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**ORIGINAL ARTICLE**

# Long-term patients' outcomes after intermediate care at a community hospital for elderly patients: 12-month follow-up of a randomized controlled trial

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**Abstract**

*Background:* Developing a better understanding of if, and when, patients need care at a general hospital is an urgent challenge, as the proportion of general hospital beds being occupied by older patients is continuously increasing. *Methods:* In a randomized controlled trial, of 142 patients aged 60 years or more admitted to a city general hospital due to acute illness or exacerbation of a chronic disease, 72 (intervention group) were randomized to intermediate care at a community hospital, and 70 (general hospital group) to further general hospital care. The patients were followed up for 12 months. The need for long-term home care and nursing homes, mortality and the number of admissions and days in general hospital for all diseases were monitored. *Results:* Thirty-five patients, 13 (18.1%) of the patients included in the intervention group and 22 (31.4%) in the general hospital group, died within 12 months ($p=0.03$). Patients in the intervention group were observed for a longer period of time than those in the general hospital group; 335.7 (95% confidence interval (CI) 312.0–359.4) vs. 292.8 (95% CI 264.1–321.5) days ($p=0.01$). There were statistically no differences in the need for long-term primary-level care or in the number of admissions or days spent in general hospital beds. ***Conclusions:*** **Intermediate care at the community hospital in Trondheim is an equal alternative to ordinary prolonged care at the city general hospital, as fewer patients were in need of community care services, and significantly fewer patients died during the 12-month follow-up time.**

**Key Words:** *Elderly, functionality, general hospital care, home care, intermediate care, survival*

## Background

The proportion of general hospital beds being occupied by older patients in all Western European countries is increasing [1]. About one-third of all general hospital beds in Norway (2006) are occupied by patients above the age of 75 years [2]. As a consequence, elderly patients' pro rata share of general hospitals' budgets is increasing [3]. There is also an increase in usage and expenditure for the provision of primary-level care services. Long-term inpatient nursing care and home care consumed 24.3% of the total health resources (running expenses) in 2006 in Norway; nearly the same percentage that secondary- and tertiary-level general and university hospital inpatient care consumed (27.2%) [3].

One important future issue will be to develop a better understanding of if and when a patient needs care at a general hospital, at a community hospital, at a nursing home, by home care, at an outpatient department, by a general practitioner, by a multi-professional team, or at an intermediate level in general hospitals or community hospitals [4–7].

The question of optimal organization of care and rehabilitation of hospitalized elderly patients has been discussed among professionals both nationally and internationally in recent years [8–15]. One of the conclusions in a report from Norway is that the

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pressure on general hospital beds is dependent on the competence of, and collaboration between, staff at both the primary and secondary care levels [16].

Healthcare provision in Norway is based on a decentralized model, and healthcare is divided into three levels: primary level (municipality level), secondary level (general hospitals and specialist care), and tertiary level (university hospitals). By far the major part of the Norwegian healthcare system is organized and financed by the public sector.

The government owns and runs general and university hospitals, ambulance services and also all specialized healthcare delivered through regional health authorities (five regions). The municipalities are responsible for primary healthcare, both curative and preventive: all home care, nursing homes, (community hospitals), family physicians, health centres for mothers, children and youth, school health services, midwives, emergency services, physiotherapists, and occupational therapists. General and university hospital care and home nursing care are free of charge.

In 2001, an intermediate care department was established at a teaching nursing home (community hospital) located in the city of Trondheim, Norway to provide intermediate care [17,18] for older patients initially admitted to the city general hospital, but without any need for further advanced hospital care. Earlier studies in the UK have not demonstrated better patient outcome when patients have been treated at a community hospital or by nurse-led intermediate care as compared to general hospital care [8,14]. However, a randomized controlled trial with 6 months of follow-up demonstrated that intermediate care at a community hospital in Trondheim significantly decreased the number of readmissions, for the same disease, to the city general hospital. Furthermore, significantly more patients were independent of community care after 26 weeks of follow-up, without any increase in mortality and number of days in institutions [18]. It was, however, important to evaluate whether the outcomes remain favourable for patients provided with care at the community hospital.

## Aims

The primary aim of the present study was to examine the results of a 12-month follow-up of patients initially provided with care at a community hospital as compared to traditional treatment at the general hospital, assessed as number of hospital admissions, need for home care and long-term nursing home, mortality, and the number of days in institutions.

## Material and methods

### *Setting*

Twenty beds at Søbstad Nursing Home were re-assigned in late 2002 to be a community hospital providing intermediate-level care [19].

St Olavs University Hospital is both a general hospital for the municipality of Trondheim and a university hospital for the three counties in Mid-Norway. It was the hospital's function as a general hospital that was included in this trial.

### *Intermediate care intervention*

The experimental intervention was based on individualized intermediate care including evaluation and treatment (''care'' and ''cure'') of each patient's diseases [14,19]. On admission of the patient to the community hospital, the physicians performed a medical examination of the patient and a careful evaluation of all available health records [19]. Communication with the patient and his family, focusing on physical and mental challenges, was essential in order to understand the patients' general needs and the level of care required to optimize care, and decide on suitable aims for the stay in the community hospital.

The nursing staff, also with full patient involvement, determined the patients' most pressing difficulties with daily activities, both physiological and mental. Together, they decided what needed to be done so that the patient would be able to manage independently on returning home. Prior to discharge of the patient from the community hospital, a multidisciplinary planning meeting took place for those patients who were in need of special arrangements or extensive follow-up.

Discharge letters were sent to the family physician, describing the patients' medical history and actual situation, and to elucidate areas that would require follow-up by the physician.

For patients at the general hospital, normal routines were followed, including type of care given and also communication with primary healthcare providers. Besides the ordinary discharge letter to the family physician, contact with primary healthcare was only established, and normally by telephone, when the general hospital evaluated the

patient as having some special needs for home-based care.

*Trial design*

Intermediate care at the community hospital was compared to conventional care in general hospital beds [19]. Four inclusion criteria for eligible participants were developed: (a) aged 60 years or more admitted to the general hospital due to an acute illness or an acute exacerbation of a known chronic disease; (b) will probably be in need of inpatient care for more than 3 or 4 days, (c) admitted from their own homes; and (d) expected to return home when inpatient care was finished. Exclusion criteria were severe dementia or psychiatric disorders needing specialized care 24 hours a day [19].

There were no dropouts, except for deaths, during the trial, and all data were collected from the first day at the general hospital and until the end of the trial or at the time of death for all included patients.

Outcome variables were need for community home care, need for long-term nursing home, number of admissions, length of stays at hospitals, and number of deaths.

When an eligible patient was identified at the general hospital and accepted for inclusion, a blinded randomization was performed by the Clinical Research Department at the Faculty of Medicine using random number tables in blocks to ensure balanced groups.

Data were collected by one of the authors (HG), according to prepared schemes, from patients' electronic and paper-based journals at the general hospital and from patients' health records kept by the local care services at the primary level in the city of Trondheim. To ensure the correct number of days in institution, readmissions and cause-specific deaths were also monitored through the patient administrative systems, independent of treatment groups by one of the employees at the general hospital. All data were collected at the time of inclusion in the study (index day), at discharge from community or general hospitals, and after 6 and 12 months from the index day. The number of deaths was monitored continuously.

*Approval*

The Regional Committee for Medical Research Ethics for Central Norway approved the study, the patient information, and the consent schemes. The study was licensed to process personal health data by the Norwegian Data Inspectorate. Each participating patient signed a written informed consent form at the general hospital prior to inclusion in the study.

*Statistical analysis*

The sample size was estimated to detect a difference of 25% in the number of readmissions for the same disease, as an assessment of morbidity, between the groups with alpha 0.05 and power of 0.80. Survival curves were estimated by Kaplan–Meier analysis. All data are presented and analysed according to the CONSORT checklist [19]. SPSS version 15.0 for Windows was used for all analyses. Differences in number of inpatient days and need for home care services or nursing homes between groups were tested by chi-squared tests, and differences in mean number of days in institution were tested by paired *t*-test. The number of days in institution was compared between groups using covariance analyses with age, gender, activities of daily living (ADL) scores and diagnoses as covariates. The number of days of follow-up was censored for death, as there were no other dropouts. The level of significance was set to $p=0.05$.

## Results

From August 2003 until the end of May 2004, 142 patients were eligible for inclusion; 70 were randomized to continued care in the general hospital (general hospital group), and 72 to the community hospital (intervention group) (Figure 1) [19]. Sixty-four patients were treated at the intermediate care hospital (intermediate care group), as eight of the patients were never transferred, due to deterioration of their medical conditions after inclusion [19]. In the intention-to-treat analyses, they were included in the intervention group; otherwise, in the treatment analyses, they were dealt with as a separate group.

*Patient characteristics*

At randomization (index day), the patients randomized to intermediate care or to general hospital care were comparable with respect to number of days of care before randomization, mean and median age, diagnosis, gender, ADL and marital status (Table I) [19].

The general hospital group had the best mean ADL score, 2.05, and the intervention group had a somewhat worse mean ADL score at 2.24, a non-significant difference ($p=0.27$).

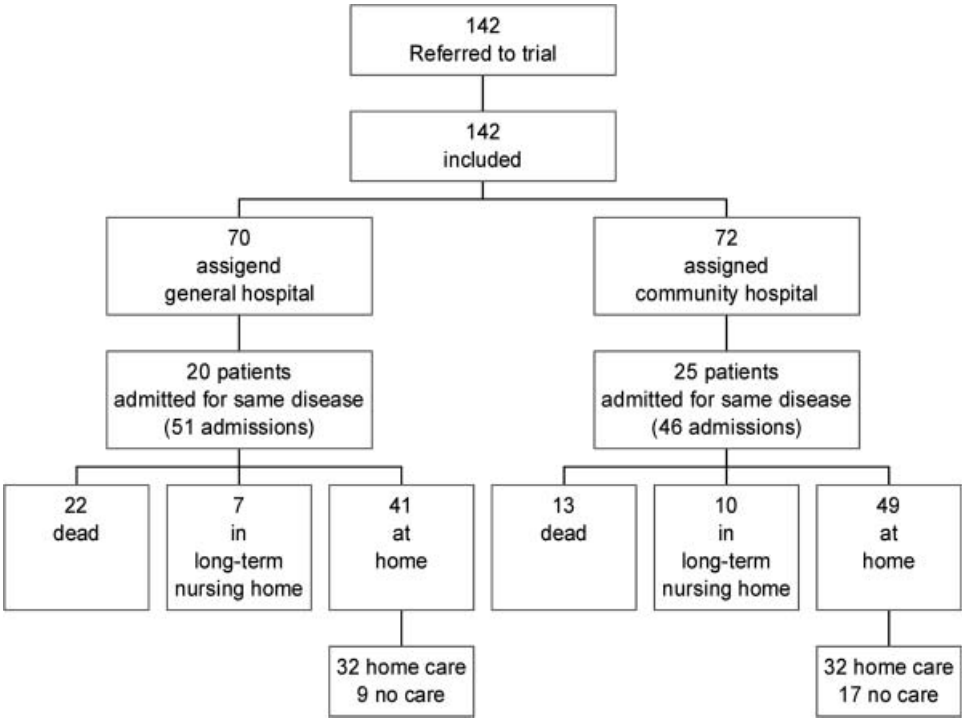


Figure 1. Trial profile after 12 months of follow-up.

*Admissions to general hospital*

Twenty-five patients, comprising 46 admissions, in the intervention group, as compared to 20 patients, with 51 admissions, in the general hospital group, were admitted to the general hospital for the same disease at initial admission during the follow-up period (Figure 1, Table II). These figures do not include initial care or acute, not expected, readmissions within the first 60 days [19]. The differences in number of admissions were statistically insignificant. Likewise, there were no statistically significant differences when comparing number of admissions for other diseases.

Average hospital stay in general hospital beds was 12.6 days for both groups; 95% confidence interval (CI) 9.2–16.1 for the intervention group and 95% CI 7.4–17.8 for the general hospital group (Table III). Censored for days at risk, patients in the intervention group spent on average 13.5 days in general hospital beds as compared to 15.5 days in the control group, a non-significant difference.

There were no differences, statistically, in the number of in-ward days for any of the patient groups, either for the same disease or for other diseases.

*Need for nursing homes and home care after 12 months*

Twelve months after discharge from intermediate care or from general hospital care, 32 patients (54.2%) in the intervention group and 32 patients (66.7%) in the general hospital group of patients still living needed long-term home nurse care (Table II).

Seventeen (28.8%) of still-living patients in the intervention group were independent of home care as compared to nine (18.8%) in the general hospital group.

Seventeen of the patients still alive, 10 (16.9%) from the intervention group and seven (14.6%) from the general hospital group, were living in long-term nursing homes, a non-significant difference. There were minor differences between the groups in the number of days from inclusion to being admitted to nursing homes. None of these differences was statistically significant (Table III).

*Mortality within 12 months and number of days at risk*

Thirty-five patients, 13 (18.1%) in the intervention group and 22 (31.4%) in the general hospital group, died within 12 months (Table II, Figure 2), a significant difference (adjusted $p=0.03$). In a treatment analysis, the difference in number of deaths was still statistically significant. In the intervention group, patients also lived longer before they died than those in the general hospital group (Table III).

Patients in the intervention group were observed for a longer period of time than those in the general hospital group: 335.7 (95% CI 312.0–359.4) vs. 292.8 (95% CI 264.1–321.5) days (adjusted $p=0.01$).

Table I. Baseline characteristics, Trondheim 2003–2005 [19].

| | Assigned community hospital | | Assigned general hospital |
|---|---|---|---|
| | Intermediate care group ($n$=64) | Intervention group ($n$=72) | General hospital group ($n$=70) |
| Demography | | | |
| Gender | | | |
| Males | 14 (21.9%) | 20 (27.8%) | 27 (38.6%) |
| Females | 50 (78.1%) | 52 (72.2%) | 43 (61.4%) |
| Age, males (years) | | | |
| Mean (SD) | 79.5 (1.5) | 80.6 (1.1) | 78.4 (1.2) |
| Median | 79.0 | 80.0 | 79.0 |
| Age, females (years) | | | |
| Mean (SD) | 81.4 (1.1) | 80.6 (1.1) | 83.1 (1.0) |
| Median | 82.5 | 82.0 | 83.0 |
| Age, both genders (years) | | | |
| Mean (SD) | 80.9 (0.9) | 80.6 (0.8) | 81.3 (0.8) |
| Median | 81.5 | 81.5 | 81.0 |
| Living with spouse | 13 | 16 | 15 |
| Males | 7 | 10 | 9 |
| Females | 6 | 6 | 6 |
| ADL scores | | | |
| Both genders | | | |
| Mean (SD) | 2.19 (0.1) | 2.24 (0.9) | 2.05 (0.7) |
| Median | 2.13 | 2.29 | 2.02 |
| Males | | | |
| Mean (SD) | 2.30 (0.2) | 2.42 (0.9) | 2.08 (0.1) |
| Median | 2.37 | 2.37 | 2.00 |
| Females | | | |
| Mean (SD) | 2.17 (0.1) | 2.24 (0.8) | 2.05 (0.1) |
| Median | 2.10 | 2.18 | 2.03 |
| Primary diagnoses | | | |
| Cardiological diseases | 21 (32.8%) | 22 (30.6%) | 20 (28.6%) |
| Infections | 7 (10.9%) | 13 (18.1%) | 16 (22.9%) |
| Fractures/contusions | 13 (20.3%) | 14 (19.4%) | 12 (17.1%) |
| Pulmonary diseases | 5 (7.8%) | 5 (6.9%) | 6 (8.6%) |
| Neurological diseases | 5 (7.8%) | 5 (6.9%) | 4 (5.7%) |
| Cancers | 2 (3.1%) | 2 (2.8%) | 4 (5.7%) |
| Psychiatric diseases | 1 (1.6%) | 1 (1.4%) | 0 (0%) |
| Other diseases | 10 (15.6%) | 10 (13.9%) | 8 (11.4%) |

Table II. Numbers of admissions for the same and other diseases, number of deaths, and need for nursing homes and home care 12 months after discharge; Trondheim 2003–2005.

| | Assigned community hospital | | Assigned general hospital | | |
|---|---|---|---|---|---|
| | Intermediate care group ($n$=64) | Intervention group ($n$=72) | General hospital group ($n$=70) | $p$-value | Adjusted $p$[a] |
| Admissions to general hospital, same disease | 40 (20 patients) | 46 (25 patients) | 51 (20 patients) | 0.34 | 0.79 |
| Deaths | 12 (18.8%) | 13 (18.1%) | 22 (31.4%) | 0.07 | 0.03 |
| Nursing home[b,c] | 10 (19.2%) | 10 (16.9%) | 7 (14.6%) | 0.19 | 0.40 |
| Home care[c] | 27 (51.9%) | 32 (54.2%) | 32 (66.7%) | 0.11 | 0.19 |
| No care[c] | 15 (28.8%) | 17 (28.8%) | 9 (18.8%) | 0.45 | 0.41 |

$p$-values are based on comparisons between intervention and general hospital groups according to intention-to-treat analyses. [a]Adjusted for age, gender, activities of daily living, and diagnosis on admission. [b]Long-term nursing home. [c]Percentage of patients still alive after 12 months.

Table III. Number of days (with 95% confidence intervals) in institution, days before death and admittance to long-term nursing home and number of days at risk 12 months after discharge; Trondheim 2003–2005.

| | Assigned community hospital | | Assigned general hospital | | |
|---|---|---|---|---|---|
| | Intermediate care group ($n$=64) | Intervention group ($n$=72) | General hospital group ($n$=70) | $p$-values | Adjusted $p$[a] |
| Number of days in general hospital in first year | 13.1 (9.3–17.0) | 12.6 (9.2–16.1) | 12.6 (7.4–17.8) | 0.99 | 0.84 |
| In-ward days for the same disease | 5.8 (2.5–9.1) | 5.5 (2.6–8.4) | 4.9 (2.1–7.8) | 0.78 | 0.88 |
| In-ward days for other diseases | 7.3 (4.7–9.9) | 7.1 (4.7–9.5) | 7.6 (3.6–11.7) | 0.83 | 0.88 |
| Days before nursing home | 160.1 (89.2–231.0) | 160.1 (89.2–231.0) | 170.4 (172.1–213.8) | 0.80 | 0.67 |
| Days before death | 130.4 (56.0–204.9) | 117.8 (52.2–183.4) | 109.2 (73.1–145.2) | 0.79 | 0.85 |
| Days at risk | 335.2 (309.8–360.5) | 335.7 (312.0–359.4) | 292.8 (264.1–321.5) | 0.02 | 0.01 |

[a]Adjusted for age, gender, activities of daily living score and diagnosis on admission.

## Discussion

In this study, intermediate-level care at a community hospital as compared to traditional care at a general hospital gave better patient outcomes, as fewer patients died during the 12 months of follow-up, and they tended to have spent fewer days in general hospital and to have less need for primary-level long-term home care.

We previously demonstrated that elderly patients with acute diseases or deterioration of a chronic disease initially cared for at the city general hospital and subsequently offered intermediate care had lower readmission rates and a higher rate of independence from long-term community care after 6 months of follow-up [19]. The differences in need for community care were no longer significant after 12 months. The difference in number of deaths was also sustained after 12 months.

The present study investigated step-down intermediate-level care at a community hospital to

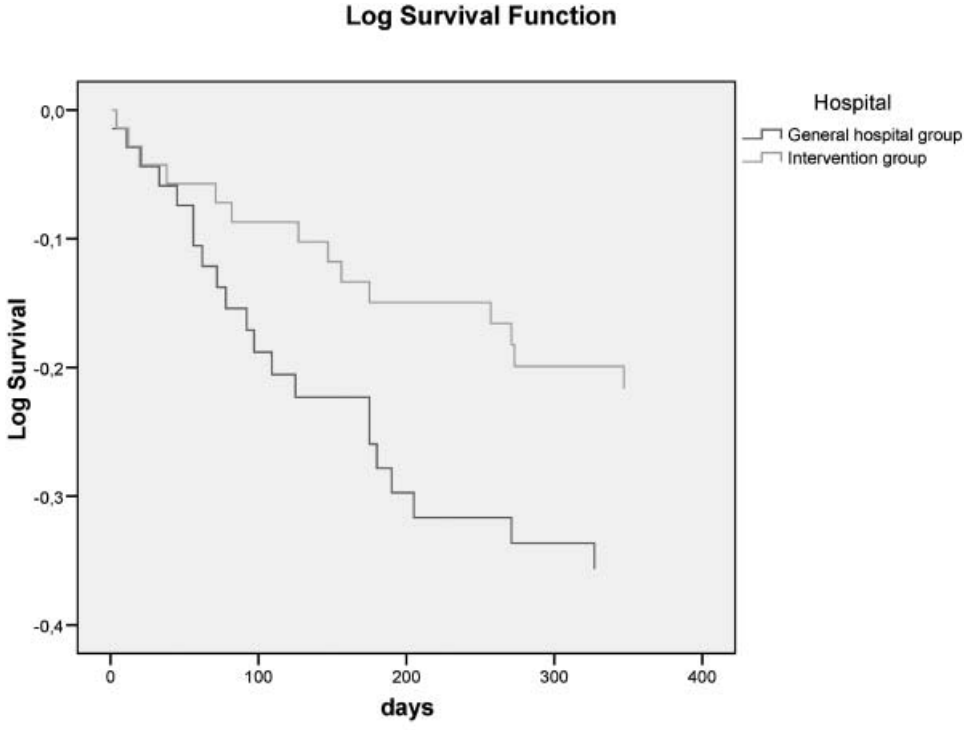


Figure 2. Survival rates after 12 months of follow-up.

provide necessary care and cure for acute admitted patients instead of traditional prolonged general hospital care. During the follow-up time, about a quarter (24.6%) of the included patients died. This was not surprising, as the study population comprised mostly older, frail people. However, with this high number of deaths, the study lost power, and there were not enough patients still alive after 12 months to reveal significant differences, except for number of deaths. Those who died in both groups had a worse ADL score than other patients. Except for a trend towards a somewhat higher number of patients dying of heart diseases in the general hospital group, there were no differences in diagnoses, age and gender between the intervention group and the general hospital group.

During recent years, there has been a policy of increasing the role of intermediate care with the use of community hospitals in the UK [20]. In a prospective cohort study in Devon, UK, 254 patients were followed for 6 months after treatment for an acute illness requiring hospital care, but with a condition that could have been treated at either a community hospital or a district general hospital. The results showed that quality of life and mortality were similar in both groups. However, in this study, patients were randomized to either a community hospital or to a general hospital [9]. Another UK study [14] showed that care in a locally based community hospital was associated with greater independence for older people than care at a district general hospital. Hensher et al. [4] claimed that there are several methods for facilitating early discharge from hospitals. These include discharge planning, nurse-led inpatient care, patient hotels, community or general practice hospitals, nursing homes, and hospital-at-home schemes. They also claimed that discharge planning and the use of nursing homes have often been overlooked as alternatives, and that little rigorous research has been conducted on any of these alternative methods [4].

Studies from Copenhagen [21] and Bergen [22] have shown that older people's ability to cope at home and their psychological well-being are important factors when making a decision to stay at home or to move to a nursing home.

Defining intermediate care can be difficult, as intermediate care is sometimes described as a supportive service and sometimes more as nursing rather than medicine [7,8]. In our study, intermediate care was defined to be a combination of treatment of the diseases and maximizing the patients' and their families' access to control over their lives.

We believe that the major factor contributing to better patient outcome in this study was the professionals' close communication with the patients and their networks combined with a patient-focused intervention programme provided by a multiprofessional team led by a skilled physician. The team had in-depth knowledge of the limitations and possibilities of the primary-level care services, thus enabling the physicians to decide on the best form of follow-up care [19,23]. This close collaboration with the patient and their network is difficult to establish in a general hospital with many acute admissions.

We believe that the potential success of intermediate care has to consist of some basic professional elements:

1. Appropriate diagnostic and therapeutic facilities and knowledge.
2. Appropriate assessments tools for monitoring ADL.
3. Structured and regular communication with the patients' network and professionals at the primary care level [23].

This study, like some others, has demonstrated the potential of intermediate care [4,8,14,19]. Our experience is that it is the elderly patient with some function deficits for whom intermediate-level care is most successful. However, it is essential that other studies are carried out on patients from other general hospitals and municipalities to identify which patients will profit most from intermediate care and whether there are any differences between university and general hospitals.

## Conclusions

Intermediate care at one community hospital as compared to ordinary prolonged care at one city general hospital provided better patient outcomes, as fewer patients needed community care services, and significantly fewer patients were dead after 12 months.

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