectories

Variables	Coefficient	SE
Intercept	46.09	1.14***
Rate of change trajectories		
Completed treatment, continuing care	0.80	0.07***
Completed treatment, no continuing care	0.70	0.06***
Incomplete treatment, continuing care	0.45	0.09***
Incomplete treatment, no continuing care	0.18	0.10
Sociodemographic factors		
Gender, female	-2.12	0.64***
Race, Caucasian	0.47	0.61
Education, 12 years	-1.27	0.60*
Employment status, employed	2.51	0.66***
Psychosocial factors		
Lifetime trauma	-1.98	0.75*
Lifetime suicide	-3.77	0.62***
Drug use severity factors		
MA use frequency	-1.84	0.65***
Polydrug use	-1.62	0.82*
Lifetime polydrug use	-0.54	0.66
Lifetime MA use	-0.49	0.64
Injection	-2.70	0.71***
Health factors		
Medical impairment	-1.33	1.29
Psychiatric impairment	-11.23	1.41***
Treatment factors		
Treatment condition, TAU	-0.16	0.04

**
 $p < .01$.*
 $p < .05$.***
 $p < .001$.