

## Drug prescriptions in Danish out-of-hours primary care: a 1-year population-based study

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### ABSTRACT

**Objective:** General practitioners are the first point of contact in Danish out-of-hours (OOH) primary care. The large number of contacts implies that prescribing behaviour may have considerable impact on health-care expenditures and quality of care. The aim of this study was to examine the prevailing practices for medication prescription in Danish OOH with a particular focus on patient characteristics and contact type.

**Design and setting:** A one-year population-based retrospective observational study was performed of all contacts to OOH primary care in the Central Denmark Region using registry data.

**Main outcome measures:** Prescriptions were categorised according to Anatomical Therapeutic Chemical Classification (ATC) codes and stratified for patient age, gender and contact type (telephone consultation, clinic consultation or home visit). Prescription rates were calculated as number of prescriptions per 100 contacts.

**Results:** Of 644,777 contacts, 154,668 (24.0%) involved medication prescriptions; 21.9% of telephone consultations, 32.9% of clinic consultations and 14.3% of home visits. Around 53% of all drug prescriptions were made in telephone consultations. Anti-infective medications for systemic use accounted for 45.5% of all prescriptions and were the most frequently prescribed drug group for all contact types, although accounting for less than 1/3 of telephone prescriptions. Other frequently prescribed drugs were ophthalmological anti-infectives (10.5%), NSAIDs (6.4%), opioids (3.9%), adrenergic inhalants (3.0%) and antihistamines (2.3%).

**Conclusion:** About 25% of all OOH contacts involved one or more medication prescriptions. The highest prescription rate was found for clinic consultations, but more than half of all prescriptions were made by telephone.

### KEY POINTS

- As the out-of-hours (OOH) primary care services cover more than 75% of all hours during a normal week, insight into the extent and type of OOH drug prescription is important.
- General practitioners (GPs) are responsible for more than 80% of all drug prescriptions in Denmark.
- Of all contacts 24.0% involved medication prescriptions; 21.9% of telephone consultations, 32.9% of clinic consultations and 14.3% of home visits.
- Of all prescriptions, 53% were made in telephone consultations.
- Anti-infective medications for systemic use accounted for 45.5% of all prescriptions, thereby being the most frequently prescribed drug group for all three contact types.

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## Background

In Denmark, general practitioners (GPs) are responsible for more than 80% of all drug prescriptions,<sup>[1–3]</sup> and they have responsibility for their listed patients 24/7 all year round.<sup>[4]</sup> Insight into prescription patterns in health-care services is crucial to ensure the best possible utilisation of resources and to reduce the risk of medical errors.<sup>[5]</sup> Former studies have described the prescription patterns among GPs in daytime,<sup>[1,6–8]</sup>

but little is known about the extent and types of drugs prescribed in the out-of-hours (OOH) primary care services. Insight into prescription patterns in OOH care may provide a basis for monitoring, evaluating and improving the prescription behaviour.

Danish GPs have collaborated in large-scale OOH cooperatives since 1992. These provide patient care from 4 pm to 8 am on weekdays, all weekends and public holidays. OOH primary care is freely accessible

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for patients, and all contacts are triaged by a GP by telephone. Thus, all patient calls are managed by GPs as either telephone consultations or further referral to a subsequent clinic consultation or home visit.[9–11] OOH GPs are paid a fee-for-service. The fee for a telephone consultation is higher than the fee for a telephone referral to a subsequent face-to-face contact to reflect the differences in time consumption and also to encourage the triaging GP to use telephone advice whenever possible.[6]

As OOH care involves large numbers of contacts, the accumulated effects of prescription patterns may have extensive socioeconomic and health-related consequences.

The aim of this study was to examine the current practice for drug prescribing in Danish OOH primary care with respect to patient age and gender, contact types and types of drugs prescribed.

## Materials and methods

### Design and setting

This population-based retrospective observational study on prescriptions in Danish OOH primary care included all contacts to the OOH primary care service in the Central Denmark Region (1.2 mill inhabitants) during one year from 1 June 2010 to 31 May 2011.

### Data

All data were collected from the OOH electronic medical record system. Drug prescriptions are processed through an electronic prescription function.

Data included information on the contact: date and time of contact, patient age and gender, contact type (i.e. telephone consultation, clinic consultation or home visit) and all prescriptions coded according to the global Anatomical Therapeutic Chemical (ATC) Classification system.[12]

Patient age was categorised into seven age groups (0–4, 5–13, 14–17, 18–40, 41–60, 61–75 and >75 years). Prescriptions were categorised according to 1st, 2nd and 3rd levels of ATC coding system.[12]

## Analysis

The frequencies and proportions of contacts with at least one prescription were calculated for each type of contact. The rate of contacts resulting in prescriptions (PC rate) was defined as the number of contacts with one or more prescriptions per 100 contacts. PC rate was calculated with 95% confidence intervals (95% CI) for age and gender stratified for all contacts and for contact type. For specific drugs, we calculated a prescription rate (Pr. rate) defined as the number of prescriptions of a specific drug per 100 contacts. The Pr. rate was calculated with 95% CI for the 10 most frequently prescribed drugs. These drugs were presented for 1st, 2nd and 3rd levels of ATC coding stratified for contact type. Groups of medication accounting for less than 1% of prescriptions were categorised into “rest” for all types of contacts. Analyses were performed in STATA version 12.

## Results

### Rate of contacts resulting in prescriptions

In total, 644,777 contacts were made to the OOH. Of these, 154,668 (24.0%) contacts involved at least one prescription (Table 1). The PC rate varied with contact type: 32.9 (95% CI: 32.6–33.1) for clinic consultations, 21.9 (95% CI: 21.8–22.0) for telephone consultations, and 14.3 (95% CI: 14.0–14.5) for home visits (Table 2). Female patients more often received a prescription than male patients (PC rates: 25.1 (95% CI: 25.0–25.3) vs. 22.6 (95% CI: 22.5–22.8)). The gender-related difference was most profound for telephone consultations. The difference found for telephone consultations was partly due to prescriptions of “sex hormones and modulators of the genital system” (GO3) and “sulphonamides and trimethoprim” (J01E) as these two types accounted for 10.2% of all prescriptions made by telephone for women (data not shown).

A higher PC rate was found for patients aged 18–40 years compared to all other age groups (Table 2). This pattern differed for home visits, for which a higher PC rate was found for children younger than four years and for patients older than 75 years.

**Table 1.** Distribution of contacts with and without prescription(s) per contact type.

Contact type	All contacts N (% column)	Contacts with at least one prescription N (% row)	Contacts without prescription N (% row)
Telephone consultations	382,748 (59.4)	83,785 (21.9)	298,963 (78.1)
Clinic consultations	180,032 (27.9)	59,167 (32.9)	120,865 (67.1)
Home visits	81,997 (12.7)	11,716 (14.3)	70,281 (85.7)
Total	644,777 (100.0)	154,668 (24.0)	490,109 (76.0)

Table 3 presents all prescriptions in the study period according to 1st, 2nd and 3rd levels of the ATC coding system. In total, 167,883 drugs were prescribed; 53.4% of these were prescribed by telephone. For almost all drug types most prescriptions were made in telephone consultations, except for “anti-infectives for systemic use” (J) and “systemic hormonal preparations” (H) (Table 3).

“Beta-lactam antibacterial, penicillin” (J01C) accounted for 36.1% of all prescriptions and was the most frequently prescribed type of drug, in particular in clinic consultations (Table 4). The 10 most frequently prescribed drugs accounted for 66.5% of all telephone prescriptions, 82.8% at clinic consultations and 86.3% at home visits.

## Discussion

### Main findings

About 25% of all contacts to OOH primary care involved prescription of one or more drugs. The highest rate of contacts resulting in prescriptions was found for clinic consultations (nearly one-third). Overall, adults aged 18–60 years received prescription(s) more often than other age groups. Yet, for home visits, the highest PC rate was found for patients aged more than 75 years. More than half of all prescriptions were made in telephone consultations, and these encompassed a larger variation of drugs than prescriptions made in face-to-face consultations. Thus, for almost all types of drugs, telephone prescriptions accounted for the majority of prescriptions made. “Anti-infective drugs” (for systemic and local use) were by far the most frequently prescribed type of drugs and accounted for about 60% of all prescriptions made by the OOH service.[13] Other frequently prescribed types of drugs were “NSAIDs”, “opioids”, “adrenergic inhalants” and “antihistamines”.

## Discussion of results

The rate of contacts to the OOH primary care is rather high in Denmark compared to other European countries.[14] The consumption in the Central Region is comparable with the rest of the country.

Few studies have mapped the prescribing patterns in primary care,[1,6–8] and only one study have addressed prescriptions in OOH primary care.[15]

As a large number of OOH contacts involve drug prescription, the economic and clinical aspects of the prescribing patterns in OOH care are significant. In daytime primary care, the frequency of prescribing is even higher (from one third to half of all consultations).[1]

The finding of more frequent prescriptions for female patients correlates with day time conditions.[1] Children and older patients (>75 years) were less likely to receive a prescription by telephone than other age groups. This may be related to a higher need for making a clinical examination in these age groups in order to determine the severity of the presented health problem and the relevant treatment option.

The high proportion of prescriptions made by telephone could indicate an overconsumption of OOH in regard to treatment of non-urgent health problems and prescription based on questionable clinical indications.[7] On the other hand, the considerable number of telephone consultations could also indicate a cost-effective OOH system that manages to meet and handle most health needs at low cost. Furthermore, the considerable proportion of telephone prescriptions may also be related to the organisation of OOH care with GPs as the triage professionals.

The PC rate found for home visits with prescription(s) in about one of seven contacts was lower than expected. This may be related to a higher frequency of hospital referrals and patients already being in possession of relevant medication or dispense of medicine from the home visiting GP’s bag.

Table 2. Number of contacts with at least one prescription per 100 OOH contacts (PC rate) according to age, gender and contact type.

	N	All contacts PC rate (95% CI)	Telephone consultations PC rate (95% CI)	Clinic consultations PC rate (95% CI)	Home visits PC rate (95% CI)
Male	65,817	22.6 (22.5–22.8)	19.3 (19.1–19.5)	32.6 (32.3–32.9)	14.5 (14.2–14.9)
Female	88,851	25.1 (25.0–25.3)	23.9 (23.7–24.1)	33.1 (32.8–33.4)	14.1 (13.7–14.4)
0–4 years	26,581	21.1 (20.9–21.3)	17.2 (17.0–17.5)	29.4 (28.9–29.8)	14.0 (13.0–15.0)
5–13 years	13,212	20.9 (20.6–21.2)	15.6 (15.2–16.0)	29.5 (28.9–30.1)	13.7 (12.4–15.1)
14–17 years	5,728	21.6 (21.1–22.1)	18.5 (17.9–19.1)	27.9 (27.0–28.8)	12.2 (10.7–13.9)
18–40 years	53,996	27.6 (27.4–27.8)	25.9 (25.6–26.1)	34.8 (34.4–35.2)	12.3 (11.7–12.8)
41–60 years	31,846	27.7 (27.4–27.9)	26.7 (26.4–27.0)	37.5 (36.9–40.0)	12.9 (12.4–13.4)
61–75 years	13,304	21.9 (21.6–22.2)	20.1 (19.6–20.5)	35.3 (34.5–36.2)	13.3 (12.8–13.8)
>75 years	10,001	17.4 (17.1–17.7)	17.8 (17.4–18.3)	29.5 (27.9–31.1)	15.5 (15.1–16.0)
Total	154,668	24.0 (23.9–24.1)	21.9 (21.8–22.0)	32.9 (32.6–33.1)	14.3 (14.0–14.5)

PC rate: number of contacts with at least one prescription per 100 contacts.

p for rate between gender for all contacts and telephone consultations <0.01 and for clinic consultations and home visit <0.05.

**Table 3.** All prescriptions in the 1-year study period presented with 1st, 2nd and 3rd ATC code level per contact type.

ATC code level			Telephone consultations	Clinic consultations	Home visits	All
1st	2nd	3rd	N (% column)	N (% column)	N (%column)	N (% column)
J			26,679 (29.7)	41,042 (63.1)	8676 (65.6)	76,397 (45.5)
	J01		24,286	40,261	8,556	73,103
		J01C	18,218	35,330	7113	60,661
		J01F	1634	3657	1018	6309
		J01E	3577	632	132	4341
		J01M	631	458	273	1362
		Rest	226	184	20	430
	J05	J05A	1005	607	87	1699
	J02	J02A	1369	172	31	1572
	Rest	J06, J07	19	2	2	23
S			16,058 (17.9)	5722 (8.8)	360 (2.7)	22,140 (13.2)
	S01		15,071	3982	286	19,339
		S01A	13,937	3470	249	17,656
		Rest	1134	512	37	1683
	S02		807	1165	42	2014
		S02C	367	838	32	1237
		S02A	440	327	10	777
	Rest	S03	180	575	32	787
N			11,247 (12.6)	2457 (3.8)	1120 (8.5)	14,824 (8.8)
	N02		6148	2058	829	9035
		N02A	4428	1462	709	6599
		N02C	1174	66	21	1261
		Rest	546	530	99	1175
	N06		2460	75	33	2568
		N06A	2214	49	29	2292
		Rest	246	26	4	276
	N05		1381	224	214	1819
		N05B	511	145	142	798
		Rest	870	79	72	1021
	N03	N03A	924	33	13	970
	Rest	N01, N04, N07	334	67	64	432
R			8850 (9.9)	4947 (7.6)	624 (4.7)	14,421 (8.6)
	R03		4339	2493	418	7250
		R03A	3005	1663	320	4988
		R03B	1007	503	60	1570
		Rest	327	327	38	692
	R06	R06A	2512	1199	74	3785
	R05		1162	816	113	2091
	Rest	R01, R02 (Nasal/throat preparations)	837	439	19	1295
M			6323 (7.1)	4129 (6.3)	564 (4.3)	11,016 (6.6)
	M01	M01A	6192	4044	555	10,791
	Rest	M02, M03, M04, M05	131	85	9	225
A			5864 (6.5)	2230 (3.4)	852 (6.4)	8946 (5.3)
	A02		1246	1070	316	2632
	A03		1409	492	289	2190
	A10		1073	9	7	1089
	Rest	A01, A04, A06-09, A11, A12	2136	659	240	3035
D			3587 (4.0)	2823 (4.3)	158 (1.2)	6568 (3.9)
	D06		1561	1334	56	2951
	D07		1109	1010	65	2184
	Rest	D01, D02, D04, D05, D08, D10, D11	917	479	37	1433
P			3872 (4.3)	353 (0.5)	29 (0.2)	4254 (2.5)
	P02	P02C	3566	47	4	3617
	Rest	P01, P03	306	306	25	637
C			3037 (3.4)	628 (1.0)	212 (1.6)	3877 (2.3)
	C05	C05A	1162	331	38	1531
	Rest	C01, C02, C03, C05B-C, C07, C08, C09, C10	1875	297	174	2246
G			2801 (3.1)	89 (0.1)	10 (0.1)	2900 (1.7)
	G03	G03A	1949	13	3	1965
	Rest	G01, G02, G03B-H, G04	852	76	7	935
H			674 (0.8)	580 (0.9)	585 (4.4)	1839 (1.1)
	H02	H02A	403	574	583	1560
	Rest	H01, H03, H04, H05	271	6	2	259
Rest		B, L, V <sup>c</sup>	605 (0.7)	70 (0.1)	26 (0.2)	701 (0.4)
All			89,597 (100)	65,070 (100)	13,216 (100)	167,883 (100)

<sup>a</sup>Propulsives (A03F) account for 93.4%.<sup>b</sup>Antibiotics for topical use (D06A) account for 87.4%.<sup>c</sup>Blood and blood-forming organs; L: antineoplastic and immunomodulating agents; V: various.

**Table 4.** The 10 most frequently prescribed drug types (ATC-code, 3rd level). Proportion (%) of all prescriptions and prescription rate (Pr. rate)<sup>a</sup> for all contacts and per contact type.

All contacts	%	Pr. rate (95% CI)	Telephone consultations	%	Pr. rate (95% CI)
Penicillin (J01C)	36.1	9.4 (9.3–9.5)	Penicillin (J01C)	20.3	4.8 (4.7–4.8)
Ophthalmological anti-infectives (S01A)	10.5	2.7 (2.7–2.8)	Ophthalmological anti-infectives (S01A)	15.6	3.6 (3.6–3.7)
NSAIDs (M01A)	6.4	1.7 (1.6–1.7)	NSAIDs (M01A)	6.9	1.6 (1.6–1.7)
Opioids (N02A)	3.9	1.0 (1.0–1.0)	Opioids (N02A)	4.9	1.2 (1.1–1.2)
Macrolides and lincosamides (J01F)	3.8	1.0 (1.0–1.0)	Sulfonamides and trimethoprim (J01E)	4.0	0.9 (0.9–1.0)
Adrenergics, inhalants (R03A)	3.0	0.8 (0.8–0.8)	Antinematodal agents (P02C)	4.0	0.9 (0.9–1.0)
Sulfonamides and trimethoprim (J01E)	2.6	0.7 (0.7–0.7)	Adrenergics, inhalants (R03A)	3.4	0.8 (0.8–0.8)
Antihistamines (for systemic use) (R06A)	2.3	0.6 (0.6–0.6)	Antihistamines for systemic use (R06A)	2.8	0.7 (0.6–0.7)
Antinematodal agents (P02C)	2.2	0.6 (0.5–0.6)	Antidepressants (N06A)	2.5	0.6 (0.6–0.6)
Antibiotics for topical use (D06A)	1.5	0.4 (0.4–0.4)	Hormonal contraceptives for systemic use (G03A)	2.2	0.5 (0.5–0.5)
Clinic consultations			Home visits		
Penicillin (J01C)	54.3	19.6 (19.4–19.8)	Penicillin (J01C)	53.8	8.7 (8.5–8.9)
NSAIDs (M01A)	6.2	2.2 (2.2–2.3)	Macrolides and lincosamides (J01F)	7.7	1.2 (1.2–1.3)
Macrolides and lincosamides (J01F)	5.6	2.0 (2.0–2.1)	Opioids (N02A)	5.4	0.9 (0.8–0.9)
Ophthalmological anti-infectives(S01A)	5.3	1.9 (1.9–2.0)	Corticosteroids for systemic use (H02A)	4.4	0.7 (0.7–0.8)
Adrenergic inhalants (R03A)	2.6	0.9 (0.9–1.0)	NSAIDs (M01A)	4.2	0.7 (0.6–0.7)
Opioids (N02A)	2.2	0.8 (0.8–0.9)	Adrenergics, inhalants (R03A)	2.4	0.4 (0.3–0.4)
Antihistamines for systemic use (R06A)	1.8	0.7 (0.6–0.7)	Drugs for peptic ulcers and GERD (A02B)	2.3	0.4 (0.3–0.4)
Antibiotics for topical use (D06A)	1.8	0.7 (0.6–0.7)	Propulsives (A03F)	2.1	0.3 (0.3–0.4)
Otologicals (S02A + S02C)	1.8	0.6 (0.6–0.7)	Quinolone antibacterials (J01M)	2.2	0.3 (0.3–0.3)
Drugs for peptic ulcers (A02B)	1.6	0.5 (0.5–0.6)	Ophthalmological anti-infectives (S01A)	1.9	0.3 (0.3–0.3)

<sup>a</sup>Number of prescriptions of a specific drug type per 100 contacts.

The typical indications for the most frequently prescribed types of drugs in this study (“anti-infectives”, “NSAIDs”, “opioids”, “adrenergics”, “inhalants” and “antihistamines”) seem to be consistent with the aim of OOH primary care to manage common urgent health requests. The diagnostic patterns on reasons for encounter with OOH primary care also confirm this association as infectious diseases and pain-related symptoms seem to be prevailing.[5,16] However, the diversity of drugs was larger among drugs prescribed by telephone than among drugs prescribed in face-to-face contacts. “Contraceptives” and “antidepressants” were among the 10 most frequently prescribed drugs by telephone, which may indicate that some prescriptions were related to renewal of prescriptions or lost, missing or mislaid medications. In an earlier study, we found that prescription renewal was the primary reason for encounter in 5% of all OOH telephone consultations.[16]

Patients should contact the OOH service only in case of a health problem that cannot wait until normal office hours. In this perspective, the 32.9% of clinic consultations resulting in at least one prescription may not be that high.

In the present study clinical information such as reason for encounter was not collected but earlier studies showed that patients in OOH often present with health issues related to infection.[15,16] Consequently, the antibiotic prescription rate will be high, in particular when dealing with acute health problems like in the OOH. Also many patients contacting OOH service may expect to have a condition requiring treatment with medication, and most GPs are aware of these assumptions.[17] A study from

Australia showed that patients who expected to receive medication were nearly three times more likely to get a prescription and that the highest frequency of prescriptions were found in cases where the doctors assessed patients to expect discharge of medication.[6] Such mechanisms may lay behind some of the findings of this study, for example that anti-infective eye drops accounted for 10.5% of all prescriptions.

The “pressure for treatment” may for some part be divided into the “demand for treatment”, which originate from the patients and their relatives, and doctor’s “urge for delivering treatment/a solution”. These two focal points should be kept in mind if we intend to reduce the number of inappropriate prescriptions and bridge the perceptual gap between patient and doctor in the clinical encounter. However, doctors should also be aware that a number of other factors also impact their decisions on prescriptions, such as financial pressure.[17]

### Strengths and limitations

This study included all drug prescriptions made during a complete year in the Danish OOH primary care service. The large sample size ensured high statistical precision with the possibility to make inference at third ATC level. The data were collected retrospectively, meaning that the GPs had no knowledge of an ongoing study of OOH prescriptions, and their performance was consequently not altered. As all prescriptions were completed electronically, the data hold high validity and completeness.[2] However, the GPs also had the option to make a handwritten prescription on paper, but as

the GPs on home visits had a laptop with online possibility of prescribing this happened rarely to our knowledge. Still, the paper option might have led to an underestimation of drug prescriptions during home visits. The data did not allow us to link prescriptions with indications. Thus, we cannot discuss the appropriateness of prescriptions, which could be particular interesting for telephone consultations.

## Conclusion

Drug prescriptions are made in 33% of all clinic consultations, 22% of all telephone consultations and 14% of all home visits in OOH primary care. More than half of all drugs were prescribed by telephone. The most frequently prescribed type of drug was “anti-infective drugs”, followed by “NSAIDs”, “opioids”, “adrenergic inhalants” and “antihistamines”.

## Clinical implications and future recommendations

Appropriate prescribing is a complex topic. Decisions strongly depend on a wide range of aspects related to both the patient and the prescribing doctor, for example the clinical situation, the working conditions, public health policies and personal and socio-economic factors.[1,6,18,19] Such aspects need to be further addressed in order to assess the appropriateness of the current prescribing behaviours in OOH primary care.

Our findings extend the ongoing discussion regarding the safety and feasibility of drug prescribing at telephone consultations. Our figures underpin the relevance of studying the most frequent types of drug prescriptions based on telephone consultations in OOH primary care and to discuss the appropriateness of these prescriptions.

## Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

## Ethical approval

According to Danish national regulations, research based on registry data on non-identifiable persons does not require approval by a research ethics committee.

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