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Intravenous Treatment in Home and Outpatient Settings: A Comprehensive Literature Review

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Abstract

The clinical homecare sector has become increasingly associated with high-cost injectable (parenteral) drug treatments and is expanding rapidly in the United Kingdom, with an annual growth rate of 20%. It is predicted that this could increase to 60% if all medications suitable for home care were included. Recent figures indicate the continued growth of homecare medicines services, which now serve over 500,000 patients, with expenditures reaching £3.2 billion in 2021. Given the substantial spending by the National Health Service (NHS) and the large patient population, it is important to examine the experiences, opinions, and perspectives of both patients and healthcare professionals (HCPs) regarding this therapy. This review seeks to examine the experience of home parenteral therapy (HPT) through qualitative research approaches. By expanding on existing quantitative research, the aim is to gain a deeper understanding of the topic. As highlighted in this review, homecare offers potential benefits, such as cost savings and enhanced patient experience. However, several challenges have been observed globally. Key factors for successful homecare implementation include patient education, support, training, ongoing supervision, and HCPs' competencies in managing patients. These elements play a critical role in determining whether the self-administration of parenteral therapy at home is successful and may significantly impact treatment adherence and outcomes. This area requires urgent research.

Keywords: Patient experience, Home parenteral therapy, Homecare, Healthcare at home, Self-administration, Self-injection

Introduction

The shift from hospital-based care to home-based care has become increasingly prevalent in recent years, driven by advancements in technology, evolving healthcare practices, patient preferences, and a focus on reducing healthcare costs [1]. Patients, particularly those with chronic conditions, are increasingly being discharged from hospitals with parenteral (injectable) treatments to manage at home for either a short or long-term period [2]. Homecare treatments, ranging from simple injections to more complex therapies like home parenteral nutrition (HPN), require specialized skills such as aseptic techniques, CVC management, and the use of infusion devices. Such treatments are considered convenient, and flexible, and allow for greater independence compared to hospital care [3, 4]. Moreover, homecare helps to reduce the chances of hospital readmissions and is often safer for vulnerable populations, including immunocompromised individuals, children, and the elderly, who are at higher risk of acquiring hospital-based infections [5].

The homecare sector, often linked to high-cost medication, has been expanding rapidly in the UK, with an annual growth rate of over 20%. This growth is expected to continue, with estimates suggesting it could increase to 60% if all medications suitable for homecare are included [6]. In 2011, approximately 200,000 people in England utilized homecare services, with an expenditure of £1 billion [7]. By 2019, the number of

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patients receiving these services had risen to 355,000, with the sector accounting for 25% of the NHS's secondary care medicines budget, totaling £2.1 billion [6]. The growth continued in 2021, with over 500,000 patients and an expenditure of £3.2 billion [8]. However, a study by Potera found that 84% of patients using autoinjectors at home made errors, with many missing multiple steps in the administration process [9]. Furthermore, the forgetting curve theory suggests that without practice and repetition, patients tend to forget much of the information provided during training. Within an hour, around half of the information may be forgotten, with 80% lost within two days and 90% within a week [10].

Objective

This review seeks to explore the experience of home parenteral therapy (HPT) through qualitative research approaches. By expanding on existing quantitative research, the aim is to gain a deeper understanding of the topic. The insights gained can help improve service delivery in this specialized field and assist service commissioners in assessing service quality in the future.

Materials and Methods

To gather relevant research, a search was conducted on the PubMed/MEDLINE database using a combination of keywords such as home injectable therapy, parenteral therapy, injections, patient experience, biologic therapy, patient training, homecare, self-administration, self-injection, autoinjector.

Results and Discussion

Home parenteral nutrition (HPN) and intravenous fluid therapy

Parenteral nutrition (PN) is a highly intricate intravenous (IV) solution that contains all the necessary nutrients mixed into a single bag [11]. It is typically prescribed for long-term use when the gastrointestinal tract fails to absorb sufficient nutrients to support life [12]. PN is essential when oral or enteral feeding is not viable, or when nutrition absorption is inadequate. Chronic intestinal failure (CIF) may result from issues such as intestinal resection, fistulae, obstructions, or extensive damage to the small intestine, caused by either benign or malignant conditions [13, 14]. For patients with chronic or irreversible intestinal failure, home parenteral nutrition (HPN) is the primary therapy that can be administered at home, potentially for extended periods or even lifelong [12, 14].

Care for HPN patients is typically supported by family members or community-based healthcare professionals. However, managing the strict regimen of HPN can be challenging for both patients and caregivers. This treatment often leads to issues such as fatigue, depression, social isolation, and reduced physical activity. There are also concerns about life-threatening infections, side effects, and the financial costs of the treatment. Both patients and caregivers must follow rigorous aseptic techniques and use infusion-control devices. The typical HPN regimen requires 12-hour infusions, often at night, which can disrupt sleep due to pump alarms, noises, and the need for frequent bathroom trips. These disruptions have been shown to negatively affect quality of life (QoL), especially in terms of family and social dynamics [15, 16].

In one reported case, a caregiver's misprogramming of an HPN pump resulted in the rapid infusion of pediatric IV lipid emulsion, causing fat overload syndrome in a 2-year-old [17]. Venous catheter infections are a common and serious complication of HPN [18]. Managing the central venous catheter is a demanding task, leading some patients and caregivers to feel dependent on the treatment and concerned about being a burden [15]. HPN, being an invasive therapy, often presents additional physical and psychological challenges, including anxiety about severe complications like infections, thrombosis, or liver failure [19].

According to Baxter [18], the impact on QoL is linked to the frequency of HPN infusions per week and the need for “HPN-free days.” Healthcare professionals require effective tools to address both the medical and psychological challenges that accompany this treatment, an area that has not been thoroughly explored in the UK [20].

Immunoglobulin replacement therapy (IRT)

Immunoglobulin replacement therapy is essential for patients with immune deficiencies, both primary (PID) and secondary (SID), where the immune system’s function is impaired. PID includes a wide range of more than 200 rare inherited disorders, often leading to increased vulnerability to repeated infections, especially bacterial ones in the respiratory system. Common variable immunodeficiency (CVID), a prevalent form of

PID, is characterized by abnormally low levels of immunoglobulins IgG, IgA, and IgM, and an inability to generate specific antibodies. SID, on the other hand, may occur due to infections, poor nutrition, or the effects of immunosuppressive treatments [21].

The primary objective of IRT is to restore normal levels of IgG in the bloodstream, thus enhancing immune defense, reducing the frequency of infections, improving overall well-being, and limiting the progression of any organ damage associated with these deficiencies [22]. IRT can be delivered via intravenous (IVIg) or subcutaneous (SCIg) methods. While both methods can be administered at home, SCIg is generally more common for home-based therapy, with IVIg primarily used in hospital settings [4, 22, 23]. SCIg treatments involve smaller, more frequent doses, leading to more consistent IgG levels, while IVIg is given in larger doses at longer intervals [21]. Home administration of SCIg is less expensive and more effective compared to hospital-based IVIg for patients with PID, leading to better health outcomes [24].

Research by Risso *et al*. [3] indicates that both patients and caregivers preferred home therapy over hospital-based treatments, such as IVIg and SCIg, primarily because of the benefits such as fewer hospital visits, reduced travel costs, and the ability to manage treatment in a more familiar environment. They highlighted the advantages of controlling infusion schedules, avoiding hospital-acquired infections, and the convenience of self-adjusting infusion rates to personal comfort. However, initial experiences with home treatment, especially during the learning phase, were often challenging for both patients and caregivers due to unfamiliarity with the procedures [4].

In contrast, a study involving young children aged 1-5 years found that parents favored hospital-based IVIg therapy due to the ease of monthly treatments and concerns about administering injections at home, as well as the perceived benefit of regular hospital visits for better disease control [23]. Parents reported greater peace of mind and less anxiety with IVIg, despite the inconvenience of frequent hospital visits. Families opting for SCIg, however, reported fewer side effects with this method [23]. A separate study involving older children (ages 5-15 years) and their parents found that home-based SCIg therapy was preferred, with greater satisfaction compared to the hospital-based IVIg option [25, 26].

Outpatient parenteral antimicrobial therapy (OPAT)

Outpatient parenteral antimicrobial therapy (OPAT) enables patients to receive intravenous antibiotics at home instead of staying in the hospital, provided they are clinically stable enough for home care. This approach is increasingly utilized for managing various infections, with antibiotics delivered via venous catheters by trained patients, caregivers, or healthcare professionals [27, 28].

Research by Keller *et al*. [28] examined how patients and caregivers performed OPAT-related tasks at home. The study found that the tasks involved were complex and carried potential risks. It was noted that patients often faced difficulties understanding the provided instructions, finding patient manuals hard to navigate, and receiving inconsistent guidance from different nurses. Issues such as unclear understanding of the medication administration schedule, proper hand hygiene practices, when to use gloves, and the required temperature for drug administration were common. Additionally, patients frequently forget to carry out necessary tasks like flushing all venous catheter lumens, skin sanitization, and air removal, or improperly clamping or unclamping the catheters. The study emphasized that patients and caregivers must master several crucial tasks to manage OPAT successfully, including understanding the treatment, ensuring timely delivery of supplies, administering medications, maintaining the catheter, performing daily activities, troubleshooting, and monitoring while on therapy. The researchers concluded that healthcare professionals could enhance their support for OPAT patients and caregivers to improve outcomes [28].

In a small UK-based qualitative study [29], parents of children undergoing pediatric OPAT shared their experiences. Despite some anxiety, both parents and children felt that home treatment provided a sense of security and normalcy, helping the family cope with the stress of the child's illness. Although the inconvenience of daily medication administration was acknowledged, parents appreciated the availability of hospital support when needed. However, most parents did not recall receiving information about potential adverse events (AEs) associated with OPAT. Some mentioned being too focused on care or too fatigued to fully review the instruction manuals until after the therapy was complete. While most parents considered any concerns about OPAT to be manageable, one parent described the experience as "scary," while another felt it was like "you

deal with it now that you're home" [29]. Glick's research also noted that parents often made errors and struggled with the complexity of discharge instructions [30].

Palliative home care therapy

In palliative care, managing complex symptoms often involves the administration of subcutaneous (SC) medications, especially for patients at the end of life who are unable to take oral medications due to their condition, which may cause symptoms like nausea, vomiting, delirium, agitation, or difficulty swallowing [31]. These patients' conditions can deteriorate quickly, sometimes outside regular working hours, when access to support is limited [32]. Additionally, the growing demand for community-based palliative care is putting increasing pressure on hospital resources [33].

Research has shown that educating caregivers to competently prepare and administer SC medications can enhance their confidence and ability to care for terminally ill family members at home, providing essential symptom relief [33]. However, a significant concern regarding this practice is the perception that it may cause unnecessary stress or anxiety for both caregivers and patients, potentially impacting the grieving process, as well as raising legal concerns for healthcare providers and caregivers [33, 34].

A recent systematic review [35] highlighted that healthcare providers believed anticipatory prescribing could improve symptom control, offer reassurance, and reduce hospital admissions. However, the review also pointed out the lack of sufficient evidence regarding patients' perspectives on the therapy, its impact on symptom management, patient comfort, safety, and hospital admissions.

Home chemotherapy

While chemotherapy is typically administered in hospital or outpatient oncology centers, home chemotherapy has gained attention for its patient satisfaction benefits when delivered by a trained nurse [36]. The advantages of receiving chemotherapy at home include enhanced communication, personalized care, and greater autonomy, as well as reduced travel-related issues, improved family involvement, less disruption to daily life, decreased anxiety, shorter wait times, a familiar and private setting, and fewer financial concerns. However, patients have also expressed several concerns, such as the risk of infusion device malfunction or extravasation, absence of direct professional oversight, the commitment of unpaid caregiving time, limitations on daily activities, hobbies, and sports due to the portable infusion device, and a lack of interaction with other cancer patients, which makes it harder to escape the experience of illness and treatment [37]. A UK study evaluated the experience of home chemotherapy under the supervision of highly trained nurses and concluded that for patients to self-administer cytotoxic therapy at home, they must undergo thorough training from qualified healthcare professionals. Detailed written and verbal instructions about drug handling, storage, administration processes, use of personal protective equipment, waste disposal, and cytotoxic spill management are essential [38, 39].

Allergen-specific immunotherapy (IT)

Allergen-specific immunotherapy (IT) is a treatment designed to alter the course of allergic rhinitis by exposing patients to allergenic proteins in immunologically active tissues under the skin or in the oral mucosa (e.g., grass pollen immunotherapy for patients with immunoglobulin E (IgE)-mediated seasonal allergic rhinitis) [40]. While subcutaneous immunotherapy (SCIT) is the most common form, it is not the preferred delivery method for many patients. However, those who do prefer SCIT appreciate that it does not require daily administration and lacks the unpleasant taste or mouth irritation that oral IT may cause. The primary barriers to adherence to SCIT include inconvenience, dislike of injections, concerns about the treatment's effectiveness, and its associated costs [41].

Heart failure home inotropic infusion therapy

Heart failure (HF), or congestive heart failure (CHF), encompasses a range of cardiac conditions that impact factors such as blood circulation, tissue perfusion, and myocardial function. These conditions, often linked to hypertension or acute myocardial infarction, may worsen due to other factors like coronary artery disease or ventricular hypertrophy [42]. For patients with advanced HF, options are often limited, and those with severe conditions may undergo interventions such as cardiac transplants or mechanical circulatory support to extend life and improve quality of life (QoL). Inotropes can be used to stabilize HF patients while awaiting heart transplants or as part of palliative care when surgery is not an option. These medications, including digoxin, dopamine, dobutamine, norepinephrine, milrinone,

levosimendan, and omecamtiv mecarbil, are commonly administered through long-term central venous catheters. Once patients are stabilized, they may be discharged to continue treatment at home until a definitive procedure is performed [43]. For patients in end-stage HF, inotropes provide palliative care, and patient education is critical to understanding the therapy's benefits and risks, allowing them to make informed decisions. Successful home therapy requires adequate training for both patients and caregivers, as well as a well-organized home healthcare support system [42].

Hereditary angioedema (HAE) home infusion therapy

Hereditary angioedema (HAE) is a rare genetic disorder that causes recurrent, unpredictable episodes of non-itchy swelling in various body parts, including the extremities, abdomen, urogenital region, and respiratory tract [44-46]. These attacks can be excruciating, disfiguring, and life-threatening, particularly if they involve the airway. Swelling episodes can range in frequency from more than once a week to less than once a year, and they do not respond to typical treatments like antihistamines or glucocorticoids. The condition is most often caused by a deficiency in the C1 esterase inhibitor (C1-INH), leading to inappropriate activation of the kallikrein-kinin system and excessive bradykinin production, which increases vascular permeability and causes edema [44, 46, 47].

The two primary types of HAE are type I (HAE-1), accounting for 80-85% of cases and characterized by low levels of functional C1-INH, and type II (HAE-2), which affects 15-20% of patients and is marked by normal or elevated but dysfunctional C1-INH levels [44, 45]. Management of HAE involves on-demand treatment for acute attacks and prophylactic therapies to reduce attack frequency and severity, though acute attacks cannot be eliminated. Effective treatments for both HAE-1 and HAE-2 include plasma-derived C1-INH (pdC1-INH), recombinant human C1-INH (rhC1-INH), icatibant, and ecallantide, with different approaches used for short- and long-term prophylaxis [48].

Guidelines recommend home treatment for HAE when feasible, as it significantly decreases hospitalizations, reduces the use of androgen-based therapies, lowers attack frequency, and improves the patient's QoL and satisfaction [48, 49]. Patient selection for home therapy depends on several factors, including the severity and frequency of attacks, the effectiveness of current prophylaxis, and the patient’s ability to manage the treatment at home. Considerations include mental and physical health, the availability of support, patient education, and venous access quality, among others. While home infusion of acute treatments such as pdC1-INH is widely accepted, self-administration of ecallantide is not recommended due to the risk of anaphylaxis [50].

Rheumatoid arthritis (RA) management

Rheumatoid arthritis (RA) is a prevalent chronic autoimmune condition, predominantly affecting older adults, especially females. Its exact cause remains unclear, but it is marked by the infiltration of immune cells such as T-cells, B-cells, and macrophages into the joints, where they release cytokines that lead to the destruction of bone and cartilage. Key pro-inflammatory cytokines involved in RA include TNF-α, IL-1, IL-6, and GM-CSF, which contribute to the inflammatory response [51].

RA impacts synovial joints, causing progressive disability and significant socioeconomic consequences, eventually leading to premature death. It typically presents with symmetrical joint involvement, including symptoms like joint pain, swelling, redness, and restricted movement. Early detection and intervention within the first 12 weeks of symptom onset are critical in preventing joint damage and preserving function [51, 52].

Most of the biological therapies used in RA treatment are administered parenterally. To mitigate the challenges associated with parenteral administration, self-injection devices have been developed, though they come with their own set of difficulties, such as needle phobia, injection site reactions (pain and stinging), lack of confidence, incorrect administration, and non-adherence, especially in patients with arthritis-related deformities [53, 54].

A study revealed that patients often felt disempowered in their treatment decisions, lacking sufficient information and involvement in the treatment planning process. Health care providers (HCPs) tended to focus on disease treatment rather than addressing patients' concerns or providing adequate training on self-injection, leading to anxiety, fear of injections, and a negative social stigma around the treatment. Many patients expressed a desire to be better informed and to have a more active role in their care decisions [54]. Another study showed that using more user-friendly devices with fewer side effects

improved the overall treatment experience [55]. A UK-based study found that younger patients (< 61 years) were more confident with self-injection and preferred subcutaneous over intravenous therapy. In contrast, older patients preferred intravenous infliximab administered by HCPs and desired more interaction with other patients and staff availability for support [56].

Multiple sclerosis (MS) treatment

Multiple sclerosis (MS) is a common autoimmune disease that typically affects young adults. It involves the infiltration of activated lymphocytes and other immune cells into the central nervous system (CNS), causing inflammation, demyelination, and neurodegeneration [57, 58]. MS is characterized by demyelinated lesions or plaques in the CNS, which impair motor and sensory functions [59].

While the exact cause of MS remains unknown, it is thought to involve a combination of genetic, viral (especially Epstein–Barr virus), and environmental factors such as vitamin D deficiency, smoking, and obesity. The disease is characterized by the presence of T-lymphocytes, with B-cells and plasma cells contributing to a lesser extent [57, 60, 61].

MS typically starts with a relapsing-remitting pattern, but over time, relapses become less frequent, with incomplete recovery, leading to progressive disability and secondary progressive MS. This progression often occurs 10-15 years after the disease's onset, with many patients becoming unable to work or dependent on a wheelchair within a decade. Life expectancy is reduced by 5-10 years on average. A small percentage of patients experience primary progressive MS from the outset, and there are currently no disease-modifying treatments available for this form [57, 62]. Symptoms of MS vary depending on the location of inflammation in the brain and can include fatigue, depression, neuropathic pain, spasticity, and difficulties with movement and bladder function [57, 62].

First-line treatments for MS include interferons, which modulate immune responses by inhibiting inflammatory cytokine production and reducing T-cell activation and migration across the blood-brain barrier. Glatiramer acetate, another treatment, modulates immune cell functions and induces anti-inflammatory responses at the site of lesions in the CNS [58].

Despite the availability of disease-modifying therapies (DMTs), adherence rates are notably low, with only 30-40% of patients adhering to treatment two years after starting therapy. Factors contributing to poor adherence include the frequency of injections, perceived lack of immediate treatment benefits, side effects, cognitive impairments, and fatigue [63]. Autoinjectors have been developed to address some of these challenges by providing more convenience, reducing discomfort, and offering reminders, which may help improve adherence and the overall treatment experience [64-66].

Therapeutic approaches for inflammatory bowel disease (IBD)

IBD refers to two chronic conditions that cause inflammation in the digestive tract: Crohn's disease (CD), which can affect any part of the gastrointestinal system, and ulcerative colitis (UC), which is limited to the colon. Both diseases have no curative treatment, and the main objective is to alleviate inflammation, promote healing, prevent colorectal cancer, and manage remission [67]. The introduction of monoclonal antibody (mAb) therapy has significantly impacted IBD management.

A variety of biological agents from various classes are available for the treatment of moderate to severe cases of UC or CD [68]. In CD, medications like infliximab, vedolizumab, adalimumab, and ustekinumab are commonly used. UC treatments include infliximab, golimumab, adalimumab, vedolizumab, and ustekinumab [68]. Infliximab and adalimumab are often used to manage severe active CD in patients who do not respond to conventional therapies such as immunosuppressants and corticosteroids [69]. Vedolizumab is recommended as a second-line treatment when anti-TNF agents like infliximab or adalimumab fail to control symptoms. Ustekinumab is also considered when immunosuppressants or steroids are ineffective, or when an anti-TNF drug is unsuccessful. In UC, vedolizumab can be used if other medications have failed or when anti-TNF drugs are ineffective [70]. Vedolizumab works by selectively targeting the gut to prevent leukocyte infiltration into the gastrointestinal submucosa, enhancing its safety profile. However, some skin side effects, such as psoriasis and acne, have been reported [71, 72]. Studies indicate that infliximab and adalimumab have similar efficacy in treating CD [73]. Infliximab is typically administered intravenously every 4-8 weeks in a clinical setting, whereas adalimumab and, more recently, infliximab can be self-administered subcutaneously at home every two weeks. The choice

between these options is often based on patient preference [68, 74].

Allen *et al*. [75] observed that patients preferred receiving infliximab in a hospital setting over self-injecting adalimumab at home. This preference was attributed to the frequency and method of administration, with many patients expressing discomfort with self-injection despite recognizing the convenience of home administration.

Use of low-molecular-weight heparin (LMWH) in thrombosis prevention

Venous thromboembolism (VTE), which includes deep vein thrombosis (DVT) and pulmonary embolism (PE), is a common and preventable cause of morbidity and mortality in hospitalized patients. DVT occurs when a clot forms in a deep vein and obstructs blood flow, while PE occurs when a clot travels to the lungs, blocking pulmonary blood flow. Hospital-associated thrombosis (HAT) can develop up to ninety days post-surgery or discharge, with patients being at high risk for VTE [76]. Research shows that approximately 42 percent of medical inpatients are at moderate to high risk for developing VTE, with 10-20% experiencing VTE during their hospital stay. VTE is responsible for more than 10% of inpatient deaths [77], with HAT accounting for 50-60% of VTE cases [78]. Clinical trials [79, 80] demonstrate that thromboprophylaxis can reduce DVT risk by 50-65%.

The National Institute for Health and Care Excellence (NICE) VTE guidelines [78] recommend LMWH as the first-line option for VTE prevention, administered via subcutaneous injection. Additionally, NICE advises extending VTE prophylaxis with LMWH for up to 35 days after discharge for certain patients.

NICE also emphasizes that patients discharged with pharmacological VTE prevention must be capable of administering their treatment independently or have assistance available [78]. However, despite the presence of guidelines, adherence to outpatient LMWH therapy remains a challenge. Non-adherence rates range from 13% to 21%, with some patients missing 38% to 53% of their injections after surgeries like knee and hip arthroplasties. Approximately 13% of patients either refused or forgot to administer their injections [81]. Factors such as anxiety, discomfort, fear, a lack of understanding about VTE risks, and the purpose of prophylaxis contribute to this non-adherence [82]. A study exploring patient experiences with VTE prevention found varying levels of training, with some patients receiving detailed demonstrations, while others only received basic instructions. The study also highlighted a general lack of awareness among patients about the symptoms of VTE and the risks of PE.

Enzyme replacement therapy (ERT) for fabry disease

Fabry disease (FD) is an inherited, progressive disorder linked to the X chromosome, caused by a deficiency in the enzyme alpha-galactosidase A. This enzyme deficiency leads to the buildup of globotriaosylceramide and related glycosphingolipids within lysosomes in various cells, such as those in the heart, kidneys, blood vessels, and nerves. As these substances accumulate, they disrupt cellular function, triggering harmful processes like oxidative stress, tissue ischemia, and cellular death, which lead to fibrosis in organs such as the heart and kidneys. The disease typically begins in childhood, progressively damaging organs and reducing life expectancy as it advances [83]. Recombinant human alpha-galactosidase-A enzyme replacement therapy (ERT) was introduced as a treatment in 2002.

Since FD requires lifelong treatment with ERT, patients typically receive intravenous infusions every two weeks, which can be a burden on their daily lives, affecting their overall quality of life [84]. However, the option to receive home-based infusions has emerged as a promising alternative, offering increased convenience, cost savings, and improved patient satisfaction, though this may not be suitable for everyone [85]. Initially administered in a hospital setting, the treatment can be shifted to the home setting under the supervision of trained nurses, as long as the patient is stable, tolerates the infusions well, and has no adverse reactions, with a suitable home environment [83, 84].

Injectable medications for hypercholesterolemia

Reducing low-density lipoprotein cholesterol (LDL-C) is a key component in lowering cardiovascular risk, and statins are generally the first-line treatment. However, some patients experience side effects, such as muscle aches or weakness, or they do not achieve sufficient LDL-C reduction even with high-intensity statin therapy, especially in cases like familial dyslipidemia, leaving them at high risk for cardiovascular events [86].

Cholesterol is produced primarily in the liver and intestines through the enzyme 3-hydroxy-3-

methylglutaryl-coenzyme A (HMG-CoA). Once produced, cholesterol is carried by LDL particles in the blood. The liver removes LDL-C from the bloodstream by binding LDL particles to low-density lipoprotein receptors (LDLR), where the complex is internalized and either degraded or recycled to the cell surface. Proprotein convertase subtilisin/kexin type 9 (PCSK9) regulates LDL-C levels by reducing the recycling of LDLR, leading to its degradation. As a result, fewer LDLRs are available on the liver surface, reducing LDL-C clearance. When PCSK9 does not bind to LDLR, the receptor is recycled, promoting greater LDL-C clearance from the blood [87, 88]. New monoclonal antibody (mAb) therapies that target and inhibit PCSK9 offer a powerful means of lowering LDL-C levels.

The National Institute for Health and Care Excellence (NICE) guidelines recommend PCSK9 inhibitors for patients with primary hypercholesterolemia or mixed dyslipidemia who have high cardiovascular risk. These medications are advised when LDL-C levels remain above 4.0 mmol/l, or for patients with elevated cardiovascular risk and LDL-C above 3.5 mmol/l. For those with primary heterozygous familial hypercholesterolemia without cardiovascular disease (CVD), evolocumab and alirocumab are recommended when LDL-C is above 5.0 mmol/l, or when the risk of CVD remains high despite maximum lipid-lowering therapies [89, 90]. Evolocumab can be administered subcutaneously by patients at home after receiving proper training from healthcare providers [91]. There are no notable differences in patient adherence or preference between monthly or bi-weekly dosing schedules [86].

Psoriasis (Ps) and psoriatic arthritis (PsA) treatment approaches

Psoriasis (Ps) is a chronic, systemic autoimmune disease with a genetic predisposition, characterized by inflammation of the skin. Its course tends to follow a relapsing-remitting pattern and is often associated with other inflammatory conditions, such as psoriatic arthritis (PsA), inflammatory bowel disease, and coronary artery disease [92-94]. Psoriasis has profound impacts on physical health, mental well-being, and quality of life (QoL), often leading to reduced work productivity and absenteeism [94, 95]. The most prevalent form, affecting about 90% of Ps patients, manifests as sharply defined, erythematous, itchy, and scaly plaques that may be localized or spread over large areas of the skin. The epidermis exhibits thickened layers (acanthosis and hyperkeratosis), resulting in raised, scaly skin lesions [51]. Other variants include inverse, guttate, and pustular psoriasis [92, 93].

Inflammatory cells infiltrate all layers of psoriatic skin lesions, comprising dermal dendritic cells, macrophages, T-cells, and neutrophils. Cytokines like TNFα and interleukins (IL-12, IL-17, IL-23) contribute to the disease's inflammatory pathways [51, 93]. Around 20% of individuals with Ps also develop Psoriatic Arthritis (PsA), which leads to joint pain, stiffness, swelling, and inflammation in tendons and ligaments, often manifesting as dactylitis and enthesitis.

Managing patients with both severe Ps and PsA presents unique challenges and requires close collaboration between dermatologists and rheumatologists. Interestingly, the severity of skin symptoms does not always correlate with joint involvement [96]. To assess disease severity, the Psoriasis Area Severity Index (PASI) is used, which evaluates plaque appearance (erythema, induration, and scaling) and the extent of affected skin. The dermatology life quality index (DLQI), a validated questionnaire, measures the physical, psychological, and social impact of psoriasis on QoL [92].

PASI and DLQI scores help assess disease severity and QoL impacts, which guide treatment decisions. Psoriasis is classified as mild if the DLQI ≤ 5, typically managed in primary care, while severe Psoriasis (PASI ≥ 10 and DLQI ≥ 10) may require specialist referral and systemic or biologic therapies [92, 96].

For mild to moderate psoriasis, topical treatments such as emollients, corticosteroids, vitamin D analogs (e.g., calcipotriol), dithranol, and coal tar preparations are usually effective. In more severe cases, systemic therapies are often necessary, including non-biological small-molecule agents (e.g., methotrexate, ciclosporin, acitretin, fumaric acid esters, apremilast, sulfasalazine) or biologic agents (e.g., etanercept, infliximab, adalimumab, certolizumab, ustekinumab, tildrakizumab, guselkumab, risankizumab, secukinumab, ixekizumab, and brodalumab) [93].

As per NICE guidelines, topical treatments are considered first-line, while phototherapy and non-biological systemic agents serve as second-line options. Biologic agents are typically used in third-line therapy, targeting specific inflammatory pathways. In the UK, biologics are recommended for severe cases (PASI ≥ 10

and DLQI > 10) that do not respond to traditional systemic therapies like ciclosporin, methotrexate, or PUVA (psoralen and ultraviolet A radiation), or when these treatments are contraindicated or intolerable. Biologic agents work by targeting critical pathways such as the IL-23/Th17 axis and TNF-α signaling and are administered either subcutaneously or intravenously on various dosing schedules [93].

A recent study on patients' views about psoriasis and its treatment revealed that many patients struggled with the emotional burden of managing their condition and adhering to prescribed therapies [97]. Adherence was often compromised due to concerns about treatment side effects, potential dependency, and uncertain efficacy. Patients also expressed frustration about the lack of involvement in decision-making regarding biological therapies. Despite these challenges, biologic therapies are advantageous due to their less frequent dosing compared to topical or oral treatments [98]. A study conducted in Japan found that both patients and healthcare providers preferred biologic injections administered in a clinic rather than self-administered injections at home [95].

Parenteral therapy at home (HPT)

The infusion day-center model offers the benefit of centralized care, with medical staff and patients receiving services in the same location, enabling efficient service delivery. However, administering therapy at home shifts much of the responsibility to non-medical caregivers. New homecare patients may feel overwhelmed in the initial days following discharge [99], experiencing negative effects on their physical, social, and psychological health that diminish their QoL.

Effective patient and caregiver education is critical for safely managing parenteral therapy at home. Training should be comprehensive, ensuring patients and caregivers are well-prepared to handle routine issues as well as emergencies [100]. Empowering patients to take control of their care can enhance their adherence to therapy, reduce stress, and improve their QoL. One study [100] emphasized that nurses, who are central to home infusion education, may lack the knowledge or confidence to properly instruct patients, especially those new to homecare. Furthermore, the absence of standardized national guidelines means that the information provided to patients may vary, potentially affecting the consistency and quality of care.

Conclusion

Homecare has been recognized for its potential to reduce costs and enhance patient satisfaction. However, challenges related to its implementation have been observed globally. The failure or success of self-administration of parenteral therapy at home hinges on several factors, including patient education, training, continuous support, and the expertise of HCPs in managing these treatments. These factors are critical in determining treatment outcomes and ensuring patient adherence.

In the UK, there is limited research investigating patients' experiences with HPT. Little is understood about how patients feel about their training and education on self-administering HPT in this setting. With more homecare providers taking on the responsibility of training, the HCPs who initially prescribe long-term self-administration may not always oversee the ongoing training or evaluate the patient's ability to self-inject. Therefore, it is crucial to understand how patients are educated, what their perceptions and experiences are, and how these compare to the views of the healthcare professionals involved in HPT.

The literature review indicates that while the use of injectable medications outside of clinical settings is well-documented, there is a lack of studies focusing on the preparation and training patients undergo for self-injection and its effect on their treatment experience and health results.

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