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ARTICLE

Evaluation of opening a type III/IV medical psychiatric unit

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ABSTRACT

Objective: The aim of this study is to examine the impact of opening a medical psychiatric unit (MPU) on a variety of outcomes.

Methods: In this non-equivalent groups design, there were two groups: 'pre-MPU' and 'actual MPU'. Staff assessed whether patients in the pre-MPU group were eligible for admission to a planned MPU, resulting in virtual admissions and discharges. The actual MPU group consisted of patients admitted after opening of the MPU.

Results: The length of stay (LOS) in the hospital was one day longer for patients in the MPU group (8.68 vs. 9.89, $p = .004$), but the LOS on the MPU was comparable in both groups (5.63 vs. 6.06, $p = .231$). The LOS on the intensive care unit (ICU) was longer in the MPU group (0.10 vs. 0.40, $p < .001$), even as the time patients were physically restraint (0.28 vs. 0.83, $p < .001$). In the pre-MPU group, the odds were not significantly different for involuntary commitment (OR = 0.92; $p = .866$) and death within six months after discharge (OR = 1.84; $p = .196$).

Conclusions: Both physical restraint and ICU admission have a link with patient complexity, it therefore seemed that opening of the MPU resulted in the treatment of more complex patients with a comparable LOS on the MPU.

KEY POINTS

- The LOS on the MPU was not significantly different between the groups before and after opening of the MPU.
- Opening of the MPU resulted in the admission of patients that were admitted more days to the ICU and to more days of physically restraint.
- It can be considered that opening of the MPU resulted in an increased ability to treat complex patients.

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Introduction

From 1980 onwards, medical psychiatric units (MPUs) have opened worldwide and are designed to address the needs of complex patients with concurrent medical and psychiatric disorders. A recent study found that in the Netherlands, 40 out of 90 hospitals have such a unit (van Schijndel et al. 2017). Despite the existence of these units for several decades, the impact of opening an MPU on treatment effects has not been studied.

Globally, only a few studies have examined the relationships between MPUs and their impact on treatment effects and costs. In 1989, Young and Harsch compared the length of stay (LOS) on an MPU with the LOS on a regular psychiatry unit and general medicine inpatient units. They found a decrease in mean LOS from more than 20 to less than 15 days (Young and Harsch 1989). Six years later Gertler et al. studied differences in LOS between an MPU and a general psychiatry unit. Despite patients on the MPU having multiple diagnoses and being considered more complex, the LOS between the units was comparable, suggesting cost-effective care on the MPU (Gertler et al. 1995). Kishi and Kathol found comparable outcomes in 1999 when they compared patients on an internal medicine ward with patients on a high-acuity ward (Kishi and Kathol 1999).

Most of these studies are more than 15 years old and all used LOS as a proxy for both costs and effects. Since these studies, the average LOS has declined in hospitals worldwide making it difficult to compare studies over time. Three recent studies examined the impact of MPUs on costs and/or effects. One found that the MPU had a positive impact on the costs related to medical service use, but a negative impact on costs of psychiatric intervention and LOS (Leue et al. 2010). These increased costs related to LOS are contrary to the results of previous studies. The other studies found that treatment on an MPU resulted in a decrease on the Health of the Nation Outcome Scales (HoNOS), indicating a decrease of behavioural problems, impairments, psychiatric symptoms, or social problems (Honig et al. 2014; Jansen et al. 2019).

In 1999, Kishi and Kathol classified MPUs into four types: (I) medium-to-high psychiatric acuity and none-to-low medical acuity, (II) none-to-low psychiatric acuity and medium-to-high

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medical acuity, (III) medium-to-high psychiatric acuity and low-to-medium medical acuity, (IV) medium-to-high psychiatric and medium-to-high medical acuity. In this study, we aimed to examine the impact of opening a type III/IV unit on LOS, intensive care unit (ICU) admission, physical restraint, involuntary commitment, and mortality. The impact of opening an MPU has not yet been described in literature.

Upfront we had no clear expectation of the impact of introducing the MPU on patient complexity. It could be reasoned that complex patients, who would otherwise be referred to more specialised hospitals, are now admitted to the MPU. On the other hand, only patients from medical wards in the same hospital could be transferred to the MPU. In this case, patients that would otherwise be treated with consultation liaison psychiatry would now receive treatment on the MPU. We would hypothesise that if more complex patients were to remain in the hospital, an increased LOS in the actual MPU group could be expected. If opening of the MPU would not attract more complex patients, we would hypothesise a reduction of LOS since the MPU is better equipped to treat these patients than regular medical wards.

Materials and methods

Study design

This was a non-equivalent control group design, also called an institutional cycle design, comparing a group of patients fitting MPU-admission criteria prior to opening of the MPU ('pre-MPU group') with patients treated on the MPU when it was opened ('actual MPU-group').

Setting

This study was performed at the Onze Lieve Vrouwe Gasthuis (OLVG), a large 550-bed teaching hospital located near Amsterdam city centre. The hospital has a psychiatric consultation team of five consultant psychiatrists, four hospital psychiatry residents, and two nurses. On average, the team treats 800 inpatients yearly. In 2010, it was decided that, because of the growing number of complex patients and reductions in hospital stay on most wards, an MPU could help to improve the quality of care for complex patients. This study was started prior to the actual opening of the MPU. In September 2011, the OLVG opened a small MPU with five beds located on a separate closed wing of an internal medicine ward. The MPU was fully running in January 2012.

Capabilities of the unit

All patients treated on the unit are inpatients with medical and psychiatric comorbidity. Only patients 18 years or over are admitted. The unit is staffed by an internist and a psychiatrist; the clinical director could be an internist or a psychiatrist. The nursing staff have both medical and psychiatric training. The psychiatrist leads the daily management of the unit. Most medical treatments are available, for example, the provision of intravenous medicine, donor blood, and total parenteral feeding. Patients with severe suicidal ideations or behaviour are also treated. Patients are discharged from the MPU on completion of inpatient medical treatment, either to a psychiatric hospital or outpatient setting, depending on the patient's needs. In cases where the psychiatric treatment is completed sooner than that of the somatic disorder, patients are discharged to a general ward.

The admission criteria of this unit are:

- Patients for which, due to psychiatric comorbidity, somatic diagnostics, treatment, and nursing in a regular somatic nursing unit, cannot proceed optimally;
- Patients suspected of suicidality, such as overdose or serious auto-mutilation, who do not have an ICU or coronary care unit (CCU) indication.

The unit has the following exclusion criteria:

- Patients who do not have a somatic admission indication;
- Patients with cognitive disorders or psychopathology (without serious behavioural disorders) who can be handled in the regular somatic nursing ward;
- Patients with an admission indication for the ICU or CCU;
- Patients who must undergo treatment that cannot be provided on the MPU.

Patients admitted to somatic units in the OLVG and patients referred from other care providers can be admitted to the MPU in the OLVG in the following ways:

Patients admitted to a somatic unit in the OLVG:

- A patient that is admitted on a somatic unit in the OLVG and develops psychiatric symptoms, can be referred to the MPU.
- A patient with a medical disorder, that had a psychiatric disorder prior to admission, can be referred to the MPU.

Patients admitted from other care providers:

- Referral from a general medical hospital, after consultation of the somatic referrer with an OLVG MPU psychiatrist.
- Referral from a mental healthcare institution. Psychiatrist of the referring ward and the OLVG discuss the admission indication. The referring psychiatrist also discusses the somatic disorder with the intended somatic specialist in the OLVG.
- Referral from home. The general practitioner contacts the OLVG MPU psychiatrist and discusses the psychiatric admission indication.

Participants

From March 2011 until September 2011 (7 months), when the MPU opened, all new psychiatric consultations were discussed at the morning report. The attending staff decided if a patient could potentially benefit from admission to an MPU, for which a virtual ward was created on a blackboard. This was considered the pre-MPU group. The staff kept a record of the virtual admissions and discharges to the MPU and determined when a patient would have recovered enough to be (virtually) sent back to the general ward. During this period, the patient was actually admitted to a general ward and received treatment from a consulting psychiatrist.

The first three months (October–December 2011) were used as a start-up phase and thus the actual MPU group comprised patients who were admitted in the first full year (12 months) of existence of the MPU, i.e., admission and discharge both occurring in 2012. Patients admitted in 2012 with a discharge in 2013 were excluded.

Data collection

The data were gathered and reviewed by the second author (RB). The patient records of all those included were reviewed in order to obtain information about the diagnosis, medical treatment specialty, time of physical restraint needed (measured in days), days in the ICU, LOS, mortality, the admitting ward, destination after

discharge (including home, nursing home, psychiatric hospital), and involuntary commitment. The main psychiatric diagnostic groups and the admitting medical specialty were obtained from the patient records. Some patients were treated by more than one medical specialty. LOS was measured in days for the complete stay in the OLVG and treatment on the MPU separately. Mortality was determined from the day of discharge, with a follow-up period of 6 months. Based on the patients' records, we were able to determine whether patients had compulsory admissions. The MPU could not admit involuntary commitment patients. Some patients did, however, show severe psychiatric deterioration during admission. These patients were referred to another psychiatric hospital with a mandate to take committed patients. This study does not include intervention in human subjects. The data were collected retrospectively and anonymised before the analyses. For these reasons, approval of a Medical Research Ethics Committee was not required under Dutch law. A waiver was given for informed consent.

Table 1. Demographic characteristics.

Characteristic	Pre-MPU group	Actual MPU group
Data collection period	7 months	12 months
Number of patients	58	174
Male	34 (59%)	83 (48%)
Age (mean)	56.66 (SD 18.04)	55.14 (SD 18.42)
Age		
18–20	0 (0%)	2 (1%)
20–40	13 (22%)	38 (22%)
40–60	17 (29%)	66 (38%)
60–80	20 (34%)	49 (28%)
80+	8 (14%)	19 (11%)
DSM IV chapter	*N* = 58	*N* = 174
Psychotic disorders	10 (17%)	43 (25%)
Cognitive disorders	14 (24%)	37 (21%)
Mood disorders	11 (19%)	30 (17%)
Other	13 (22%)	27 (16%)
Substance-related disorders	6 (10%)	22 (13%)
Personality disorders	4 (6%)	12 (7%)
Missing	0 (0%)	3 (2%)
Medical treatment specialty	*N* = 125	*N* = 399
Internal medicine	45 (36%)	142 (36%)
Surgery	35 (28%)	115 (29%)
Neurology	17 (14%)	54 (14%)
Gastroenterology	2 (2%)	22 (6%)
Other	1 (0%)	19 (5%)
Geriatrics	6 (5%)	19 (5%)
Cardiology	18 (14%)	15 (4%)
Nephrology	0 (0%)	10 (3%)
Gynaecology	1 (0%)	3 (1%)

Table 2. Location before MPU admission.

Admitting unit	Pre-MPU group	Actual MPU group
Emergency department	1 (1.7%)	86 (49.4%)
General ward	57 (98.3%)	64 (36.7%)
Intensive care unit	0 (0.0%)	13 (7.5%)
Scheduled admission	0 (0.0%)	11 (6.3%)

Statistical analysis

Descriptive statistics were used to explore differences in demographic characteristics of the pre-MPU and actual-MPU groups. Generalised linear modelling was performed using the GenLin procedure in IBM SPSS Statistics for Windows, Version 21.0 (IBM Corp., Armonk, NY). The gamma distribution with log link was used for skewed continuous data (medical costs) and a quasi-Poisson distribution with log link to model the LOS, ICU, and physical restraint. Binominal distribution was used to model mortality and involuntary commitment. Null-models included age (grand mean centred) and gender interactions (effect coded) to account for case-mix differences across the groups. Non-significant main effects and interactions were dropped based on likelihood ratio tests ($p > .05$). An account of the analysis and syntax files is available from the first author (LJ) upon request. The effects are reported as estimated means for the pre-MPU group and actual MPU group.

Results

The pre-MPU group consisted of 58 patients, in 2012, a total number of 174 patients were admitted to the MPU: these patients formed the actual MPU group. Cognitive disorders were the most common form of disorder reported in the pre-MPU group whereas the most common in the actual MPU group were psychotic disorders. In both groups, most patients were treated for their somatic disorder by an internist (Table 1).

In the pre-MPU group, 57 patients (98.3%) were admitted by general wards in the OLVG and one (1.7%) patient was directly admitted by the emergency department. After the opening of the MPU, 86 (49.4%) patients were admitted by the emergency department, 64 (36.7%) by a general ward, 13 (7.5%) by the ICU, and for 11 (6.3%) the admission was directly scheduled (Table 2).

The estimated mean hospital LOS in the pre-MPU group was 1.2 days shorter compared to the actual MPU group ($p = .004$) (Table 3). There was no statistically significant difference in LOS on the MPU between the two groups ($p = .231$). In the actual MPU group compared to the pre-MPU group, the estimated mean LOS on the ICU increased with 0.3 days ($p \leq .001$) and days of physical restraint with 0.5 days ($p \leq .001$). In the pre-MPU group, the odds were not significantly different for involuntary commitment (adjusted OR 0.92; 95% CI = 0.36–2.36; $p = .866$) and death within six months after discharge (adjusted OR 1.84; 95% CI = 0.73–4.63; $p = .196$).

Discussion

In this study, we aimed to describe the impact of introducing a type III/IV MPU on different outcomes. In the pre-MPU group, most patients (98.3%) were admitted from a general ward in the hospital. In the actual MPU group, most patients were admitted directly via the emergency department (49.4%), the general ward (36.7%), the ICU (7.5%), or scheduled (6.3%). The differences

Table 3. Differences in outcomes between the pre-MPU group and actual MPU group (estimates from generalised linear models).

Outcome[a]	Pre-MPU group (95% CI)	Actual MPU group (95% CI)	*p* Value
LOS OLVG (days)	8.68 (7.55–10.41)	9.89 (9.41–10.41)	.004
LOS MPU (days)	5.63 (4.69–6.76)	6.06 (5.69–6.46)	.231
ICU (days)	0.10 (0.04–0.26)	0.40 (0.30–0.52)	.000
Physical restraint (days)	0.28 (0.16–0.50)	0.83 (0.68–1.00)	.000
Involuntary commitment at discharge	0.92 (0.36–2.36)	Reference	.866
Death within six months	1.84 (0.73–4.63)	Reference	.196

[a]Corrected for age and gender.

between both groups in LOS on the MPU, death within six months and involuntary commitment at discharge were not statistically significant. Our study showed that LOS in the hospital was one day longer in the MPU group. The number of days on the ICU and medical restraint were increased in the MPU group.

Interpretation of the results

More patients were physically restrained in the actual MPU group, and the days on the ICU were also increased compared to the pre-MPU group. Both physical restraint and ICU admission are linked to patient complexity (Beglinger 2006; Duffy 2016; Philabaum 2016). The finding that both days on the ICU and of physical restraint were significantly increased in the MPU group, suggests that this group consisted of more complex patients. This was underlined by the staff that included the patients in this study. They indicated that patients with complex comorbid disorders that were transferred to another unit outside of the hospital prior to the opening were admitted to the MPU in the OLVG after it opened.

Patient complexity has been defined by Kathol (2016) as 'interference with the achievement of expected or desired health and cost outcomes due to the interaction of biological, psychological, social, and health system factors when patients are exposed to standard care delivered by doctors' (Kathol et al. 2016). This definition builds on the work of Huyse et al., who developed an instrument to assess complexity called INTERMED (Huyse et al. 2006). Considering Kathol's definition of health complexity and the INTERMED labels, the ability to take care of complex patients in the pre-MPU group was limited. The patients were admitted to a general ward with care from a consulting psychiatrist. In contrast, the MPU has a closed main door, a specially trained nursing team, and dedicated psychiatrists, giving the possibility to treat complex patients that probably would have been referred to another hospital prior to opening of the unit. These results appear to be comparable with the results of other studies that have researched the impact of MPUs. These studies also showed that more complex patients were treated on MPUs (Gertler, et al. 1995; Kishi and Kathol 1999). This shows that the introduction of an MPU can result in the ability to treat more complex patients with comparable lengths of stay.

Another finding was that, after opening of the MPU, more patients were directly admitted from the emergency department, ICU or had a scheduled admission. This suggests that the hospital was able to admit these complex patients directly to the right bed instead of admissions to a general ward prior to MPU admission. This shows that an MPU can have an important positive impact on the referral patterns of a hospital. This is explicitly of interest for hospitals with a high number of patients that are seen by consultation-liaison psychiatry. This positive impact might suggest that opening of an MPU can result in costs savings. Indeed, several studies showed that MPUs shorten the LOS and are costs-effective. However, to our knowledge, costs-effectiveness analysis that examines the cost-effectiveness of MPUs compared to general wards does not exist.

Strengths and limitations

The design used threatens internal validity since factors other than the MPU opening may have been involved and had impacts on the outcomes evaluated. The aim was to include comparable patients in both groups by having the same team admitting patients to the virtual and to the actual MPU. Hence, the design could have given an indication of the effectiveness of the MPU. Four limitations can be discerned. (i) Despite the attempts to compare two homogenous patient groups, the used study design did not succeed in this, which limits any conclusion about effectiveness. (ii) We could only use age and gender to account for case mix. (iii) The absence of a variable to compare the achieved change in health status, like for instance the HoNOS that is used in other studies (Honig et al. 2014; Jansen et al. 2019). As this study was lacking such an outcome measure, the impact of opening an MPU on outcome indicators could not be assessed (Drummond et al. 2015). Moreover such a variable could have helped with controlling for the case mix. (iv) This research was only performed in one centre which limits the generalisability of our findings.

Future research

The impact of MPU admission on treatment outcomes has only been studied to a limited degree. A possible reason might be the fact that it is hard to use a design that includes homogenous cohorts or homogenous interventions. This study used the rare event of opening an MPU to let the same team include patients in the before and after group to improve the homogeneity of groups.

In future research, a randomised controlled trial (RCT) would be the best design to study cost-effectiveness of MPUs since it reduces the problem of heterogeneity. So far, efforts to test the effectiveness of an MPU with an RCT design have failed. It is reasonable to question if it is ethical to randomly include patients with concurrent medical and psychiatric disorders to a general unit and a unit that is focussed on the treatment of these patients. Also, the logistics could be difficult since these patients can be admitted to several wards in the hospital prior to possible MPU admission, which would therefore involve several teams and logistic chains. We, suggest that a multicentre study that prospectively includes large numbers of patients and examines the impact of MPU treatment on costs and treatment outcomes compared to care as usual would be preferable. In order to improve comparability between studies, a detailed description of patient characteristics and the unit capabilities would be required as well. This would improve our understanding of the costs-effectiveness of MPUs compared to care as usual.

In summary, our analysis showed that opening of the MPU was associated with an increased hospital LOS, whereas difference in LOS on the MPU was not significant. Furthermore, patients in the actual MPU group were physically restrained more often and had longer lengths of stay on the ICU and could therefore be considered more complex. This claim of complexity was supported by the psychiatrist that included the patients in this study, who suggested these patients would be referred to other hospitals prior to opening of the MPU. It can thus be considered that introduction of the MPU resulted in an increased ability to treat complex patients.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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