Increased Somatic Morbidity in the First Year after Leaving Opioid Maintenance Treatment: Results from a Norwegian Cohort Study

I. Skeie a–c, f M. Brekke c T. Clausen b M. Gossop b, h M. Lindbaek c, d E. Reinertsen g M. Thoresen e H. Waal b

a Centre for Addiction Treatment, Oslo University Hospital, and b Norwegian Centre for Addiction Research, University of Oslo, c Department of General Practice, Institute of Health and Society, University of Oslo, d The Antibiotic Centre for Primary Care, Institute of Health and Society, University of Oslo, e Department of Biostatistics, Institute of Basic Medical Sciences, University of Oslo, f Regional Psychiatric Centre, Innlandet Hospital, Gjøvik, g Department of Internal Medicine, Innlandet Hospital, Gjøvik, Norway; h National Addiction Centre, Department of Psychiatry, King’s College London, London, UK

Key Words
Somatic morbidity · Opioid maintenance treatment · Opioid dependence · Cohort study · Comorbidity · Methadone · Buprenorphine · Treatment interruption · Heroin and overdose

Abstract
Background/Aims: Some patients on opioid maintenance treatment (OMT) leave treatment temporarily or permanently. This study investigated whether patients interrupting their OMT differed from non-interrupters in sociodemographic and drug-use characteristics and examined acute/sub-acute somatic morbidity among the interrupters, prior to, during, and after OMT. Methods: Cohort design. Observation Period: 5 years prior to, up to first 5 years during, and up to 5 years after interruption of OMT. Participants: The sample (n = 200) comprised 51 OMT interrupters and 149 non-interrupters. Data on patient characteristics were obtained from interviews and OMT register information. Data on somatic morbidity were gathered from hospital records. Measurements: Key patient characteristics among OMT interrupters and non-interrupters. Incidence rates of acute and sub-acute somatic disease incidents leading to hospital treatment (drug-related/non-drug-related/injuries) prior to/during/after OMT. Results: Interrupters and non-interrupters did not differ in sociodemographic characteristics, while longer duration of amphetamine and benzodiazepine dependence predicted OMT interruption. Interrupters scored significantly higher on drug-taking and overdose during OMT but still had a significant 41% reduction in drug-related treatment episodes. After interruption of treatment, such episodes increased markedly and were 3.6 times more frequent during the first post-OMT year compared to the pre-OMT period (p < 0.001). This increase was highest during the first months after OMT interruption. 2–5 years after interruption there was no significant increase. Conclusions: Increased somatic morbidity was found among OMT interrupters during the first year after OMT, and especially during the immediate post-treatment period.

Introduction
Opioid maintenance treatment (OMT) has been the most widely used treatment for opioid dependence worldwide during the last decades [1]. Several favourable out-
comes for OMT are documented in the literature. Reduced mortality during OMT is shown in studies from different countries [2–8], and reduction in crime and related costs is well established [9–11], as are overall societal economic benefits [9]. Several studies indicate improved health during treatment based on self-report [12, 13], clinical assessment [14] and reduced inpatient hospital treatment [15, 16].

The favourable outcomes of OMT are primarily in-treatment effects. Less is known about the situation after interruption of treatment, although increased mortality after OMT interruption has been found in studies from several countries [2, 7, 17–19]. The possible effects of OMT interruption on somatic morbidity remain poorly studied. Although in some high-threshold programmes a substantial proportion of patients achieve a stable drug-free life after planned OMT cessation [15, 20], interruption of maintenance treatment must primarily be regarded as an indicator of treatment problems arising from patient and/or programme characteristics.

A significant reduction in total drug-related acute and sub-acute somatic disease leading to hospital treatment for patients who entered OMT was reported in a previous paper from our group [21]. This reduction was also found among those who later interrupted their OMT, though it was less than among those without interruption of treatment. After OMT termination the interrupters had a five-fold increase in drug-related disease episodes compared to the in-treatment period. In the present paper we focus on those who had interruptions of their OMT and investigate patient characteristics as well as the increase in somatic disease after OMT interruption. The research questions were: Do patients with interrupted OMT differ from other OMT patients in terms of problem behaviours? How does the incidence of somatic health problems within the interrupter group vary before and during OMT and especially throughout the post-OMT period? And, how is the incidence of such problems after OMT interruption influenced by patient characteristics?

Material and Methods

Design, Sample and Setting

In Norway, OMT was started in 1998 as a public nationwide programme organized in parallel with the public hospital catchment area orientation [22]. Thus, OMT cohorts from one hospital catchment area may be studied, simplifying investigation of hospital treatment among OMT patients.

Before OMT inclusion, all patients received an assessment of mental and behavioural disorders due to psychoactive substance use and all were diagnosed as opioid-dependent according to ICD-10 [23] (F 11.2 Opioid dependence). Hence, the basic common clinical characteristic which defined the sample was that all were opioid-dependent and that they were or had been receiving OMT.

The study cohort was established in 2007/2008 and consisted of patients who started OMT from 1998 until the end of June 2007 in two counties (Hedmark and Oppland) in Norway. The criteria for acceptance to the programme were in that period severity and duration of opioid dependence, experience with abstinence-oriented treatment, and age [22]. The criteria were somewhat flexible, but patients were, in general, supposed to be 25 years of age or older, to have been dependent on heroin for several years, and to have previously received abstinence-oriented treatment. Since 2010, these criteria have been changed in new national guidelines, and opioid dependence is now the only mandatory inclusion criterion [24].

Out of a total of 319 patients who started OMT during this period, 38 could not be reached as they had no contact with local health and social services, and these were regarded as ineligible. Among the 281 eligible, 13 had died after their first OMT admittance and these were included. 187 of those alive consented to participate, 81 did not, rendering a study cohort of 200 persons. 51 of these (26%) had experienced interruption of OMT at least once and these are the focus of this paper. The overall participation rate was 71.2% (73.7% among persons not in treatment when invited versus 68.8% among those in treatment).

Interruption of OMT could be planned or unplanned. Unplanned interruption was defined as any unplanned stop of OMT medication (methadone or buprenorphine) lasting for more than 5 days [24]. When patients voluntarily or involuntarily were tapering off OMT medication, interruption was defined as the first day without medication.

Measures and Data Collection

Out of the 187 included who were alive, 136 (73%), 35 with interrupted treatment and 101 with continuous treatment, underwent a structured interview which provided information on personal data, former hospital contacts, drug history as well as education and employment history.

Records from somatic departments in the local hospitals were collected for all participants. Based on information from these records and from the interviews, records from other hospitals were gathered and more than 99% of all requested records were collected. The number of somatic disease incidents resulting in hospital treatment was counted. Somatic disease incidents were defined as any acute or sub-acute somatic health problem leading to inpatient or outpatient hospital contact, below referred to as hospital treatment episodes. Elective hospital treatment due to chronic somatic disorders was not included, but acute episodes caused by an underlying chronic disease were registered as new incidents. One treatment episode could lead to more than one contact. An episode documented in records from several hospitals was counted as one episode only. Psychiatric disease incidents were not included unless they caused a somatic condition, e.g. due to self-harm.

Incidence rates of these treatment episodes were the primary outcome measure and were estimated separately for the periods prior to and during OMT, and for different post-OMT sub-periods. Incidence rate ratios prior to versus during and after versus during treatment were estimated, as well as post-OMT time sequence comparisons versus the pre-OMT period.
Information about ongoing drug use during OMT and interruption of OMT was gathered from annual reports on each participant from the national OMT programme. These reports separately record the use of illicit opioids, cannabis, benzodiazepines, and central stimulants during the previous 4 weeks based on urine tests and clinical assessment. A combined score for all four substance classes for the whole OMT period was made for each patient, based on the annual evaluations. Such scores were obtained for 183 participants (91.5%), 47 (92.2%) with interrupted treatment, and 136 (91.3%) with continuous treatment.

**Observation Period**

Hospital record data for each participant were gathered for the last 5 years prior to the first admission to OMT, up to the first 5 years during OMT (one or consecutive periods), and up to the first 5 years out of treatment after the first in-treatment period (one or consecutive periods). Time between OMT periods and after the last period was registered as post-OMT. Post-OMT somatic treatment episodes were registered according to the end of the preceding treatment period and divided into different post-OMT sub-periods: month 1, months 2 and 3, months 4–12, and years 2–5 (‘later post-OMT period’). Total pre-OMT observation time was 255 years (mean individual observation time = 5 years). Total during-OMT observation time was 193 years (mean individual observation time = 3.8 years). Total post-OMT observation time was 91 patient-years (mean individual observation time = 1.8 years); 50 patient-years the first year post-OMT and 41 the second to fifth year post-OMT. The study end-point for each patient was defined as the date when the record from the local hospital was collected during 2008/2009.

**Categories of Disease Incidents**

Hospital treatment episodes were categorised as drug-related (overdoses, injecting-related, other), non-drug-related or injuries. Among injecting-related episodes were deep venous thrombosis/lung embolism, acute hepatitis B and hepatitis C, local injection site bacterial infections and systemic bacterial infections assessed as related to injecting. Among ‘other drug-related episodes’ were withdrawal-related episodes, incidents related to impaired general condition due to problem drug use and neuromuscular conditions. Inter-rater agreement on whether treatment episodes were drug-related or not (κ = 1) and on sub-categories among drug-related episodes (overdose, injecting-related or other, κ = 0.82) was established in a pilot study [25]. In the present study, I.S. (first author) examined all full-text records. Treatment episodes considered problematic to categorise were discussed between I.S. and E.R. (co-author) until consensus was reached.

**Statistics**

Patient characteristics in the groups with and without interruption of OMT were compared by Pearson’s χ² test or Fisher’s exact test for categorical variables and independent-samples t test for continuous variables. Incidence rates for treatment episodes were analysed using a Poisson regression model. Incidence rates and incidence rate ratios with 95% confidence intervals were estimated and the significance level was set to 5%. Dependencies in the data, as each participant was measured repeatedly (before, during, and after OMT), were handled by Generalized Estimating Equations (GEE) with unstructured working correlation and robust variance estimation. Influence of patient characteristics on the health effects of OMT interruption was investigated by including an interaction term between OMT status and the characteristic in question in the model, one by one. Statistical analysis was performed in SPSS version 15.

**Ethics**

The study was approved by the Regional Committee for Medical Research Ethics and the Norwegian Social Science Data Services. Exemption from professional secrecy duty of confidentiality for those dead was given by the Norwegian Directorate of Health.

**Results**

**Sample Characteristics**

Key sample characteristics are shown in table 1. OMT interrupters (n = 51) and non-interrupters (n = 149) were compared for gender, age at first admission to OMT, and employment and education history. No statistically significant differences were found. Among substance-use trajectory characteristics, interrupters scored higher on years of amphetamine (p = 0.048) and benzodiazepine (p = 0.051) dependence, indicating that greater duration of amphetamine and benzodiazepine dependence predicts increased risk of interrupting OMT. Years of opioid dependence before OMT did not differ significantly between the groups, nor did duration of alcohol dependence and regular use of cannabis during lifetime. There were no significant differences between the groups concerning debut age of any substance or in the number of overdoses during lifetime. Scores for ongoing drug-taking and for overdoses during OMT were significantly higher among those who interrupted their treatment.

Table 2 compares hospital treatment episodes prior to OMT for interrupters and non-interrupters. Except for injuries, which were significantly more frequent among interrupters and ‘other drug-related episodes’ which were found to be significantly more frequent among non-interrupters, there were no significant differences between the groups.

**Time Sequence Analysis of Somatic Disease Episodes**

The total number of drug-related treatment episodes showed a statistically significant reduction during OMT compared to before OMT (table 3). When regarded separately, overdoses, injecting-related and other drug-related episodes, did not show a statistically significant reduction. During the total post-OMT period, drug-related episodes were 5.6 times more frequent than during OMT and overdoses, injecting-related and other drug-related episodes all increased significantly when as-
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Table 1. Group characteristics for patients with versus those without interrupted OMT

|                                | Interrupters (n = 51) | Non-interrupters (n = 149) | p value |
|--------------------------------|-----------------------|----------------------------|---------|
| Sociodemographic characteristics |                       |                            |         |
| Gender                         |                       |                            |         |
| Male                           | 34 (25.6)             | 99 (74.4)                  | 0.98    |
| Female                         | 17 (25.4)             | 50 (74.6)                  |         |
| Age at OMT start               | n = 51 n = 146        |                            |         |
| mean ± SD                      | 35.5 ± 5.7            | 37.5 ± 6.8                 | 0.06    |
| Years education                | n = 37 n = 101        |                            | 0.33    |
| Not completed 9 years compulsory school | 4 (10.8) | 20 (19.8) |         |
| Completed 9 years              | 21 (56.8)             | 48 (47.5)                  |         |
| Completed 12 years             | 12 (32.4)             | 27 (26.7)                  |         |
| College/university             | 0                     | 6 (5.9)                    |         |
| Employment                     | n = 36 n = 99         |                            | 0.64    |
| <1 year                        | 8 (22.2)              | 23 (23.2)                  |         |
| 1–5 years                      | 13 (36.1)             | 25 (25.3)                  |         |
| >5 years                       | 15 (41.7)             | 51 (51.5)                  |         |
| Substance-use trajectory characterisitics |                   |                            |         |
| Overdoses during lifetime      | n = 35 n = 99         |                            | 0.71    |
| 0                              | 3 (8.6)               | 13 (13.1)                  |         |
| 1–2                            | 8 (22.9)              | 19 (19.2)                  |         |
| 3–10                           | 10 (28.6)             | 35 (35.4)                  |         |
| >10                            | 14 (40.0)             | 32 (32.3)                  |         |
| Age of heroin debut            | n = 33 n = 98         |                            |         |
| mean ± SD                      | 20.9 ± 5.3            | 21.1 ± 6.4                 | 0.85    |
| Years of opioid dependence     | n = 33 n = 97         |                            |         |
| mean ± SD                      | 13.1 ± 6.9            | 12.0 ± 6.8                 | 0.41    |
| Years of alcohol dependence    | n = 33 n = 97         |                            |         |
| mean ± SD                      | 4.4 ± 7.4             | 4.1 ± 7.2                  |         |
| Years of benzodiazepine depencence | n = 33 n = 96      |                            |         |
| mean ± SD                      | 14.9 ± 10.3           | 10.7 ± 10.8                | 0.05    |
| Years of amphetamine depencence | n = 33 n = 98        |                            |         |
| mean ± SD                      | 9.2 ± 9.7             | 5.5 ± 7.0                  | 0.05    |
| Years of regular cannabis use  | n = 33 n = 96         |                            |         |
| mean ± SD                      | 13.7 ± 11.0           | 11.9 ± 11.0                | 0.41    |
| During-OMT characterisitics    |                       |                            |         |
| Illicit use of opioids, cannabis, benzodiazepines and central stimulants | n = 47 n = 136 | 0.35 0.2 | <0.001 |
| Overdoses during OMT           | n = 32 n = 81         |                            | 0.007   |
| 0                              | 24 (75.0)             | 76 (93.8)                  |         |
| 1–5                            | 6 (18.8)              | 5 (6.2)                    |         |
| >5                             | 2 (6.3)               | 0 (0)                      |         |

Values in parentheses are percentages within group. 1 Pearson’s χ² test. 2 Independent-samples t test. 3 Based on interview. 4 Based on urine tests and clinical assessment (see text for further explanation). 5 Fisher’s exact test.

Table 2. Hospital-treated somatic disease incidents: average incidence rates the 5 years prior to the first admission to OMT in patients with interrupted or continuous OMT

|                                | Interrupted OMT (n = 51) | Continuous OMT (n = 149) | p value |
|--------------------------------|--------------------------|--------------------------|---------|
| All drug-related               | 27.5 (21.7–34.7)         | 33.4 (29.5–37.8)         | 0.15    |
| Overdoses                      | 11.0 (7.6–15.9)          | 10.2 (8.1–12.8)          | 0.74    |
| Injecting-related              | 12.2 (8.6–17.3)          | 14.9 (12.4–17.9)         | 0.32    |
| Other                          | 4.3 (2.4–7.8)            | 8.3 (6.5–10.7)           | 0.05*   |
| All non-drug-related           | 12.5 (8.9–17.7)          | 12.3 (10.1–15.1)         | 0.94    |
| Injuries                       | 21.2 (16.2–27.7)         | 14.5 (12.0–17.5)         | 0.02*   |
| All incidents                  | 61.2 (52.3–71.6)         | 60.3 (54.9–66.1)         | 0.99    |

Incidents shown per 100 patient-years (95% CI).

Years at risk before OMT: 1,000 years (255 in OMT interrupters). Number of incidents before OMT: 605 (156 in OMT interrupters). Among injecting-related disease incidents were reckoned deep venous thrombosis/lung embolism, acute hepatitis B and C, local and systemic infections assessed as related to injecting.

* Statistically significant difference between the groups with interrupted vs. continuous OMT, Poisson regression.

Figure 1 shows rates for the various groups of treatment episodes prior to and during treatment and during the post-OMT time sequences for patients with interrupted OMT. Table 4 shows incidence rate ratios between post-OMT year 1 and post-OMT years 2–5, respectively, compared to the pre-OMT period. When comparing the first post-OMT year with the pre-OMT period, there was a statistically significant increase in all subgroups of drug-related episodes. The increase was greatest during the first months after OMT interruption and overdoses were especially frequent in the first 4 weeks. Among the injecting-related episodes, local skin infections and systemic bacterial infections showed the greatest increase after OMT interruption. Treatment contacts due to ‘impaired general health condition’ also increased substantially. Non-drug-related episodes showed a significant increase during the first post-OMT year compared to the pre-OMT period, while injuries showed stable rates throughout the whole observation period. With regard to post-OMT years 2–5 (‘later post-OMT period’), there was no significant increase in drug-related or non-drug-related episodes compared to the pre-OMT period.
Table 3. Hospital-treated somatic disease incidents in patients with interrupted OMT (n = 51): crude incidence rate ratio (IRR) according to OMT status (before, during, and after treatment).

|                          | IRR   | 95% CI   | p value |
|--------------------------|-------|----------|---------|
| Before vs. during OMT: during treatment as reference (incidence rate = 1) |       |          |         |
| All drug-related         | 1.7   | 1.0–2.9  | 0.04    |
| Overdoses                | 2.4   | 0.9–6.1  | 0.08    |
| Injecting-related        | 1.5   | 0.8–2.7  | 0.18    |
| Other                    | 2.0   | 0.5–7.5  | 0.33    |
| Non-drug-related         | 0.8   | 0.5–1.5  | 0.54    |
| Injuries                 | 1.1   | 0.7–1.6  | 0.80    |
| All incidents            | 1.3   | 0.9–1.8  | 0.16    |

After OMT vs. during OMT: during treatment as reference (incidence rate =1) |       |          |         |
| All drug-related         | 5.6   | 3.0–9.8  | <0.001  |
| Overdoses                | 4.7   | 1.7–12.6 | 0.003   |
| Injecting-related        | 4.7   | 1.9–11.2 | 0.001   |
| Other                    | 10.3  | 2.7–39.0 | 0.001   |
| Non-drug-related         | 1.6   | 0.8–2.8  | 0.12    |
| Injuries                 | 0.8   | 0.4–1.4  | 0.41    |
| All incidents            | 2.5   | 1.7–3.5  | <0.001  |

Years at risk: before OMT 1,000 years (255 in patients with interrupted OMT), during OMT 813 years (193), and after OMT 91 years (only in patients with interrupted treatment). Number of incidents: before OMT 605 (156 in patients with interrupted OMT), during OMT 310 (94), and after OMT 104 (only in patients with interrupted treatment).

Table 4. Hospital-treated somatic disease incidents in patients with interrupted OMT (n = 51): crude IRR after leaving OMT.

|                          | IRR   | 95% CI   | p value |
|--------------------------|-------|----------|---------|
| Year 1 post-OMT vs. pre-OMT period |       |          |         |
| All drug-related         | 3.6   | 2.3–5.6  | <0.001  |
| Overdoses                | 2.9   | 1.4–6.4  | 0.006   |
| Injecting-related        | 2.6   | 1.3–4.9  | 0.005   |
| Other                    | 7.7   | 3.4–17.4 | <0.001  |
| Non-drug-related         | 2.6   | 1.4–4.6  | <0.001  |
| Injuries                 | 0.6   | 0.3–1.3  | 0.23    |
| All incidents            | 2.3   | 1.7–3.2  | <0.001  |

Years 2–5 post-OMT vs. pre-OMT period |       |          |         |
| All drug-related         | 2.0   | 0.9–4.5  | 0.11    |
| Overdoses                | 0.7   | 0.2–2.2  | 0.49    |
| Injecting-related        | 2.9   | 0.9–9.4  | 0.09    |
| Other                    | 2.3   | 0.9–6.0  | 0.08    |
| Non-drug-related         | 1.0   | 0.4–2.3  | 0.93    |
| Injuries                 | 0.8   | 0.4–1.9  | 0.66    |
| All incidents            | 1.4   | 0.8–2.4  | 0.22    |

IRR estimated by Poisson regression. Patient-years at risk: 255 before OMT, 50 in the first year after OMT, and 41 in the second to fifth years after OMT. Number of incidents: 156 before OMT, 70 in the first year after OMT, and 34 in the second to fifth years after OMT.

Fig. 1. Hospital-treated somatic disease incidents in 51 patients with interrupted OMT. Rates for all, drug-related and non-drug-related incidents and injuries (left) and all drug-related incidents and the subgroups overdoses, injecting-related and other drug-related incidents (right) during the last 5 years before the first admission to OMT, the first 5 years during OMT (one or consecutive periods) and the first 5 years after OMT interruption (one or consecutive periods).
**Main Findings**

The group with interrupted OMT contact did not differ from the non-interrupters with regard to sociodemographic characteristics and acute somatic health problems prior to the first OMT admittance. Interrupters scored higher on overall duration of amphetamine and benzodiazepine dependence. During OMT, interrupters took more drugs and were more likely to have taken one or more non-fatal overdoses and experienced less reduction in drug-related health problems than non-interrupters. Only 15% of the interrupters were rated as drug-free and stable when leaving treatment, the rest left treatment while taking illicit drugs and being in an unstable situation. Interruption of OMT was therefore, for the majority, related to problems in treatment.

The first year after interruption of OMT drug-related morbidity was increased, not only when compared to the in-treatment period, but also to the period prior to OMT. The increase comprised overdoses, injecting-related problems and other drug-related health problems as well as non-drug-related problems. These findings are most likely related to relapse to heroin use as opioid-dependent persons are known to be at high risk of relapsing after leaving OMT [26]. The findings support the view that interruption of maintenance treatment is a high-risk situation.

Among the injecting-related treatment episodes, injecting site infections and invasive bacterial infections like sepsis were most common after exit from OMT. These conditions can be severe, they may cause permanent health damage and may sometimes be life-threatening and they often result in complicated, expensive and long-lasting hospital treatment [27].

**Limitations and Strengths**

One of the limitations of the study is that hospital-treated somatic disease incidents were assessed, and not morbidity as such. However, despite a probable closer contact to health and social services during maintenance treatment, and an expected increased morbidity due to increasing age, we found a significant reduction in drug-related treatment episodes during OMT among the interrupters. This most probably reflects a substantial reduction in drug-related somatic morbidity. The increase in drug-related treatment episodes found in the first post-OMT year most certainly reflects a major increase in somatic morbidity due to drug taking activities.

Another limitation is that the sample includes only 51 OMT interrupters and that the overall post-OMT patient-years and the corresponding number of treatment episodes are limited, especially from post-OMT year 2 on. This leads to fewer episodes and lower statistical power, exemplified by the number of drug-related treatment episodes where the total number of episodes showed a significant reduction during OMT, while when examining each specific type of drug-related episodes, no significant reductions were found although the estimated effects were equally large.

Further, only episodes which led to hospital contacts were examined, as the study did not assess less severe morbidity not resulting in hospital contact. However, hospital treatment episodes were considered sufficient to evaluate changes in severe and potentially life-threatening acute morbidity. Moreover, the list of disease categories differentiating between drug-related and non-drug-related episodes, and between injecting-related and non-
injecting-related incidents, was not validated by external researchers.

It is possible that psychiatric and personality disorders prior to OMT may have influenced rates of acute health problems before, during and after OMT. However, in a recent study, severity of psychiatric comorbidity was not shown to be associated with lower retention in treatment or higher substance use during treatment [28]. The influence of mental disorders on acute somatic morbidity would have been of interest, but these data were not available in this study.

Among the strengths of the study are the long pre-, during- and post-OMT observation periods that made it possible to study long-term health effects of being in OMT and of leaving treatment. The high participation rate makes it probable that the study sample is representative for the OMT interrupters in this region. Also, participants were recruited from a particular catchment area enabling a comprehensive cohort with defined health service connections. This made it possible to trace almost all hospital contacts. And, as evaluation of morbidity changes is based on in-depth examination of full-text records, and almost all requested records were obtained, the data should be more robust, specific and reliable than interview and register data alone.

Treatment Implications

Our findings have implications regarding the handling of ‘problem patients’ in OMT programmes. Often, OMT interruption will coincide with a crisis in treatment and any problems at that time may continue or deteriorate after leaving treatment. This should draw attention to the need for proactive follow-up when treatment crises emerge, in order to prevent OMT interruption [29]. Patients should not be subject to involuntary discharge from OMT unless continued treatment is considered to increase their mortality and morbidity risks. In general, treatment services should, as far as possible, seek to retain ‘problem patients’ in treatment [12]. Re-admittance to OMT should be prompt when patients are ready for it.

As the positive effects of OMT mainly are in-treatment effects, strategies for keeping patients in danger of OMT interruption in treatment are important. Besides reinforcement of psychosocial follow-up during treatment crisis, medications other than methadone and buprenorphine within traditional OMT frames have been tried for patients with poor retention in traditional maintenance treatment. Low-threshold buprenorphine programmes, supervised administration of oral slow release morphine and supervised injecting of heroin (diacetylmorphine) have been tried in different countries, and oral diacetylmorphine is now being tested [30].

Conclusion

The study shows a significant reduction in drug-related somatic disease incidents during OMT compared to the 5 years before entering OMT in patients who later interrupted their maintenance treatment. Interrupters and non-interrupters did not differ in sociodemographic characteristics, but interrupters took more illegal drugs and had more overdoses during OMT. For the great majority, interruption of OMT was closely related to problems in treatment, especially ongoing illicit drug-taking. Nevertheless, there was a substantial increase in drug-related somatic health problems during the first year after OMT interruption, compared both to the pre- and during-OMT periods. The increase was greatest the first months after leaving OMT, and especially the first month. This suggests relapse to extensive drug use and risk-taking behaviour. Hence, it should generally be a goal to keep ‘problem patients’ in treatment. Patients interrupting OMT should receive special follow-up.

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References

1. WHO: Guidelines for the Psychosocially Assisted Pharmacological Treatment of Opioid Dependence. Geneva, WHO: 2009.
2. Bell JR, et al: Comparing overdose mortality associated with methadone and buprenorphine treatment. Drug Alcohol Depend 2009; 104: 73–77.
3. Brugal MT, et al: Evaluating the impact of methadone maintenance programmes on mortality due to overdose and aids in a cohort of heroin users in Spain. Addiction 2005;100:981–989.
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