

A 33-Year Follow-up of Narcotics Addicts

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Background: This study examined longitudinal patterns of heroin use, other substance use, health, mental health, employment, criminal involvement, and mortality among heroin addicts.

Methods: The sample was composed of 581 male heroin addicts admitted to the California Civil Addict Program (CAP) during the years 1962 through 1964; CAP was a compulsory drug treatment program for heroin-dependent criminal offenders. This 33-year follow-up study updates information previously obtained from admission records and 2 face-to-face interviews conducted in 1974-1975 and 1985-1986; in 1996-1997, at the latest follow-up, 284 were dead and 242 were interviewed.

Results: In 1996-1997, the mean age of the 242 interviewed subjects was 57.4 years. Age, disability, years since first heroin use, and heavy alcohol use were significant correlates of mortality. Of the 242 interviewed

subjects, 20.7% tested positive for heroin (with additional 9.5% urine refusal and 14.0% incarceration, for whom urinalyses were unavailable), 66.9% reported tobacco use, 22.1% were daily alcohol drinkers, and many reported illicit drug use (eg, past-year heroin use was 40.5%; marijuana, 35.5%; cocaine, 19.4%; crack, 10.3%; amphetamine, 11.6%). The group also reported high rates of health problems, mental health problems, and criminal justice system involvement. Long-term heroin abstinence was associated with less criminality, morbidity, psychological distress, and higher employment.

Conclusions: While the number of deaths increased steadily over time, heroin use patterns were remarkably stable for the group as a whole. For some, heroin addiction has been a lifelong condition associated with severe health and social consequences.

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NARCOTICS, or heroin, addiction is a persistent, long-term affliction for many and is associated with severe consequences, particularly in terms of premature mortality and high morbidity. We have previously reported these and other related findings based on a 24-year follow-up study of California narcotics addicts.^{1,2} Ten years after that study, we have completed another follow-up of this same cohort and updated data on their drug use and life histories since the last interview. This article presents findings from this 33-year follow-up study, focusing on the patterns and consequences of heroin use among these addicts over more than 30 years of their addiction careers.

The concept of addiction careers refers to a longitudinal characterization of an individual's use of drugs over a lifetime. Particularly among heroin addicts, repeated cycles of remission and resump-

tion of use often occur over extended periods.^{1,3-6} Longitudinal studies, such as the one reported here, have the advantage of revealing long-term patterns and consequences associated with heroin use. The lengthy observation period covered in the present study provides a unique opportunity to examine drug-related issues that span an extended period of the life cycle. In this article, we use "heroin" and "narcotic" interchangeably, because heroin was the main narcotic used by our sample. Furthermore, we have traditionally used the term *narcotic* in our prior publications^{1,2,7}; hence, we use it here for consistency.

RESULTS

HEROIN USE AND MORTALITY AT EACH INTERVIEW POINT

At the first follow-up study in 1974-1975, 13.8% of the original 581 subjects

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SUBJECTS AND METHODS

SUBJECTS

The sample consisted of 581 male narcotics addicts admitted to the California Civil Addict Program (CAP) from 1962 through 1964. The CAP, established in 1961 by California legislation, was a compulsory drug treatment program for narcotic-dependent criminal offenders committed under court order. The sample was limited to male subjects because of the small number of female commitments to the CAP. Selected from the 1962 through 1964 admission records, the sample was first interviewed in 1974-1975 as part of an evaluation of the CAP.⁷ A second follow-up of this sample was conducted in 1985-1986,¹ and a third in 1996-1997. The 1996-1997 study had a 96% location rate (242 interviewed, 31 refused or were too mentally dysfunctional to be interviewed, and 284 were confirmed to be dead) with 24 subjects lost to follow-up.

Of the 242 interviewed subjects, 36.8% were white, 56.2% Hispanic, and 7.0% African American. Before age 18 years, more than 80% of the sample had been arrested, and 80% had tried marijuana. More than 60% of the sample started using heroin before age 20 years. Mean (SD) age at admission to CAP in 1962 through 1964 was 25.4 (3.9) years.

INTERVIEW PROCEDURE

Three face-to-face interviews were conducted at 10-year intervals. Fieldwork interviewers were trained research staff

employed at University of California, Los Angeles. Most had bachelor's degrees or several years of experience conducting research interviews in other studies of a similar nature. Most interviews took place in a private office at University of California, Los Angeles. If incarcerated, subjects were interviewed in a private room of the jail or prison. Interviews also were conducted at the subject's home or in a public place if requested by the subject. The average interview at each follow-up point required between 2 and 3 hours to administer. At the end of each interview, subjects provided a urine specimen if they were not incarcerated. At the 1996-1997 follow-up, 185 subjects provided a urine specimen (89% of the 208 subjects who were not incarcerated when they completed interviews). All participation, including the furnishing of urine samples, was voluntary.

The interview protocol was adapted from Nurco et al.⁸ Interview questionnaires covered information on subjects' demographic characteristics, family history, drug use history, employment, and criminal behavior, as well as information on their legal status history. Subjects were aware that the interviewer already knew their official history of criminal activity and legal status from information obtained independently from California criminal justice system records. The information provided by the participants was retrospectively recalled in a chronological sequence for the entire addiction career that covered, across the 3 interviews, from 1 year before first heroin use to the present time of the 1996-1997 interview.

Urinalyses were conducted to detect recent use of heroin (morphine) and other drugs (eg, methadone, cocaine/crack, cannabis, phencyclidine, barbiturates, benzodiazepines,

Table 1. Respondent's Status at 3 Interview Points*

Status	1974-1975		1985-1986		1996-1997	
	Total, % (N = 581)	Living and Interviewed, % (N = 439)	Total, % (N = 581)	Living and Interviewed, % (N = 354)	Total, % (N = 581)	Living and Interviewed, % (N = 242)
Inactive use						
Urine negative for opiates	28.6	37.8	25.0	41.0	23.2	55.8
Active use						
Urine positive for opiates	23.1	30.5	19.4	31.9	8.6	20.7
Refused to provide urine	6.2	8.2	4.8	7.9	4.0	9.5
Incarcerated	17.7	23.5	11.7	19.2	5.8	14.0
Dead	13.8	...	27.7	...	48.9	...
Not interviewed	10.7	...	11.4	...	9.5	...
Total	100.0	100.0	100.0	100.0	100.0	100.0

*Ellipses indicate value not applicable.

had died (**Table 1**). The mean (SD) age of the 439 living addicts interviewed at that time was 36.8 (5.4) years. Of these 439 subjects, 37.8% showed no opiate use from their urine test results. At the second follow-up study in 1985-1986, 27.7% of the original 581 subjects had died, and the mean (SD) age of the 354 interviewed was 47.6 (5.1) years. Urinalysis revealed that 41.0% of these 354 subjects tested negative for opiates. At the latest, or third follow-up study in 1996-1997, close to half (48.9%) of the original 581

subjects had died, and the mean (SD) age of the 242 interviewed was 57.4 (4.0) years. Of these 242 subjects, 55.8% tested negative for opiates.

NATURAL HISTORY OF HEROIN USE

To examine the cohort's overall natural history of heroin use, we have graphically displayed the sample's entire addiction career (**Figure**). The addiction career was broken down into 6 states of interest: daily heroin use, oc-

amphetamines, methamphetamine). The rates of congruence between self-reported current heroin use and urinalysis results on morphine among those who provided a urine specimen was 73.7% at the first interview, 85.8% at the second interview, and 90.3% at the third interview. At the 1996-1997 interview, of the 185 subjects who provided a urine specimen, underreporting (denying use but testing positive in urinalysis) was 9.7% for heroin, 3.1% for cocaine, and 10.8% for marijuana. The reliability of the instrument has been examined and reported in previous articles.^{9,10}

MEASURES

The database contains admission and interview information, data from official record archives (eg, criminal justice system, death certificates for those deceased), and urinalysis results. Relevant self-reported variables for this analysis included background characteristics, health, mental health, employment, and criminal involvement. Substance use measures (eg, tobacco, alcohol, marijuana, cocaine, heroin) included ages of onset and current and past levels of use. To be consistent with the definition used in our previous articles,^{1,2,7} and to allow plotting of yearly change, narcotics, or heroin, addiction was defined as daily use for 30 or more consecutive days. Similarly, self-reported abstinence was defined as no use for 30 or more consecutive days. In between these 2 categories was a broad range of occasional use. Alcohol use measures included daily drinking and percentage of time using alcohol heavily during the 10 years before each interview point, where heavy alcohol use was defined as getting high on alcohol at least twice a week.

Measures of health included self-reported lifetime disability and history of infectious diseases, including hepatitis, human immunodeficiency virus, and other sexually transmitted diseases. Disability was elicited by a question about "any physical disabilities that interfered with or prevented one from holding a job." Sexually transmitted diseases included gonorrhea, syphilis, herpes, and other sexually transmitted diseases (excluding human immunodeficiency virus and hepatitis, which are reported as separate categories). Mental health or psychological distress was measured by Hopkins Symptom Checklist.¹¹ The Hopkins Symptom Checklist measures current psychiatric symptoms rated on a scale of 1 to 4, with 4 indicating greater problem severity; scores are calculated for 5 underlying symptom dimensions: depression, anxiety, somatization, obsessive-compulsive disorder, and interpersonal sensitivity.

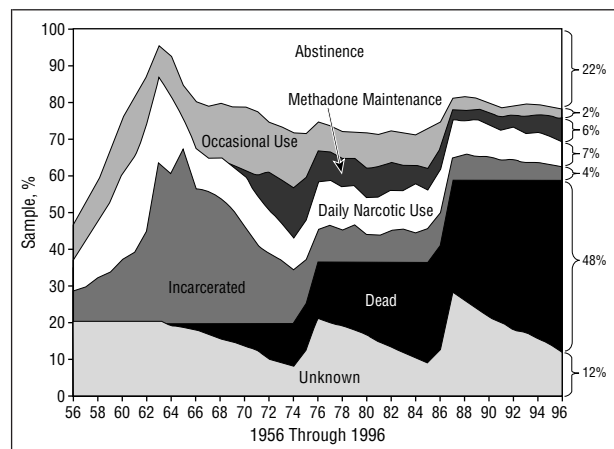
Using death certificate data, causes of death were classified by the underlying cause of death as coded by a trained nosologist in accordance with the *International Classification of Diseases, Ninth Revision*.^{12,13}

STATISTICAL ANALYSES

Descriptive statistics were reported for sample characteristics and statuses. Two multivariate logistic regression analyses were conducted, each to predict mortality (at 1985-1986 and 1996-1997) using the measures taken in the previous interview conducted approximately 10 years earlier (1974-1975 and 1985-1986, respectively). A set of *t* tests (for continuous variables) or χ^2 tests (for categorical variables) was conducted to test group differences. Unless otherwise indicated, the significance level (2-tailed) was set at $P < .05$.

casual use, abstinence, methadone maintenance treatment participation, incarceration, and death. For each year during his addiction career, if a subject was not dead, his status was determined by choosing 1 category out of the remaining 5 in which he had been involved for the most months during that year. Percentages of the sample in each of these categories between 1956 to 1996 (a period covering 40 years before the third interview) are presented in the Figure. The height of each horizontal band indicates the percentage of subjects who were classified into each of the 6 groups at each given year.

Because there were only 3 interview points and subject status was retrospectively constructed by asking about the previous 10 years, subjects were classified as "unknown status" for those who were lost to follow-up, as well as for those who were dead over the period between their last interview and the year of their death. Over time, individual subjects shifted among the nondeath categories. Before the CAP admission in 1962 through 1964, the group showed gradual increases in daily heroin use and incarceration (the CAP inpatient period is classified as a period of incarceration). After 1965, incarceration rates started to decline, and the percentages of the sample engaged in occasional heroin use and abstinence increased. This pattern continued for the next 10 years, but with noticeable changes, including increased methadone maintenance treatment participation and deaths. Af-



The natural history of narcotics addiction among a male sample (N=581).

ter 1974-1975, the group status seemed to become fairly stable; only the number of deaths continued to increase.

MORTALITY

Among the 284 confirmed deaths over the 33-year follow-up period, the most common cause of death (21.6%) was accidental poisoning (E850.0-E858) or drug overdose (45 overdose deaths were caused by heroin and 16

Table 2. Logistic Regression Analysis Predicting Mortality*

Predictor	1974-1975 to 1985-1986 (N = 439), Adjusted Odds Ratio (95% CI)	1985-1986 to 1996-1997 (N = 345), Adjusted Odds Ratio (95% CI)
Race†		
White	1.38 (0.41-4.70)	1.72 (0.59-5.08)
Hispanic	2.11 (0.67-6.66)	1.16 (0.42-3.19)
Age at the previous interview‡		
Older vs younger§	1.23 (0.70-2.19)	1.90 (1.07-3.38)
Disability status at the previous interview		
Yes vs no	3.58 (1.77-7.23)	2.74 (1.51-4.99)
No. of packs smoked per day at the previous interview		
High vs low||	1.58 (0.89-2.83)	0.59 (0.34-1.01)
Mean percentage of time using alcohol heavily before the previous interview		
High vs low¶	1.69 (0.97-2.19)	2.05 (1.20-3.52)
Active status at the previous interview		
Yes vs no#	1.32 (0.75-2.35)	1.38 (0.76-2.50)
Years since first heroin use		
High vs low**	0.84 (0.47-1.50)	2.20 (1.21-3.98)
Mean No. of arrests before the previous interview		
High vs low††	1.66 (0.94-2.92)	0.94 (0.52-1.68)

*CI indicates confidence interval.

†Reference group was African American.

‡Reference group was the younger group.

§Median values are 35 years for the period from 1974-1975 to 1985-1986, and 46 years from 1985-1986 to 1996-1997.

||Median value is 0.75 for the periods from 1974-1975 to 1985-1986 and 1985-1986 to 1996-1997.

¶Median values are 12 for the period from 1974-1975 to 1985-1986, and 15 from 1985-1986 to 1996-1997.

#In active status, the "no" category corresponds to negative urine results, and "yes" includes all other conditions (ie, positive urine results, incarcerated, or refused to test).

**Median values are 12 years for the period from 1974-1975 to 1985-1986, and 26 years from 1985-1986 to 1996-1997.

††Median values are 20 for the period from 1974-1975 to 1985-1986, and 27 from 1985-1986 to 1996-1997.

were caused by other drugs). The next most common causes of death were chronic liver disease (15.2%), cancer (11.7%), and cardiovascular diseases (11.7%). Fifty-five deaths (19.5% of the deceased) were caused by homicide, suicide, or an accident. Three deaths were caused by acquired immunodeficiency syndrome.

We examined predictors of deaths for each of the two 10-year periods (**Table 2**). Median split was used to dichotomize continuous predictor variables. For the 439 addicts interviewed in 1974-1975, 77 were dead by 1985-1986, with disability showing the highest odds ratio (OR) for mortality (OR, 3.58; 95% confidence intervals [CI], 1.77-7.23; $P = .001$). For the 345 addicts interviewed in 1985-1986, 104 had died by 1996-1997, and the significant predictors of death included older age (median, 46 years; OR, 1.90; 95% CI, 1.07-3.38; $P = .03$);

disability (OR, 2.74; 95% CI, 1.51-4.99; $P = .001$); years since first heroin use (median, 26 years; OR, 2.20; 95% CI, 1.21-3.98; $P = .009$); and heavy alcohol use (median, 15% of time; OR, 2.05; 95% CI, 1.20-3.52; $P = .009$).

LONGITUDINAL PATTERNS OF HEROIN USE, ABSTINENCE, AND STABLE CESSATION

To explore variations at the individual level, we examined long-term heroin use patterns among the 242 subjects interviewed in 1996-1997. The group's mean (SD) age for initiation of heroin use was 18.0 (2.9) years. The number of years of heroin use (ie, years between the initiation and last use) ranged from 0.8 to 50.4 years, with a mean (SD) of 30.3 (12.1) years. The mean (SD) number of years of continuous abstinence before 1996-1997 was 9.5 (11.4) years (range, 0-36 years; median, 3.4 years). While many of these living subjects had ceased use for extensive periods, fewer than one half (46.7%) had been abstinent for more than 5 years.

We examined the likelihood of eventual cessation of heroin use (during the period between 1985-1986 and 1996-1997) associated with the lengths of abstinence before the 1985 to 1986 interview. The rate of abstinence in 1996-1997 was 15.3% among the 85 subjects who reported active use at the 1985-1986 follow-up, was 16.7% among the 66 who reported abstinence for up to 5 years, 75.0% among the 36 men who reported abstinence for 6 to 15 years, and 72.2% among the 34 men abstinent for more than 15 years.

HEALTH, MENTAL HEALTH, OTHER SUBSTANCE USE, AND CRIMINAL INVOLVEMENT

To examine correlates of long-term heroin use and abstinence, we classified the 242 subjects by their use status at the 1996-1997 interview into those who had been continuously abstinent in the past 5 or more years and those who had been abstinent less than 5 years or were continuing to use heroin. Examinations of these 2 groups showed no differences in terms of ethnicity, age at first heroin use, and current age. Nor did the 2 groups differ in rates of hepatitis, human immunodeficiency virus, and sexually transmitted diseases (**Table 3**). However, the heroin-user group consistently reported higher rates of disability, psychological distress (eg, depression, anxiety, interpersonal sensitivity), cigarette smoking, daily alcohol drinking, other illicit drug use (eg, marijuana, cocaine, crack, amphetamine), and criminal involvement (eg, property crime, drug trafficking, incarceration), and lower rates of employment. Yet, some heroin-abstinent individuals still reported use of other drugs; more than half used tobacco, one quarter used marijuana, and 15% used alcohol daily in the year before the interview.

COMMENT

The present article updated results reported 10 years ago on a cohort of male heroin addicts,¹ who, by now, have

Table 3. Characteristics by Heroin Abstinence Status at 1996-1997 Among Interviewed Participants (N = 242)*

	Total (N = 242)	Abstinent 5 or More Years (N = 113)	Abstinent Less Than 5 Years (N = 129)	Statistical Test Results	P
Health status, %					
Disability	43.8	33.0	53.1	$\chi^2_1 = 9.80$	.002
Hepatitis	41.7	41.6	41.7	$\chi^2_1 = 0.01$	.98
HIV	1.2	0.9	1.6	$\chi^2_1 = 0.22$	.64
Sexual transmitted diseases	27.5	24.1	30.5	$\chi^2_1 = 1.21$	.27
Mental health, mean (SD)					
Depression	1.49 (0.52)	1.32 (0.38)	1.64 (0.58)	$t_{219} = 5.04$	<.001
Anxiety	1.30 (0.42)	1.19 (0.28)	1.40 (0.48)	$t_{208} = 4.05$	<.001
Somatization disorder	1.48 (0.44)	1.39 (0.34)	1.56 (0.49)	$t_{226} = 3.20$	.002
Obsessive-compulsive disorder	1.59 (0.54)	1.51 (0.46)	1.66 (0.59)	$t_{234} = 2.08$	.04
Interpersonal sensitivity	1.42 (0.43)	1.32 (0.35)	1.50 (0.48)	$t_{230} = 3.18$	.002
Any substance use in past year, %					
Tobacco	66.9	51.3	80.6	$\chi^2_1 = 22.36$	<.001
Daily alcohol use	22.1	15.2	28.1	$\chi^2_1 = 5.82$	.02
Marijuana	35.5	24.8	45.0	$\chi^2_1 = 10.71$	<.001
Cocaine	19.4	3.5	33.3	$\chi^2_1 = 34.17$	<.001
Crack	10.3	2.7	17.1	$\chi^2_1 = 13.48$	<.001
Heroin	40.5	0.0	76.0	$\chi^2_1 = 44.27$	<.001
Amphetamine	11.6	4.4	17.8	$\chi^2_1 = 10.58$	<.001
Current employment status, %				$\chi^2_2 = 45.84$	<.001
Employed	33.9	55.8	14.7		
Retired	5.8	2.7	8.5		
Unemployed	60.3	41.6	76.7		
Public assistance, %					
SSI/disability	27.3	22.1	31.8	$\chi^2_1 = 2.83$	.09
Social Security	15.3	14.2	16.3	$\chi^2_1 = 0.21$	.65
Welfare/food stamps	14.0	10.6	17.1	$\chi^2_1 = 2.07$	.15
Current legal status, %				$\chi^2_2 = 53.35$	<.001
No legal status	77.2	89.3	66.7		
Incarcerated	14.1	5.4	21.7		
Probation/parole	8.7	5.4	11.6		
Illegal activities in past year, %					
Incarcerated	20.3	8.0	31.3	$\chi^2_1 = 20.09$	<.001
Property crime	7.4	1.8	12.4	$\chi^2_1 = 9.89$	.002
Drug dealing	13.7	0.0	25.8	$\chi^2_1 = 33.76$	<.001

*HIV indicates human immunodeficiency virus; SSI, Supplemental Security Income.

been followed up for more than 33 years. The present sample was selected from a corrections-based treatment program, which may not represent those who would have voluntarily admitted themselves to community-based treatment if that option had been available 30 years ago. Although studies have shown that many clients in community-based programs have past or current involvement with the criminal justice system,^{5,14} not all heroin addicts exhibit a criminal lifestyle. Another limitation of the sample is that all subjects came from California, and thus their behaviors, particularly those involving human immunodeficiency virus risks, are not generalizable to heroin addicts in other parts of the country. Nevertheless, we believe our findings on patterns of heroin use and related consequences still have important implications for the study of heroin addicts generally. Several issues that are particularly related to long-term relationships are discussed below.

By age 50 to 60 years, only about half of the 242 interviewed subjects tested negative for heroin. Overall, the group showed remarkably stable use patterns continuing from the previous observation in 1985-1986. Between 1985-1986 and 1996-1997, about 7% to 9% of the original group of 581 subjects used heroin on a daily ba-

sis, 2% to 3% engaged in occasional use, and 20% to 22% reported abstinence. (The rest of the sample were dead [49%], incarcerated [4%-7%], in methadone maintenance [2%-6%], or lost to follow-up [12%].) These results reconfirm our previous conclusion¹ that reaching long-term abstinence from heroin use is a very slow process.

Additionally, we have found that a minimum of 5 years of heroin abstinence considerably reduced the likelihood of future relapse, but a quarter still relapsed even after 15 years of abstinence. Even among those who had abstained from heroin for more than 5 years, non-negligible numbers of subjects were still daily drinkers or using other drugs (eg, marijuana, cocaine/crack, amphetamines). These results are in striking contrast to those found among alcohol abusers followed up by Vaillant,¹⁵ who reported that relapse to alcohol use was rare after abstinence had been maintained for 5 years. Our study results suggest that, at least for some individuals, heroin addiction may be a lifelong condition.

The sample showed high overall rates of disability, hepatitis, excessive drinking, cigarette smoking, marijuana use, and other drug-related problems. The analysis also showed that with other risk information lack-

ing, deaths that occurred before the 1985-1986 interview were predicted by disability at the 1974-1975 follow-up. In the later decade, older age, disability, and long periods of heroin use and heavy alcohol use were among the strongest correlates of premature mortality. The overall high mortality rates^{13,16} and the many overdose deaths provide evidence of the severe consequences of heroin use and, perhaps, the mediating factors, such as the heavy drinking and criminal lifestyle, that often accompany heroin addiction.

Even among the surviving members of this cohort, problems associated with long-term heroin use were severe (eg, high levels of health problems, criminal involvement, public assistance). Confirming our previous findings,¹ and similar to those in the long-term follow-up study of alcohol abuse by Vaillant,¹⁵ the group's level of heroin addiction seemed relatively stable, and those who continued to use heroin experienced far more problems in health and other areas of their lives. While criminal activities are less common among alcohol abusers, many heroin addicts have extensive involvement in such activities,¹⁵ even into older age, as we have shown in the present article.

Treatment effectiveness was not a focus of the present article; however, prior analyses based on the 24-year follow-up data have shown that methadone maintenance treatment was effective in reducing heroin use among this sample.¹⁷ Furthermore, the participation rates in methadone maintenance remained less than 10% of the sample in any given year. The general lack of treatment participation may explain the persistence of the heroin use over the addiction careers observed in this sample. The study documented the severe personal and social consequences associated with heroin addiction and the low likelihood that heroin addicts will permanently stop their use of the drug. These results suggest that drug abuse treatment programs should focus more on incremental improvements in the lives of heroin addicts, a more realistic goal than lifelong abstinence. Treatment programs also need to consider the social and physical health needs of older adults with addictions. Future research needs to examine factors influencing the transition to eventual cessation so that intervention strategies can be improved or developed to promote earlier cessation and to minimize the personal and social costs of heroin addiction.

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