DANISH MEDICAL JOURNAL

Original Article

Development of a virtual cross-sectional polypharmacy outpatient clinic

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Dan Med J 2025;72(7):A12240869. doi: 10.61409/A12240869

ABSTRACT

INTRODUCTION. Multimorbidity and polypharmacy present significant challenges for the healthcare system. In Denmark, general practitioners (GPs) play a key role in coordinating patient care, while also relying on specialist support for complex cases. This study reports on the development and implementation of the Telepharmacological Outpatient Clinic (TPOC) (Danish: Telefarmakologisk Ambulatorium), a virtual cross-sectional polypharmacy counselling service.

METHODS. The intervention was developed adopting an interdisciplinary approach. The service provided virtual consultations to GPs in the Region of Southern Denmark, offering multidisciplinary specialist counselling for patients with polypharmacy. The process included referral, medication review, video conference and follow-up. Data were collected on referrals, demographics and service utilisation.

RESULTS. A total of 364 patients (median age 74 years, 61.0% female) were referred to the TPOC from March 2019 to February 2024. Referrals increased from a median of 3.5 per month in 2019-2020 to nine per month in 2023-2024. GPs from 21 of 22 municipalities referred patients. The service was well received by GPs and recognised by national authorities as a valuable model for managing multimorbidity.

CONCLUSIONS. The TPOC was shown to be a successful model for providing specialist support to GPs. Its growing utilisation and positive reception indicate relevance in addressing multimorbidity and polypharmacy challenges.

FUNDING. The TPOC is funded by the Region of Southern Denmark.

TRIAL REGISTRATION. Not relevant.

The global prevalence of multimorbidity is increasing, presenting considerable healthcare challenges [1]. One key issue in this context is polypharmacy, which often accompanies multimorbidity and complicates treatment regimens.

In Denmark, general practitioners (GPs) play a pivotal role in coordinating patient care, acting as the central healthcare providers in the management of chronic diseases [2]. GPs play a vital role in managing the overall medication regimen, among others, by preventing adverse effects, drug interactions and reducing the polypharmacy burden [3]. However, the growing complexity of multimorbidity and polypharmacy requires the expertise of specialists within an integrated approach that leverages the strengths of both primary and secondary care [4].

Telehealth has been proposed as a feasible approach to delivering accessible medication reviews; however, the evidence remains limited [5]. Telehealth was used to deliver a geriatric medication optimisation service, showing

a decrease in potentially inappropriate prescriptions and as-needed drugs, but no change in polypharmacy [6]. However, the study included only a limited number of patients [6]. While evidence on telehealth initiatives is limited, hospital-based medication reviews are likely to reduce the risk of readmissions [7]. However, a cross-sectional approach where GPs are integrated into the decision-making and follow-up is essential to obtaining significant clinical benefits of medication reviews [8].

To address these challenges, we developed and implemented the Telepharmacological Outpatient Clinic (TPOC) (Danish: Telefarmakologisk Ambulatorium), which is a virtual, cross-sectional, polypharmacy outpatient clinic. The outpatient clinic aims to provide patient-centred specialist counselling to GPs in the Region of Southern Denmark, focusing on rational pharmacotherapy in patients with polypharmacy. The outpatient clinic challenges the traditional secondary care focus on disease-specific treatment, which may occasionally hinder effective management of multimorbidity and the associated medication regimens [9, 10].

This study reports the development and implementation of the TPOC.

Methods

Setting and context

Danish healthcare is tax-funded, providing the entire population with free access to GPs and hospitals as well as partial reimbursement for prescription drugs [11]. GPs operate as self-employed professionals under a contract with public funding authorities, governed by a reimbursement and fee schedule system [2].

The TPOC is affiliated with the Department of Clinical Pharmacology at Odense University Hospital. Patients were referred from the entire Region of Southern Denmark, encompassing 1.2 million inhabitants and approximately 800 GPs across 350 clinics [12].

Intervention development

The TPOC was developed in response to a clear need for specialist counselling on polypharmacy and multimorbidity expressed by GPs. It was designed as a telehealth initiative, offering specialist counselling through virtual consultations. The intervention focused on counselling GPs, though patients were also encouraged to join the virtual consultations. Unlike traditional models, where patients attend outpatient clinics, this intervention supported GPs in maintaining their primary care responsibilities while facilitating improved access to specialist care. This clear delineation of responsibilities addressed barriers to medication changes during transitions from secondary to primary care, as highlighted by Strehlau et al. [13]. The aim was to mitigate the risk of healthcare fragmentation [13], which could lead to inconsistent care for patients with complex medication regimens, by providing specialist counselling to the healthcare professionals who interact with these patients most frequently [2].

A two-year pilot was initially planned, but it was expanded to three years due to the COVID-19 pandemic. An evaluation revealed high satisfaction levels and that the outpatient clinic was economically viable. This was reflected in a five-year extension of the operating grant, bringing the total funding to eight years. During the initial five years, the specialist team was expanded from one consultant in clinical pharmacology to also include a consultant in geriatrics and two clinical pharmacists.

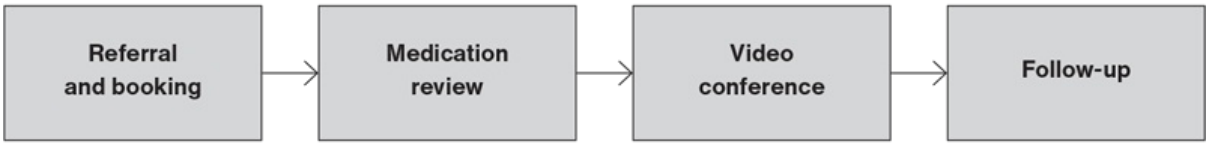
Eligible patients

All patients receiving at least five drugs and residing in the Region of Southern Denmark could be referred to the TPOC.

The intervention

The intervention consisted of four steps, as outlined in **Figure 1**.

FIGURE 1 Flow chart for the Telepharmacological Outpatient Clinic, illustrating the process from referral and booking to follow-up.



Referral and booking

GPs followed standard referral protocols, requiring only patient consent. The specialist team reviewed the referrals, and a video conference was scheduled at the GP's convenience. Booking options comprised either an integrated booking system, by telephone, or specifying a preferred time in the referral.

Medication review

A detailed medication review was conducted, tailored to specific inquiries from the patient or GP, such as possible adverse effects or opioid tapering. Standard items (Supplementary table 1) were routinely assessed, following the seven-step NHS Scotland framework for patient-centred medication reviews [14].

A clinical pharmacist conducted the initial medication review, which included analysing prescription patterns, lab results and drafting recommendations. A consultant subsequently reviewed the patient's medical history and adjusted the recommendations.

Video conference

The video conference was the core element of the intervention. The specialist team presented the medication review and recommendations to the GP in a 15-30-minute video conference, encouraging participation of the patient and relatives. Afterwards, the recommendations were appropriately adjusted, and a summary was added to the patient's medical record, ensuring transparency and accessibility for both the patient and healthcare providers.

GPs were remunerated for participation in the video conference according to a local agreement between the Region of Southern Denmark and the GPs' union [15].

Follow-up

GPs were encouraged to schedule a follow-up appointment if necessary. All patients underwent administrative follow-up three months after the video conference to support the GP in achieving continued patient compliance with the agreed medication changes.

General practitioner satisfaction

A structured questionnaire was developed to assess GPs' perceptions of the initiative. The questionnaire was anonymous and covered overall satisfaction, quality of the written report, and structure and flow of the video conference. Satisfaction was measured using a five-point Likert scale ranging from "Very dissatisfied" to "Very satisfied". A link to the survey was provided after the video conference.

Analysis

Demographic characteristics were presented as absolute numbers and proportions for categorical values;

medians, as IQR for continuous variables.

We examined referral trends over time. To assess the geographical distribution, we calculated referral rates per 100,000 inhabitants in each municipality as of 1 January 2024. In addition, the number of referrals was stratified by type of GP practice. We evaluated temporal patterns of video conference appointments, including the most frequent weekday for video conferences and the median time from referral to video conference. We also recorded the time spent on the medication review and video conference.

Descriptive statistics were used to summarise responses to the GP satisfaction questionnaire. Responses to each Likert scale item were assessed to determine the distribution of satisfaction levels.

Data were analysed using R version 4.2.2. Due to confidentiality policies, local guidelines prohibited the reporting of exact counts below five. Data were retrospectively collected as part of a quality assurance and improvement project, as permitted under Section 42d of the Danish Healthcare Act, and stored securely in accordance with institutional protocols.

Data-sharing statement

The authors are prohibited by Danish law from sharing national health data or granting access to it. Data may be accessed upon application and by contacting the relevant Danish authorities.

Trail registration: not relevant.

Results

A total of 364 patients were referred to the TPOC over the five-year study period. The patients had a median age of 74 years (IQR: 65-81 years), and 61.0% (n = 222) were female (**Table 1**). Approximately one in four (23.1%) were below 65 years of age.

TABLE 1 Characteristics of patients referred to the Telepharmacological Outpatient Clinic (N = 364).

Age, median (IQR), yrs	74 (65-81)
Age group, n (%)	
18-64 yrs	84 (23.1)
≥ 65 yrs	280 (76.9)
Sex, n (%)	
Female	222 (61.0)
Male	142 (39.0)
eGFR level, n (%)	
0-59 ml/min/1.73 m2	116 (31.9)
≥ 60 ml/min/1.73 m2	248 (68.1)
Drugs at baseline, median (IQR), n	17 (13-21)
Type of GP, n (%)	
Solo	45 (12.4)
Cooperation	319 (87.6)
Time from referral to videoconference, median (IQR), days	15 (8-26)
Reason for referral, n (%)	
Abnormal laboratory value	14 (3.9)
Suspected drug interactions	5 (1.4)
General symptoms	10 (2.8)
General medication review	218 (60.9)
Multiple symptoms	25 (7.0)
Patient request	21 (5.9)
Specific medication query	25 (7.0)
Specific symptom	40 (11.2)

eGFR = estimated glomerular filtration rate; GP = general practitioner.

The most common diagnoses were chronic pain (69.2%), hypertension (60.7%) and dyslipidaemia (45.3%) and a total of 152 (41.8%) patients had diabetes. The patients received a median of 17 drugs (IQR: 13-21) upon referral. The most frequently used drugs were paracetamol (85.4%), furosemide (45.0%), potassium (44.2%) and a supplement of calcium and vitamin D (42.6%). We proposed a median of 4.0 (IQR: 2.0-6.0) drug changes per patient, with changes recommended for 24.5% (n = 1,551) of all reviewed drugs. We recommended immediate discontinuation for 14.4% (n = 914), gradual discontinuation for 2.8% (n = 180), increased dose for 0.5% (n = 33), decreased dose for 3.9% (n = 249), and switching to another drug for 2.7% (n = 174).

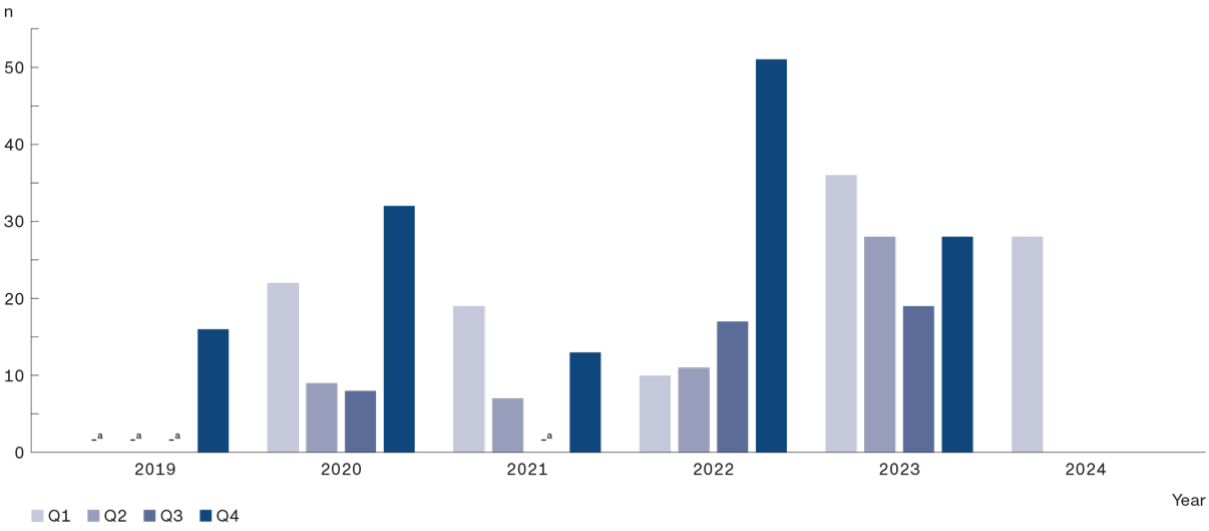
We recorded the median time spent on the medication review and video conference for 269 out of 364 patients

(73.9%), which were 186.5 minutes (IQR: 146.5-226.5 minutes) and 25 minutes (IQR: 20-30 minutes), respectively.

Referrals

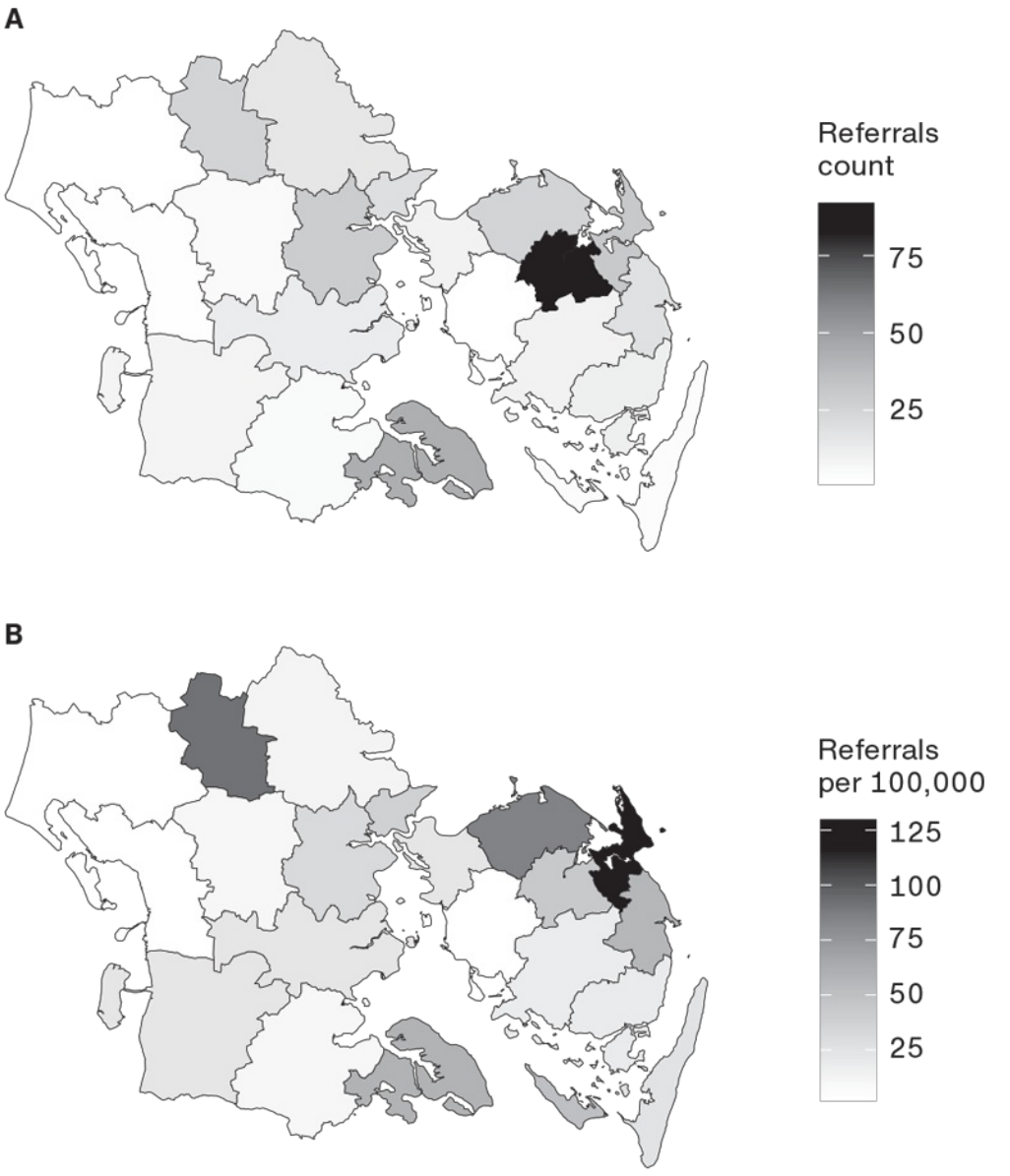
The number of referrals increased from a median of 3.5 (IQR: 1-5) per month in 2019-2020 to nine (IQR: 6-11.5) per month in 2023-2024 (**Figure 2**). GPs from 21 of the 22 (95.5%) municipalities in the Region of Southern Denmark referred patients during the five-year period (**Figure 3**). The highest proportion of referrals was from Odense (25.3%, n = 92), while the highest referral rate per inhabitant was from Kerteminde (130 per 100,000 inhabitants).

FIGURE 2 Quarterly referrals to the Telepharmacological Outpatient Clinic.



a) Numbers < 5 are not depicted in the figure.

FIGURE 3 Heat map of referrals by municipality.
A. The absolute numbers. **B**. The number of referrals per 100,000 inhabitants in the municipality.



A median of 15 days (IQR: 8-26 days) passed from referral to video conference, with no remarkable difference from 2019-2020 (17 days, IQR: 9-24.5 days) to 2023-2024 (17 days, IQR: 8-25.5 days). Thursday was the most common weekday for video conferencing (25.6%).

General practitioner satisfaction

We collected 80 completed questionnaires (22.0%). Overall, 94% of respondents were "Very satisfied" with the initiative, and 6% were "Satisfied". Satisfaction was high for both the quality of the written report (84% "Very satisfied", 16% "Satisfied") and the structure and flow of the video conference (86% "Very satisfied", 11% "Satisfied").

Discussion

The implementation and five-year operation of the TPOC provides insights into the feasibility and potential impact of a virtual, cross-sectional polypharmacy counselling service. The increase in referrals from 2019 to 2024 suggests mounting acceptance of the initiative.

Alongside satisfaction among GPs, the outpatient clinic has been well received by various stakeholders. The initiative was mentioned in the "Recommendations for Organising Care for People with Multimorbidity" published by the Danish Health Authority in 2023 [16]. These recommendations describe the complexity of managing multimorbidity and highlight the need for specialist counselling to support GPs [16]. In 2024, the Danish adoption of the Choosing Wisely initiative, "Vælg Klogt", mentioned the TPOC as a solution to specialist counselling on polypharmacy [17]. This recognition of the TPOC facilitates further utilisation of the initiative and suggests relevance to broader healthcare policies.

Laursen et al. identified several barriers faced by GPs in managing multimorbidity and polypharmacy, including a lack of dialogue with hospital-based specialists and an overemphasis on disease-specific guidelines rather than holistic patient care [9]. The TPOC aimed to address these issues by providing cross-sectional, patient-centred consultations. Our multidisciplinary team aligns with recent viewpoints on polypharmacy management. Thus, Barnet described the complementary skills of pharmacists and clinical pharmacologists, suggesting increased collaboration to achieve effective medicine optimisation initiatives across sectors [18].

Furthermore, the present study aligns with evidence presented in a recent scoping review on telehealth medication reviews [5]. The review highlighted telehealth-facilitated medication reviews as a feasible model, capable of improving clinical outcomes, optimising medication use and generating high patient satisfaction while reducing costs. However, the review also emphasised the limited evidence, with small sample sizes and a lack of randomised trials.

The primary barrier to implementing the TPOC was a lack of referrals. This is not a unique challenge [19], and it has required a considerable effort to promote the TPOC and achieve a steady referral rate. Promotion efforts included presentations at national and international conferences, visits to GPs and features in newsletters and the Danish Medical Journal [20].

Our study has limitations, including a low response rate to the GP satisfaction questionnaire. However, there were instances in which multiple patients were discussed at a single video conference, but only one questionnaire was completed. Another limitation of our study is the absence of direct patient-reported outcomes. Patient participation in video conferences was not recorded systematically, and most patients did not participate. Those who did often provided additional perspectives, occasionally influencing recommendations. Including patient feedback could potentially have offered a more comprehensive understanding of the impact of the intervention on patient-centred care and medication management.

Conclusions

The TPOC was a successful model for integrating cross-sectional specialist support into primary care management of polypharmacy. Its growing utilisation and positive reception indicate relevance in addressing multimorbidity and polypharmacy. Future efforts should focus on evaluating the clinical outcomes and cost-effectiveness of the TPOC, as well as sharing experiences to further develop the intervention and inspire new research in rational pharmacotherapy.

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Accepted 30 April 2025

Published 24 June 2025

Conflicts of interest none. Both authors have submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. These are available together with the article at ugeskriftet.dk/dmj

Acknowledgements We are grateful for all the help received from the Primary Healthcare Planning Unit (Praksisenheden) of the Region of Southern Denmark, especially from Department Head *Trine Malling Lungskov.* We are also thankful to *Palle Mark Christensen* for his invaluable assistance in developing the outpatient clinic.

References can be found with the article at ugeskriftet.dk/dmj

Cite this as Dan Med J 2025;72(7):A12240869

doi 10.61409/A12240869

Supplementary material: https://content.ugeskriftet.dk/sites/default/files/2025-04/a12240869_supplementary.pdf

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