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Home Treatment and Home Hospitalization for Cancer Patients: the role of the Oncology Pharmacist

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ABSTRACT

Home-based treatment represents a promising strategy to alleviate the burden on hospitals while simultaneously improving patient-centred care. In this position paper, seven experts from the clinical oncology pharmacy group of the European Society of Oncology Pharmacy (ESOP) global combined their practical experience with home treatment to identify barriers to implementation and to formulate recommendations for oncology pharmacists. The recommendations were developed by consensus and reviewed by other ESOP members, involving participation from nine countries in total. The findings highlight considerable regional variability within Europe, largely driven by differences in regulatory, organizational, and infrastructural constraints among countries and regions. Several key domains are identified as critical for the successful establishment of home treatment, including drug stability, delivery systems, patient and healthcare provider education, monitoring of safety and adverse drug reactions, and the integration of digital health solutions. Strengthening frameworks for home-based treatment, particularly in oncology, is essential to ensure a sustainable and compassionate alternative to conventional hospital-centred care. Further research and coordinated efforts are required to address regional disparities and to enable equitable access to high-quality home treatment across Europe.

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Introduction

The incidence of cancer continues to increase in Europe, partly due to population growth and ageing, partly due to shifts in lifestyle factors. It is estimated that there will be 5.4 million cancer patients in Europe by 2045.[1] At the same time, the healthcare workforce is not expanding enough to keep up with this growing case burden.[2,3] While most systemic anticancer therapies are still administered in hospitals and clinics, shifting some to patients' homes might alleviate part of the burden on the hospitals while providing benefits for patients at the same time. Several studies have shown a patient preference for home-based (chemo)therapy, but safety and cost-effectiveness should be further investigated.[4–6]

There are several options that are currently being used or developed to accommodate a shift from hospital care to home care. Three schemes are described in the literature and already used in practice:

1. *Ambulatory anticancer treatment:* the patient comes to the hospital or day-care unit where the administration is started. During the administration, the patient is then allowed to leave. Disconnection at the end is either done at the hospital (the patient returns) or by a home care nurse. This scheme is often used for continuous multi-day infusions (5-fluorouracil (5-FU) or blinatumomab).

2. *Home administration of anticancer treatment:* the patient stays at home and a nurse or doctor comes to the home to administer the anticancer treatment. This scheme is often used for subcutaneous administration of chemotherapy (bortezomib), for monoclonal antibody injections, for supportive treatments (growth factors or bisphosphonates) or anti-hormonal treatment (fulvestrant, GnRH analogues/antagonists). In some countries, self-administration (by the patient or a caregiver) is also possible.

3. *Home hospitalization:* an acute clinical service that takes staff, equipment, technologies, medication, and skills usually provided in hospitals and delivers that hospital care to selected people in their homes or in nursing homes. It substitutes for acute inpatient hospital care.[7] In cancer care, this scheme is mostly used in haemato-oncology.[8,9]

The aim of this position paper is to describe the current home-oncology practices represented within the ESOP working group and formulate expert recommendations regarding safe implementation and the role of oncology pharmacists.

Methods

This position paper was developed by a working group of seven experts from the Clinical Oncology Pharmacy Working Group of the European Society of Oncology Pharmacy (ESOP). Participants volunteered in response to a call for participation issued within ESOP and were selected based on their professional experience, expertise in oncology pharmacy, involvement in home treatment and/or hospital-at-home programmes, and willingness to contribute. The working group included experts representing a range of countries, including those countries in which home treatment is already available. Each working group member was responsible for verifying the information pertaining to their own country within their national network. A brief outline of the current practices of the experts was collected. The country examples are intended to identify barriers to the

implementation of home treatment and to provide inspiration for countries that aim to implement home treatment.

Recommendations were developed collaboratively based on the participating experts' clinical experience, professional knowledge, and relevant scientific literature identified and contributed by the group members. No systematic literature search or formal evidence-grading procedure was undertaken. The working group held six meetings during which the proposed recommendations were discussed, different perspectives and practices were considered, and the manuscript was progressively refined. Following these discussions, the draft manuscript and its recommendations were circulated to additional members of the clinical oncology pharmacy working group of ESOP to validate the results. Comments and suggestions received were considered by the working group and incorporated into the manuscript where appropriate, based on consensus. Overall, experts and delegates from nine countries contributed to the development and review process.

Recommendations should be interpreted as expert-informed recommendations intended to support oncology pharmacists in the safe implementation of home-based anticancer treatment, while recognising differences in national regulations, healthcare organisation, available resources, and local clinical practices.

Results and discussion

Country examples

An overview of the country examples is given in Table 1.

Table 1 Overview of country examples

Country	*Available therapies*	*Level of implementation*	*Limitations*
Portugal	monoclonal antibodies, hormonal therapy, bone-targeted agents, 5-FU	Differences across regions/hospitals	For home hospitalization: distance between home and hospital: maximum of 30 km
Spain	Immunotherapy, azacitidine, romiplostim, denosumab, 5-FU		For home hospitalization: continuous presence of a caregiver and a maximum of 30 min of travel time from the home to the hospital
Romania	No available therapies yet		
Italy	Continuous infusion therapies (elastomeric pumps, parenteral nutrition, etc.) and multiple therapies for chronic patients	Few hospitals have home treatment.	The training provided—or poorly provided—by health institutions to caregivers expected to work in the home is sometimes inadequate
Netherlands	monoclonal antibodies, azacitidine, bortezomib,		

	zoledronic acid, growth factors	Differences across regions/hospitals	Limited availability of nurses Reimbursement restraints
France	subcutaneous formulations, immunotherapies		Differences across regions based on hospital-at-home structure

5-FU = 5-fluorouracil, km = Kilometer, min = minutes

1. Portugal

Anticancer treatment administered at home currently consists of monoclonal antibodies, hormonal therapy (fulvestrant) and bone-targeted agents (denosumab and zoledronic acid). Immunotherapy is considered the next step for home administration; however, implementation is currently limited by a shortage of oncology nurses. 5-FU is already administered using an elastomeric pump that is connected in the hospital and the patient is discharged home with the device. For all anticancer therapies, the first two administrations are performed at the hospital, and the following cycles may be administered at home if infusion-related reactions are absent. Drug reconstitution is performed in the hospital and the medication is transported by a nurse to the patient's home. The hospital-at-home program is only available for patients living within 30 km of the hospital.

1. Spain

Anticancer therapy can be administered at home by an oncology nurse with blood sampling also performed at the patient's home. Some examples of home-based therapy consist of immunotherapy, azacitidine, romiplostim and denosumab. 5-FU can also be given via an elastomeric pump following the same procedure used in Portugal. The hospital-at-home program is available for patients undergoing bone marrow transplantation and for patients treated with leukaemia after receiving chemotherapy. For these patients, a hospital bed is permanently reserved. All medications, including oral agents, are dispensed by the hospital pharmacy. To participate in the hospital-at-home program, continuous presence of a caregiver is required, as well as a safe home environment and a travel time to the hospital of <30 minutes by public transport.

1. Romania

Home treatment in oncology is not yet available in Romania.

1. Italy

Oncology treatment at home is offered by relatively few hospitals and is commonly available in larger metropolitan areas in hospitals dedicated exclusively to oncology. In these oncology-focused hospitals, and with the essential support of patient associations, personalized home-based oncology care pathways can be implemented for patients who meet the criteria. These pathways are delivered by a multidisciplinary team consisting of a physician, a nurse and a psychologist or social worker. Home-based therapy predominantly includes continuous therapies in elastomeric pumps.

1. Netherlands

Home administration of anticancer therapy includes monoclonal antibodies, azacitidine, bortezomib and zoledronic acid. In some hospitals, gastrointestinal carcinoma patients and/or haematology patients are connected to a chemotherapy infusion in the hospital and subsequently discharged

home with the treatment in place. The major challenges for expansion of home-based oncology care are the limited availability of trained oncology nurses and insufficient funding for these services. Recent developments aim to increase patient autonomy by training patients or caregivers to perform selected tasks by themselves. Examples include elastomeric pumps, flushing peripherally inserted central catheters (PICCs) and self-administration of subcutaneous therapies (daratumumab or trastuzumab).

6) France

The administration of injectable anticancer treatments at home relies on the hospital-at-home (HAD) structures, affiliated with either a hospital or a community pharmacy. If the pharmacy does not operate a centralized chemotherapy preparation unit, drug preparation must be contracted to another pharmacy with this capability. Each HAD structure is coordinated by a physician and supported by a nurse and operates within a fixed funding framework. Organization varies by region resulting in uneven distribution of home-based chemotherapy across France. Protocol compendia (*thesauri),*, based on consensus between an oncologist and a hospital pharmacist, are used to define which treatments are eligible for home administration. Important aspects are the frequency of use and physicochemical stability. In practice, home administration predominantly includes subcutaneous formulations (e.g., trastuzumab, pertuzumab, bortezomib and azacitidine) as well as immunotherapies.

The examples from several European countries show that the level of implementation varies between regions even within the same country and that the overall implementation of home treatment remains limited, due to various encountered barriers. Based on the experiences in the different countries and expert opinion, the following aspects were considered important to set up a successful program for home administration and/or home hospitalization: stability of the drugs, drug delivery devices, education for patients and healthcare providers, safety and drug reactions and digital solutions. Each aspect will be discussed briefly below.

Stability of drugs

Successful transition of anticancer therapy from hospital to patients' homes requires appropriate procedures to guarantee the safety and efficacy of the therapy including monitoring the stability of the drug formulations. Therefore, it is critical to ensure that the medication can be prepared in a setting maintaining its physicochemical characteristics, as well as ensuring microbiological safety during production, transport, and until it is administered to the patient. For the physicochemical stability of the drug, controlling the temperature is an important aspect. Not only is drug degradation affected by high temperature, but also the viscosity of the formulation could change as could the properties of an elastomeric pump. Stability data should be collated and made readily available to assist in the optimal implementation of home cancer therapy. Bibliographic research is needed to confirm stability. Microbiological stability is essential as microbial growth can impact the safety of the chemotherapeutic agent. Preparation in aseptic conditions would eliminate microbiological concerns. Stability information can be found in the following sources: Summary of Product Characteristics (SmPC), Stabilis 4.0[10], UpToDate database[11], Trissel's[12] or digitally via Micromedex[13], through information from pharmaceutical companies or by conducting stability studies. The information of these sources should be combined and conclusions should be made per hospital and per intended care delivery pathway.

Drug delivery devices suitable for home treatment

To deliver safe treatment at home, reliable devices are required for parenteral administration. All devices have different advantages and limitations. An overview of devices is given in Table 2.

Table 2 Devices for home administration

Type of device	*Advantages*	*Limitations*
Conventional mechanical infusion pumps	Suitable for continuous as well as intermittent delivery	Multiple devices needed: pole, pump
Elastomeric pumps	No battery required Small size	Only continuous flow possible over preset time period Flow can be affected by temperature or wearing height
Battery operated ambulatory mechanical pumps	Small size Can be used on peripheral veins Suitable for continuous as well as intermittent delivery	Sensitive to air bubbles
Auto-injector devices like prefilled syringes or ready-to-administer devices	Easy to administer Suitable for self-administration	Self-administration not always allowed following drug label

Education

Education for both patients and healthcare professionals is essential for ensuring patient safety, independence and quality of life while optimizing hospital resources. Patient therapeutic education (PTE) aims to empower patients,[14] but support for patients or parents is necessary to ensure safety and feasibility.[15] Training and education should also include practical training in the use of medical devices, recognition of adverse effects and hygiene measures.[15,16] Regarding the comfort of staying at home, patients express mixed feelings, have some difficulties associated with self-managing their care and feel the need for more specific, personalised support.[17] This is also endorsed by Witwaranukool et al. (2024) who are planning a qualitative systematic review to better understand the perceptions of patients receiving chemotherapy at home.[18] Education could also support symptom management and improve the quality of life, by managing side effects and adopting preventive behaviours.[19,20] However, even with education, specific challenges still exist, for example harmonisation across regions.[21,22]

Safety of treatment at home

To increase the safety of home-based treatment, a multidisciplinary approach involving medical teams, patients, and caregivers, with rigorous hygiene and correct medication management procedures, is necessary. Most of the advice for safe treatment is comparable with hospital

treatment, however, some aspects are less strictly controlled in a home environment compared to a hospital environment. For example, excreta should be handled with care and hygiene standards are important to prevent infections.

Oncology pharmacists must implement robust safety measures to prevent and manage adverse drug events. Some of these recommended measures are:

- At least the first infusion of any systemic anti-cancer therapy (SACT) should be administered in the hospital setting to safely monitor for unexpected hypersensitivity, allergies, or anaphylaxis.[5,9,23]
- Regimen eligibility based on administration time and stability is important. For example, only intravenous infusions lasting ≤ 60 to 120 minutes, or subcutaneous/intramuscular injections and a minimum stability of 24 h are suitable for home administration, if administration is done at home by a nurse.[24]
- Drugs that require an extended observation time should be excluded from home administration.[9,23,24]
- SACT must be prepared in the Pharmacy Service using sterile class II biosafety cabinets according to the standards described in Quapos[25]. For subcutaneous or intramuscular drugs, syringes must be loaded with safety anti-reflux caps or anti-reflux stoppers to minimize exposure risks.[9,23]
- Medications must be transported in hard-walled, secure containers that are fastened during transit. The temperature inside the transport container must be actively monitored (e.g., using small temperature loggers or indicators) to ensure the required temperature is maintained.[23,24]
- Homecare nurses must be equipped with comprehensive spill kits containing personal protective equipment, absorbent materials, and specific cytotoxic waste disposal bags, if the delivered treatment consists of cytotoxics. Home treatment could introduce or increase an exposure risk of hazardous drugs for caregivers and households. Even though the advice is comparable for home and hospital environment, education is essential to use the advice correctly in a home environment.[23,24]
- Nurses administering SACT in the home must have immediate access to emergency medications like medications for allergic reactions (clemastine, dexamethasone), anaphylaxis and extravasations.[5,23,24]
- Establishing a dedicated 24-hour medical support telephone line with standardized symptom triage tools helps categorize toxicities (e.g., red/amber/green alerts) and guide immediate interventions, significantly reducing unnecessary emergency room visits.[9,23,24,26]
- Treatment adherence for pre-medication should be evaluated for patients who self-administer. For in-clinic patients or day admissions, treatment adherence is always checked before starting the infusions, however, this is also important for treatments with self-administration. Hospital pharmacists could help with medication reconciliation and counselling, providing patient and/or caregiver education, written plans, teach-back, and checking health literacy.[23]
- Patient instructions should be extremely concrete, covering timing, safety and monitoring and escalation. These instructions should be comparable with instructions for day admission or in-clinic treatment and should be harmonized with institutional (antiemetic) guidelines.[23]
- To safely treat a patient, accurate adverse drug reaction history must be readily available at the point of care and emergency medications should be available.[23]
- Hospital pharmacists could help with risk stratification to individualize premedication intensity or refining premedication.[23]

Digital solutions

eHealth apps (such as MY-Medula or Continuum+ Connect) allow patients or their caregivers to self-monitor and log vital signs (like blood pressure, heart rate, and temperature) and real-time symptoms. Digital solutions provide a continuous flow of information, even without the presence of a nurse, and bridge the gap between the hospital and the home environment.[27] Patients can report adverse effects using standardized criteria like the Common Terminology Criteria for Adverse Events (CTCAE).[28] They can also report unexpected or infrequent adverse events via free-text entries. This continuous documentation directly integrates into the patient's electronic clinical history.[6,27] When a patient logs a symptom or an adverse effect, the system generates an alert on the healthcare team's dashboard. Applications often use color-coded "traffic light" systems (red-orange-green) to categorize the severity of the alerts, allowing pharmacists and the clinical team to immediately prioritize interventions for patients developing severe or worsening toxicities.[27]

Telepharmacy and apps could help pharmacists assess medication adherence and the data also help pharmacists to track whether adverse events are negatively impacting a patient's adherence to their oral chemotherapy and to provide targeted counselling.[29,30] eHealth apps preferably have real-time bidirectional chat systems that allow patients to send text messages. A direct line of communication allows the pharmacist and the care team to address patient questions, clarify medication instructions, and manage clinically important adverse events early on, preventing them from escalating to severe (grade 3–4) toxicities and avoiding unnecessary hospital readmissions or emergency room visits.[27] However, there are two important disadvantages of using health apps. First, the safety and privacy of the patient should be secured. Furthermore, one app should be used in a large region, to prevent implementation of several apps in one hospital or for a nurse care organization.

Strengths and Limitations

This position paper has several strengths and limitations. One of its main strengths is the contribution of oncology pharmacy experts from different European countries, providing diverse perspectives on the implementation of home-based cancer care. In addition, the manuscript and its recommendations were reviewed by other ESOP delegates who were not directly involved in the writing process, allowing for broader professional input. However, several limitations should be acknowledged. The first and most important limitation is the selection of the working group, which was formed on voluntary participation rather than systematic expert selection. Furthermore, the selected literature was not based on a systematic review because that was not the scope of the position paper, but therefore, selection bias of the included literature might be a risk. Importantly, patients and caregivers did not participate in the development of the recommendations. Further work should therefore involve patient and caregiver representatives. Further research should also include equity to reduce the differences between patients based on region or other factors such as stable housing or caregiver availability.

Conclusions

Home-based care for oncology patients treated with parenteral anticancer medicines is an emerging development in cancer management that may help align cancer treatment with patient-centered

priorities. By enabling treatment, monitoring, and supportive care in the home environment, this approach has the potential to improve quality of life, promote patient autonomy, and may reduce healthcare system burden. However, the current evidence on the safety and effectiveness of home-based care remains limited, and practical experience is still scarce. Its successful implementation is likely to depend on robust multidisciplinary coordination, adequate caregiver support, and the integration of clear clinical protocols to ensure safety and continuity of care. The involvement of hospital pharmacists is considered essential to ensure appropriate medication management, adherence, and pharmacovigilance.

As oncology care continues to shift toward ambulatory therapies, strengthening home care frameworks will be critical. The expansion of structured home care models may offer a sustainable and compassionate alternative to traditional hospital-centred care. Future efforts should focus on generating further evidence from clinical practice, standardizing practices, using digital health tools, and addressing disparities in access so that all patients can benefit from high-quality, equitable oncology care at home and continuous evaluation of outcomes to ensure safety, efficiency, and sustainability of care delivery.

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