Effectiveness of a 24-hour access outpatient clinic for patients with chronic conditions in hospital outpatient follow-up: a registry-based controlled cohort study of healthcare utilisation and mortality

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ABSTRACT

Objective To evaluate the effectiveness of a 24-hour telephone access outpatient clinic (24-hour access clinic) in terms of healthcare utilisation and mortality in patients with five chronic conditions (chronic obstructive pulmonary disease, atrial fibrillation/flutter, congestive heart failure, inflammatory bowel disease and chronic liver disease).

Methods and analysis This was a registry-based controlled cohort study. The 24-hour access clinic was established at Silkeborg Regional Hospital in Central Denmark Region. The five other regional hospitals served as comparison hospitals. The 24-hour access clinic allowed patients with five chronic conditions with ongoing hospital outpatient follow-up to call the hospital outpatient clinic in case of an exacerbation. Outcomes were use of hospital admissions, length of stay (LOS), outpatient visits, contacts to general practice and all-cause mortality during 18 months of follow-up.

Results The study included 992 the 24-hour access patients and 3878 usual care patients. For the five conditions combined, the 24 hours access patients had fewer all-cause admissions (incidence rate ratio (IRR) 0.81, 95% CI 0.71 to 0.92), general practice out-of-hours contacts (IRR 0.81, 95% CI 0.71 to 0.92) and shorter LOS (IRR 0.71, 95% CI 0.57 to 0.88). The rate of all-cause outpatient visits tended to be higher (IRR 1.07, 95% CI 0.99 to 1.15). General practice daytime contacts were similar between the groups, and there was no significant difference in mortality.

Conclusions The results suggest that a 24-hour telephone access clinic may lead to enhanced integration of care measured as unplanned acute care substituted with planned outpatient care.

INTRODUCTION

A high prevalence of people living with chronic conditions is a global challenge and a further increase is expected due to ageing populations, changes in risk factor exposure and early diagnosis of disease.1,4 Living with chronic conditions is associated with reduced functional status,5 reduced quality of life,6,7 increased mortality8 and higher healthcare...
utilisation.6 9 A high prevalence of chronic conditions demands many healthcare services delivered by multiple providers and specialities, potentially resulting in fragmented care, poor patient outcomes and system inefficiencies.10 Patients receiving outpatient based follow-up care due to a chronic condition may be particularly prone to fragmentation due to a division of routine and acute care between hospital outpatient clinics, general practitioners (GPs), out-of-hours services, emergency departments (EDs) and inpatient bed wards.

The concept of integrated care has been suggested for improving the quality of chronic care delivery.11 12 Integrated care has numerous definitions13 14 but seems in brief to cover patient-centred approaches for the delivery of care within and between providers.15 Studies have shown that integrated care interventions can improve patient experiences, access to care and quality of life.16 The results have been mixed for healthcare utilisation and costs.16–18 Moreover, these interventions often depend on healthcare context, and results obtained in one setting may not necessarily translate to another.19

 Provision of 24 hours telephone access to hospital care for patients with complex chronic conditions has been proposed as a specific model of integrated care.20 21 A 24-hour access clinic may allow for easy and flexible access to specialised care, which are among the highest priorities for patients with chronic conditions22 23 and an enabler for self-management.24 25 Studies have found that a 24-hour access clinic may reduce admissions and length of stay (LOS).20 21 26 However, none of these studies have been performed using a controlled study design, which challenges the interpretation of the findings.27 Moreover, none of the studies have reported health outcomes. In 2015, University Clinic of Innovative Patients Pathways, Regional Hospital Silkeborg in Denmark introduced a 24-hour access clinic for patients with atrial fibrillation (AF), congestive heart failure (CHF), chronic liver disease (CLD), inflammatory bowel disease (IBD) or chronic obstructive pulmonary disease (COPD) in long-term hospital outpatient follow-up.

The aim of this study was to evaluate the effectiveness of this 24 hours access clinic compared with usual outpatient care in terms of planned and unplanned hospital and general practice utilisation and mortality in patients with chronic conditions.

**Materials and Methods**

**Study design and setting**

The design was a registry-based controlled cohort study conducted in the Central Denmark Region, which has a population of 1.3 million.28 The 24-hour telephone access outpatient clinic was established at Silkeborg Regional Hospital in 2015, while the five other regional hospitals in Central Denmark Region, Herning, Viborg, Holstebro, Horsens and Randers, served as comparison hospitals.

The Danish healthcare system

Denmark is a northern European country with approx. 5.8 million inhabitants.29 Healthcare is mainly tax financed, and Danes have free access to most healthcare services.29 The Danish healthcare system is governed by the state, 5 regions and 98 municipalities. The regions run hospitals and reimburse GPs and other primary care providers. The GPs act as gatekeepers to specialised care, and 99% of the population are registered with a general practice, which they have to consult for medical advice. This also applies for out-of-hours care except for emergencies. Municipalities are responsible for elderly care and local healthcare promotion.

Danish chronic care management is characterised by risk stratification based on severity.30 31 This implies that a majority of patients are primarily in general practice follow-up, while those with more complex needs are also in long-term hospital outpatient follow-up. The place of follow-up may change correspondingly with changes in disease status.

**The 24-hour telephone access outpatient clinic**

The 24-hour access clinic allowed patients in active hospital-based outpatient follow-up to call the hospital if they experienced exacerbation or problems related to their chronic condition. Relatives, GPs and municipal healthcare professionals could call on behalf of patients. A specialised hospital nurse answered all calls and coordinated the patient’s further course. If needed, a hospital physician was available for assistance. Within the framework of shared decision making, the nurse and the caller arranged the further course of action. This could include self-management assistance or home care by a municipal nurse-led acute team. If hospital care was needed, the patient was seen in the 24-hour access outpatient clinic which was located in a section of the specialised ward.

Access to the 24-hour access outpatient clinic was granted to all patients in long-term outpatient follow-up at Silkeborg Regional Hospital with a primary diagnosis of AF, CHF, CLD, IBD or COPD. Patients had to reside in Silkeborg Municipality because the 24-hour access outpatient clinic was developed in a collaboration between hospital, municipality and GPs in Silkeborg Municipality. No additional funds were allocated for running the 24-hours access outpatient clinic. Patients were informed by postal mail about the 24-hours access outpatient clinic.

**Usual care**

At the comparison hospitals, similar patient categories received usual outpatient and inpatient care as determined by regional policies after consultation with their GP or the GP out-of-hours services. In these hospitals, the initial acute hospital care was typically delivered by EDs, with a subsequent transfer to a specialised ward if necessary. In some hospitals, cardiac patients received initial acute care in a specialised cardiac setting instead of an ED.
Data sources
All information used in this study was obtained from Danish health and social registries. All Danish residents have a personal identification number (CPR) that links information about all health and social events from birth to death.

The following health and social registries were used: The Danish National Patient Register (DNPR), which contains information from all Danish somatic hospitals about inpatient contacts since 1977 and outpatient contacts since 1995. The Danish National Health Services Register (DNHSR), which contains information about all contacts to GPs. The Danish Civil Registration System (CRS), which holds information about gender, age, vital status, immigration and emigration and residence. Finally, we used Statistics Denmark to determine the highest obtained educational level.

Study population
All patients from Central Denmark Region were identified based on data from the DNPR. Patients were eligible for inclusion if they on the index date had been in hospital outpatient follow-up for at least 6 months with an International Classification of Disease, 10th revision (ICD-10) primary diagnosis of: AF (ICD-10: I48*), CHF (ICD-10: I110, I130, I132, I420, I426, I427, I428*, I429, I500*, I501*, I509), IBD (ICD-10: K50*, K51*), CLD (ICD-10: K658I, K702*, K703*, K704*, K711*, K717*, K72*, K73*, K74*, K754*, K761*, DK766*, K767, I85*) or COPD (ICD-10: J44, J440, J441, J449).

The 24-hour access group was identified at Silkeborg Regional Hospital, while usual care patients were identified at the regional hospitals in Viborg, Herning, Holstebro, Randers and Horsens. Exclusion criteria were young age (AF: <20, CHF: <30, CLD: <18, IBD: <17 and COPD: <35 years), 38-42 death within 6 months from index date to exclude patients receiving palliative care, and residence in a municipality other than the affiliated hospital to account for differences in health seeking behaviour based on the distance between home and hospital.

Index dates and follow-up
Index dates were decided by the dates on which the 24-hours access outpatient clinic was started for each condition. Index dates were 17 August 2015 for patients with COPD, 26 October 2015 for IBD and CLD patients and 2 November 2015 for patients with AF and CHF. Follow-up time was 18 months for all conditions.

Descriptive variables
Descriptive variables included age, gender, Charlson Comorbidity Index (CCI), highest obtained educational level and baseline utilisation the year before the index date. CCI included all inpatient and outpatient ICD-10 hospital diagnoses 10 years prior to the index date. All diagnoses of the qualifying chronic condition were excluded in the calculation of this measure. Highest obtained educational level was described by the International Standard Classification of Education.

Outcome variables
Information about all outcomes was obtained by the same methods for both groups and included nationwide utilisation data. Acute hospital utilisation included all-cause and exacerbation-related admissions and total LOS in bed days. Both acute inpatient admissions and ED contacts were considered as acute admissions. Exacerbations were identified by the assigned ICD-10 diagnosis code of the admission (online supplemental appendix 1.a). All-cause and disease-related outpatient visits were identified. A disease related visit was identified by the assigned ICD-10 diagnosis (online supplemental appendix 1.b). General practice utilisation included daytime and out-of-hours contacts. These were identified by reimbursement codes (online supplemental appendix 1.c) in the DNHSR. As the reason-for-encounter is not registered in general practice, all contacts were included. All-cause mortality at 18 months was based on any date of death retrieved from the CRS.

Statistical analysis
Patient characteristics were reported by percentages, median and interquartile interval or mean and SD. Crude incidence rates (counts per person per year) of baseline healthcare utilisation were determined. At baseline, we compared patient characteristics and healthcare utilisation in the preceding year before index date between 24-hours access patients and usual care patients.

Analyses of healthcare utilisation outcomes were conducted separately for each of the five conditions and for all conditions combined. Patients with more than one of the five chronic conditions were eligible for inclusion in multiple analyses. No formal sample size calculation was undertaken as this was a population-based study that included all eligible patients. The comparative analyses of healthcare utilisation were based on intention-to-treat and included all eligible patients followed up for 18 months or until the patient was censored due to death or leaving the municipality. To calculate rates of outcomes that could not occur when a patients was hospitalised (eg, a new admission or a GP contact), we subtracted any days hospitalised from the total time at risk.

Differences in healthcare utilisation between groups were estimated using negative binomial regression model. We report incidence rate ratios (IRR) with 95% CIs with robust SEs. The models included gender, age, CCI, highest obtained educational level and baseline utilisation the year before the index date. The inclusion of each was based on known associations between patient characteristics and healthcare utilisation for these chronic conditions. We intended to perform a difference-in-difference analysis based on linear regression but found that the assumption of linearity of residuals was violated. Compared with a difference-in-difference analysis, analysing postintervention outcomes adjusted for...
baseline was also preferable due to better robustness against baseline imbalance and as a precaution against regression towards the mean.53 54

Mortality was analysed by pseudo-value regression analysis and reported as risk ratios. We adjusted for gender, age, educational level and the CCI. Cox regression did not comply with the proportional hazards assumption, which is not an assumption of pseudo-value regression.55

We hypothesised that the subgroup of patients with prior admissions (high-risk patients) would benefit more from a 24-hour access outpatient clinic than patients with no prior admissions.56 57 Thus, sensitivity analyses of healthcare utilisation were carried out among patients with no all-cause admissions in the year prior to index date and patients with at least one all-cause admission.

We carried out another sensitivity analysis in the analyses of healthcare utilisation and mortality that included all patients regardless of any deaths that may have occurred during the follow-up period. This was to investigate any implications of excluding patients who died within 6 months after index date.

All analyses were conducted using the STATA V.15 (StataCorp) statistical software.

Patient and public involvement

Patients were not involved in the design of this study.

RESULTS

We identified 9225 patients with the five diagnoses. Of these, we excluded a total of 4355 patients (death within 6 months=332, young age=31 and living in another municipality than the affiliated hospital=3992). The analyses included 4870 patients (24-hour access care=992 and usual care=3878). The 24-hour access patients were slightly older, had less general practice daytime and out-of-hours contacts, and more outpatient visits than the patients receiving usual outpatient care (table 1).

Table 2 depicts the comparison of healthcare utilisation between 24-hour access and usual care. Totally, the 24 hours access patients had shorter all-cause LOS (IRR 0.71, 95% CI 0.57 to .88) and fewer all-cause admissions (IRR 0.81, 95% CI 0.71 to .92) than patients receiving usual care. For single conditions, the differences in these outcomes were not statistically significant, except for IBD where 24 hours access patients had shorter LOS than usual care patients (IRR 0.60, 95% CI 0.39 to 0.92).

The 24-hour access patients had more disease-related outpatient visits (IRR 1.23, 95% CI 1.13 to 1.34) than usual care patients and tended to have more all-cause outpatient visits (IRR 1.07, 95% CI 0.99 to 1.15) (table 2).

Rates of general practice daytime contacts were similar between groups and for all conditions combined (table 2). For all conditions combined, the 24 hours access patients had fewer out-of-hour general practice contacts (IRR 0.81, 95% CI 0.71 to 0.92). This was significantly less for 24 hours access patients with COPD (IRR 0.48, 95% CI 0.36 to 0.64) and non-significantly less in 24 hours access patients with AF, CHF, CLD and IBD.

To support the interpretation of the results, trends in crude all-cause hospital utilisation rates before and after implementation of the 24 hours access clinic are shown in figure 1. For admissions, LOS and GP out-of-hours contacts, the figures confirm that differences between follow-up groups increased after implementation of the 24-hour access clinic. No clear difference was observable in the pattern of GP daytime contacts before and after implementation between the groups. While the difference in all-cause outpatient visits seemed to decrease after implementation, this was not supported by the adjusted estimate (IRR 1.07, 95% CI 0.99 to 1.15).

There were no significant differences in mortality between 24 hours access and usual care patients for all conditions combined or any specific condition (table 3). The sensitivity analyses suggested that replacing hospital admissions with outpatient visits was more effective in 24-hour access patients with at least one admission in the preceding year compared with no admission (online supplemental appendix 2.a). Results of a sensitivity analysis that included all the patients showed that including the patients that had died during the first 6 months of follow-up had no decisive impact on outcomes of healthcare utilisation (online supplemental appendix 2.b) and mortality (online supplemental appendix 2.c).

DISCUSSION

In general, patients enrolled in a 24-hour telephone access outpatient clinic had fewer acute hospital contacts and general practice out-of-hours contacts than patients in usual outpatient care. In contrast, similar or higher rates of hospital outpatient visits and general practice daytime contacts were seen among the 24-hour access patients. No difference in mortality was observed. These results suggest that a 24-hour access outpatient clinic could lead to greater use of planned outpatient care, thereby avoiding unplanned healthcare utilisation. The magnitude of this substitution was greater in the subgroup of patients with at least one admission in the preceding year.

Strengths and limitations

This study was conducted in the same administrative region of Denmark and this ensured consistency in the delivery of care. We were able to include all eligible patients and had no loss to follow-up.58 Neither patients nor healthcare staff knew about the data collection and had no incitement to select any particular course of action that might have affected outcomes. We used Danish national health registries, which are considered to be highly complete.55 56

For the five diagnoses in this study, validity in terms of positive predictive values (PPVs) has been found satisfactory for inpatient contacts (84%–100%) and outpatient contacts (93%–100%).57 64

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<table>
<thead>
<tr>
<th>Table 1</th>
<th>Characteristics of patients with chronic conditions enrolled in a 24-hour telephone access outpatient clinic and patients receiving usual outpatient care</th>
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</thead>
<tbody>
<tr>
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<td>AF (n=1286)</td>
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<tr>
<td></td>
<td>CHF (n=602)</td>
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<tr>
<td></td>
<td>CLD (n=206)</td>
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<tr>
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<td>IBD (n=1999)</td>
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<td>COPD (n=777)</td>
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<td></td>
<td>All (n=4870)</td>
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<td>24 hours (n=270)</td>
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<td>Usual care (n=1016)</td>
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<td>Usual care (n=3878)</td>
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<tr>
<td>Patient characteristics</td>
<td></td>
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<tr>
<td>Female</td>
<td>35.9% 36.5% 25.2% 30.9% 52.0% 66.0% 53.3% 53.6% 51.8% 55.6% 44.8% 47.1%</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>70.9 (11.4) 71.4 (10.7) 70.0 (11.5) 67.4* (12.2) 60.8 (8.4) 61.7 (10.9) 49.8 (15.9) 48.4 (16.1) 71.3 (9.4) 70.9 (10.0) 62.1 (16.4) 60.9* (17.1)</td>
</tr>
<tr>
<td>CCI, median (IQI)</td>
<td>1 (0–2) 1 (0–2) 1 (0–2) 2* (1–3) 0 (0–1) 1* (0–2) 0 (0–0) 0 (0–0) 1 (0–2) 1 (0–3) 0 (0–2)</td>
</tr>
<tr>
<td>Educational level</td>
<td></td>
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<tr>
<td>Primary education</td>
<td>31.6% 37.6% 41.3% 42.0% 37.5% 49.4% 23.4% 24.3% 48.2% 58.9% 32.7% 36.4%</td>
</tr>
<tr>
<td>High school or vocational training</td>
<td>39.9% 40.4% 38.0% 44.3% 45.8% 38.3% 50.4% 47.9% 42.1% 33.6% 44.4% 42.9%</td>
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<tr>
<td>Higher education</td>
<td>28.6% 22.0%* 20.7% 13.7% 16.7% 12.3% 26.3% 27.8% 9.8% 7.5%* 23.0% 20.7%</td>
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<tr>
<td>Baseline all-cause utilisation rates†</td>
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<tr>
<td>Hospital, all cause</td>
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<tr>
<td>LOS</td>
<td>2.4 1.8 2.8 3.9 1.8 3.2 0.6 0.8 4.5 5.8 2.1 2.3</td>
</tr>
<tr>
<td>Admissions</td>
<td>1.0 0.8* 0.8 0.9 0.7 0.8 0.2 0.3 1.0 1.3 0.7 0.7</td>
</tr>
<tr>
<td>Outpatient visits</td>
<td>11.1 6.4* 12.2 10.9 7.7 6.1 5.9 5.2 9.7 8.1* 8.8 6.7*</td>
</tr>
<tr>
<td>General practice contacts</td>
<td></td>
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<tr>
<td>Daytime</td>
<td>15.6 19.3* 15.9 18.3 12.8 13.3 8.4 8.8 18.5 21.0 13.2 14.8*</td>
</tr>
<tr>
<td>Out-of-hours</td>
<td>1.4 1.3 0.8 1.5* 1.2 1.4 0.9 1.0 2.0 3.1* 1.2 1.5*</td>
</tr>
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</table>

*Difference expressed by p<0.05.
†Counts of all-cause incidences per patient in 12 months before index date. Numbers may not add up to 100% due to rounding.
AF, atrial fibrillation; CCI, Charlson Comorbidity Index; CHF, congestive heart failure; CLD, chronic liver disease; COPD, chronic obstructive pulmonary disease; 24 hours, 24-hours access patients; IBD, inflammatory bowel disease; IQI, interquartile interval; LOS, length of stay.
<table>
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<tr>
<th></th>
<th>AF Crude rates*</th>
<th>CHF Crude rates*</th>
<th>CLD Crude rates*</th>
<th>IBD Crude rates*</th>
<th>COPD Crude rates*</th>
<th>All Crude rates*</th>
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<tr>
<td></td>
<td>24 hours Usual care</td>
<td>Adj. IRR (95% CI)†</td>
<td>24 hours Usual care</td>
<td>Adj. IRR (95% CI)†</td>
<td>24 hours Usual care</td>
<td>Adj. IRR (95% CI)†</td>
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<tr>
<td>LOS All cause</td>
<td>1.59 1.94</td>
<td>0.79 (0.56 to 1.12)</td>
<td>2.22 3.97</td>
<td>0.82 (0.45 to 1.49)</td>
<td>3.53 5.08</td>
<td>0.62 (0.20 to 1.67)</td>
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<td>Admissions</td>
<td>0.59 0.69</td>
<td>0.88 (0.71 to 1.08)</td>
<td>0.58 0.95</td>
<td>0.69 (0.44 to 1.07)</td>
<td>0.87 1.12</td>
<td>0.57 (0.29 to 1.11)</td>
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<td>Outpatient visits</td>
<td>8.12 5.75</td>
<td>1.30 (1.15 to 1.48)</td>
<td>8.67 8.13</td>
<td>1.12 (0.92 to 1.37)</td>
<td>8.41 6.89</td>
<td>1.12 (0.85 to 1.48)</td>
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<td>Exacerbations/ disease related</td>
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<td>LOS</td>
<td>0.31 0.16</td>
<td>1.94 (1.18 to 3.18)</td>
<td>0.42 0.67</td>
<td>0.31 (0.12 to 0.82)</td>
<td>0.67 2.21</td>
<td>0.12 (0.03 to 0.43)</td>
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<tr>
<td>Admissions</td>
<td>0.19 0.14</td>
<td>1.13 (0.79 to 1.60)</td>
<td>0.11 0.13</td>
<td>0.61 (0.29 to 1.28)</td>
<td>0.27 0.35</td>
<td>0.60 (0.21 to 1.72)</td>
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<tr>
<td>Outpatient visits</td>
<td>4.32 1.73</td>
<td>1.70 (1.40 to 2.07)</td>
<td>3.05 2.16</td>
<td>1.07 (0.87 to 1.31)</td>
<td>4.34 2.33</td>
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<td>General practice contacts</td>
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<tr>
<td>Daytime contacts</td>
<td>15.90 18.32</td>
<td>1.01 (0.93 to 1.09)</td>
<td>14.97 17.70</td>
<td>0.93 (0.84 to 1.04)</td>
<td>13.92 14.38</td>
<td>1.02 (0.82 to 1.25)</td>
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<tr>
<td>Out-of-hours contacts</td>
<td>1.15 1.37</td>
<td>0.86 (0.67 to 1.09)</td>
<td>0.89 1.42</td>
<td>0.82 (0.57 to 1.19)</td>
<td>1.16 1.80</td>
<td>0.76 (0.46 to 1.25)</td>
</tr>
</tbody>
</table>

*Counts of the outcome per patient per year.
†Adjusted by gender, age, Charlson Comorbidity, highest obtained educational level and baseline status of the outcome.
‡Difference expressed by p<0.05.
Adj., adjusted; AF, atrial fibrillation; CHF, congestive heart failure; CLD, chronic liver disease; COPD, chronic obstructive pulmonary disease; 24-hours, 4-hour access patients; IBD, inflammatory bowel disease; IRR, incidence rate ratio; LOS, length of stay.
We also reported all-cause inpatient hospital outcomes (PPV=97.6%) which were unaffected by the validity of specific diagnoses. In contrast, exacerbation related hospital admissions and LOS outcomes may have been prone to information bias. Self-referral may have inclined the 24-hour access staff to assign more exacerbation related diagnoses. This may have led us to underestimate the actual differences in healthcare utilisation between the two groups.

We evaluated an already implemented intervention, and therefore a randomised study was not an option. Bias due to systematic between-group differences is a threat in an observational study. To limit this, we studied patients within the same administrative region and adjusted our analyses for known health and sociodemographic characteristics. Still, we cannot rule out residual confounding due to the presence of a factor that we were unable to account for and this is a limitation of our study.

An important bias may be confounding by indication if patients followed in the Silkeborg area differed from the others regarding the severity of the chronic condition. We included prior utilisation, comorbidity and age to adjust for such differences. Comparing the two groups with regard to baseline utilisation revealed some smaller differences in utilisation, in particular a higher use of outpatient visits and lower use of general practice services in the Silkeborg area. Many estimates for the single conditions in the study had wide confidence intervals. Thus, some non-significant differences might be prone to a type 2 error due to small sample sizes.

Figure 1  Trends in crude rates of quarterly healthcare utilisation among 24 hours access patients and usual care patients before and after implementation of the 24 hours access clinic.
Interpretation

Only few prior studies have investigated the effect of 24-hour telephone access to a hospital outpatient clinic in patients with chronic conditions. Two studies were based on patients with COPD with prior exacerbations or advanced condition severity, and a 24-hour access was just one of several intervention components. In a before and after study of COPD, Hurst et al found a 37% reduction in all-cause LOS.20 Roberts et al found that 12% of the calls to a 24-hour access clinic averted an emergency call among COPD patients.21 We found a reduction similar to that of Hurst et al regarding all-cause LOS among patients with COPD with at least one admission in the preceding year. This reduction was not present in patients with COPD with no prior admissions.

We have recently compared healthcare utilisation before and after implementation of the 24-hour access clinic in Silkeborg Regional Hospital.26 This study found a reduction in the proportion of patients with at least one admission (OR 0.79; 95% CI 0.64 to 0.96).

In summary, this study adds to the evidence suggesting that the provision of a 24-hour access clinic is associated with reduced unplanned healthcare utilisation. Our study was the first to add a controlled design, included a wider range of outcomes and included five chronic conditions, and this is an improvement compared with previous studies in this field. Still, studies based on randomisation may be needed to improve the evidence of effectiveness. Moreover, qualitative studies are needed to better understand how patients experience a 24-hour access clinic.

As expected, larger reductions in unplanned hospital care were seen among patients with admissions in the preceding year compared with patients with none. This was particularly prominent for COPD. One explanation may be statistical due to the higher use and thus a higher possible decrease. However, it could also be explained by a better knowledge about self-management among these patients and that the healthcare system had more knowledge about the patient and therefore could give better advice.

About 60%–86% of total healthcare expenditures are considered attributable to patients with chronic conditions68 69 and admissions are a main driver of costs.9 70 Our findings support that a 24-hour access clinic can contribute to a change in admissions by integrating hospital outpatient follow-up care. Specific factors may explain the possible effect. A 24-hour access clinic enhances access to specialist care. Access to specialist care for acute conditions is associated with improved treatment quality and reduced LOS.71–76 Moreover, flexible access to relevant healthcare professionals is considered an important enabler for self-management of chronic conditions24 25 77 which can lead to reductions in healthcare utilisation.17 Lastly, continuity of care seems enhanced when both routine and acute care are coordinated by the outpatient clinic. Improved continuity of care is associated with lower mortality,78 reduced hospital utilisation,79 increased
adherence to medicine and improved patient satisfaction and health outcomes. In Denmark, 13%–41% of all patients with these five chronic conditions are followed in a hospital outpatient clinic and are potentially eligible for inclusion in a 24-hour access clinic. Patients in hospital outpatient follow-up account for 21% to 42% of annual exacerbation admissions. At a national level, this is a large amount of resources. Further, the changes we found may very well be applicable for other chronic conditions.

In conclusion, a 24-hour access patients had lower utilisation of acute hospital care and general practice out-of-hours contacts but more outpatient visits compared with usual care patents in the rest of the health region. No difference in mortality was observed. We found that improving integration of care by means of a 24-hour access clinic reduced unplanned hospital care and general practice out-of-hours contacts, which to some extent were substituted with more planned hospital outpatient visits.

**Generalisability**

Studies in Europe and Australia have described the results of 24-hour telephone access for patients with chronic conditions, thus indicating the international relevance of a 24-hour access clinic. In a Danish perspective, our results should be generalisable to other regions of Denmark. Danish Regions are considered homogeneous and results obtained in one region should be transferable to the others. A 24-hour access clinic may be characterised as a low level clinical integration of care with limited complexity. Consequently, this model of care may be considered less complex and more transferable to other settings than many other integrated care models.

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**REFERENCES**


