Review article

Hypodermoclysis in Palliative Care

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Abstract

Introduction: With an aging population and rising rates of chronic and oncological diseases, the need for effective palliative care solutions is growing. In terminal stages, patients often face dehydration and challenges with oral medication intake, making parenteral fluid administration essential. Intravenous access, though standard, presents difficulties in elderly patients due to fragile veins and prior treatments. Subcutaneous infusion (hypodermoclysis) offers a simpler, less invasive alternative, especially suited for home and hospice care settings.

Objectives: By reviewing scientific and professional literature, present the latest findings on the effectiveness, safety, applicability, and current barriers to the wider use of hypodermoclysis in palliative care.

Methods: A systematic literature search was conducted in PubMed, Scopus, and Web of Science databases for articles published between 1995 and 2024. Studies involving adult patients receiving palliative care and reporting on the use, outcomes, and safety of hypodermoclysis were included.

Results: Out of 169 identified records, 13 studies were included. The findings suggest that hypodermoclysis is underutilized despite its proven efficacy, low complication rates (1–4%), cost-effectiveness, and applicability for administration by non-professional caregivers. Common barriers include lack of education among healthcare providers and outdated clinical guidelines.

Conclusion: Previous studies have shown that although supported by decades of evidence, hypodermoclysis remains underutilized, particularly outside of specialized settings such as palliative care. Its proven safety, simplicity, cost-effectiveness, and suitability for home-based administration make it an ideal method for fluid and medication delivery in terminally ill patients.

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Introduction

With the aging population, the incidence of oncological and other irreversible chronic diseases is progressively rising. Patients in the terminal stage of illness often experience a diminished ability to maintain adequate oral intake of nutrition and hydration. This reduction in oral intake leads to dehydration, and difficulties with swallowing hinder the administration of oral medications. Dehydration is one of the ten most common causes of hospitalization (1).

Infusion is a standard method of fluid replacement and is traditionally administered through an intravenous access (2). However, when discussing patients who require palliative care, it typically involves the elderly population and patients with long-term comorbidities, which results in damaged veins and difficulty in establishing venous access (3–5). The issue of venous access is further exacerbated by unnecessary peripheral venipunctures, leading to additional physical and psychological trauma for the patient, as well as increased treatment costs (4,6–9). In addition to hospitals, intravenous therapy and fluid replacement are administered in mobile palliative teams, home healthcare, hospices, and chronic care facilities (10). Unfortunately, recently developed tools for planning parenteral therapy do not take into account the possibility of subcutaneous access (11,12).

Healthcare professionals must be able to assess a patient's fluid replacement needs, as well as the preferences of the patient and their family, when considering a palliative approach. If hydration is indicated for the patient, and the family and patient believe that fluid replacement will be administered intravenously, the mobile palliative team may consider subcutaneous infusions. The subcutaneous route is the most acceptable method for fluid replacement and medication administration due to its ease of application, low cost, and feasibility in home settings (13).

A review of available literature shows that as early as 1865, the Italian physician Arnaldo Cantani documented the use of subcutaneous infusion as a treatment for dehydration in patients with cholera during an epidemic in the Venice area (14).

Subcutaneous infusion, also known as hypodermoclysis, is a technique that is insufficiently recognized and underused among healthcare professionals. It is defined as a procedure in which fluids are administered into the subcutaneous space (2).

The use of subcutaneous infusions for fluid replacement and medication administration is most common in palliative care (15,16). Decision-making regarding the limitation of medical procedures and the transition from active to palliative treatment is highly challenging, requiring careful and professional management of the patient. It is essential to prepare the family so that, together with the mobile palliative team, they can provide care for the patient. In this context, hypodermoclysis becomes an integral part of palliative care, alleviating symptoms in the terminal phase of illness (17).

The goal of this research is to evaluate the effectiveness, safety, and practicality of subcutaneous infusion (hypodermoclysis) as an alternative method of fluid and medication administration in palliative care. The research aims to analyze whether this less invasive technique can improve the quality of care for terminally ill patients, particularly in home and hospice environments, by reducing complications, enhancing comfort, and increasing accessibility of treatment. Furthermore, the study seeks to identify current barriers to its wider implementation—such as lack of awareness, outdated clinical guidelines, and insufficient training—and to highlight evidence-based recommendations for integrating hypodermoclysis more systematically into palliative care practice.

Methods

A systematic literature search was performed using electronic databases, including PubMed, Scopus, and Web of Science, to identify articles published within the past 30 years, specifically from 1995 onward. The focus was on meta-analyses, review articles, and clinical studies. By including older articles in research, we can gain insight into the historical context in which the method was introduced or reintroduced. This helps define the baseline from which we can observe growth, decline, or renewed interest in its use. The keywords used in the search were: hypodermoclysis, palliative care, and subcutaneous infusion. Boolean operators (AND) were used to narrow the search in the following combinations: Hypodermoclysis AND palliative care, Subcutaneous infusion AND palliative care (Table 1 shows the research findings by type). A total of 169 papers were found using the search query "Hypodermoclysis AND palliative care," No relevant results were found for the search "Subcutaneous infusion AND palliative care". Inclusion criteria were: full text articles published in English or Croatian, studies involving adult patients in palliative care, and research focusing on use, outcomes, and safety of hypodermoclysis. Exclusion criteria included articles published before 1995 and those that did not address palliative care. Before screening we removed duplicate items (n=59) and some of them were not full text articles in English and Croatian (n=25). We screened 85 records and excluded 42. 24 reports weren't successfully retrieved. Six reports did not have adequate data. We summarized our results in Figure 1.

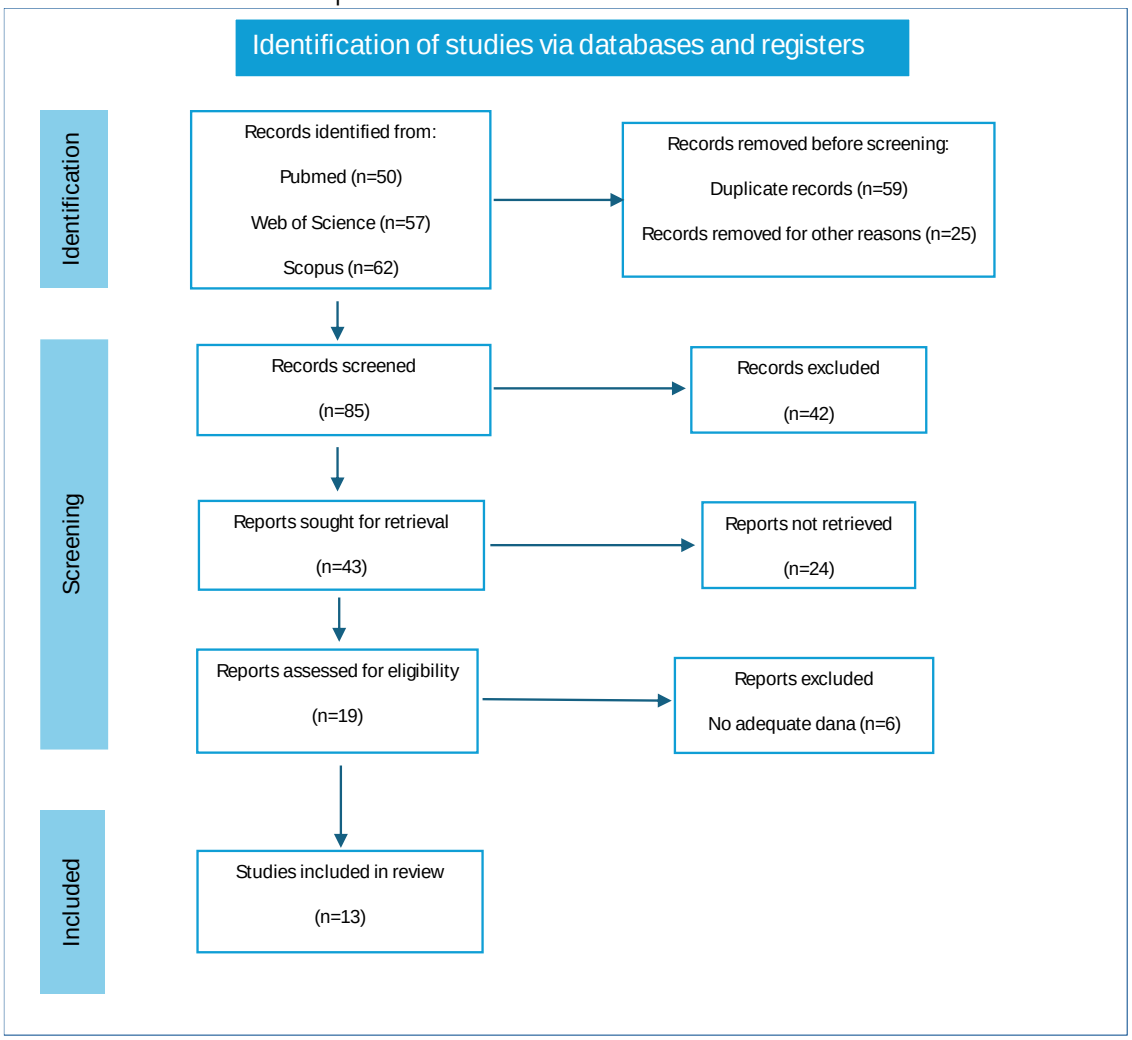

Figure 1. Flow diagram of the literature search process

Palliative care

Palliative care is provided to individuals in the terminal stage of incurable diseases, regardless of age, with the primary goal of enhancing quality of life (18).

Given the aging population and the increasing number of individuals with incurable, chronic, and oncological diseases, palliative care is becoming essential. Historically, palliative care represents progress in the approach to death and dying, where quality of life has become as important as the duration of life. For patients with chronic, progressive diseases in their final stages, the duration of life is no longer the primary concern; rather, the focus is on how the person will live their remaining days, rather than how many days are left. Symptom control, pain reduction, and emotional support become crucial for preserving dignity and maintaining good psychological well-being. In these cases, quality of life, which includes physical, emotional, and social well-being, becomes the priority (19). Patients often wish to spend their final days at home with their family, especially when they know they have only a few days left. By providing care at the patient's home, a sense of security, privacy, confidentiality, and peace can be more easily achieved.

Specialist palliative care at the patient's home improves symptom control, healthcare communication, and psychosocial support. This approach helps patients and their families better prepare for death since the outcome of the disease is certain and unfavourable, and the disease progression is inevitable and severe (20). Initially, palliative care was oriented toward patients with cancer, but it now includes individuals of all age groups with incurable diseases in the terminal stages, such as progressive lung diseases, kidney diseases, chronic heart failure, progressive neurological conditions, and dementia. Its purpose is to effectively reduce pain symptoms and improve quality of life until the very end (21).

When the general condition and progression of the primary disease suggest that the expected life expectancy is no longer than twelve months, this period can be considered the beginning of the end of life (22). Determining the precise onset of the end-of-life phase is challenging, making it difficult to establish a definitive starting point for end-of-life care (22). When death is anticipated within 48 to 72 hours, the patient is considered to be in a state of imminent death (22).

Subcutaneous infusion (hypodermoclysis)

Subcutaneous infusion or hypodermoclysis is a medical procedure in which fluids and medications are slowly absorbed from the subcutaneous tissue (23). It is administered into the hypodermis via a baby system or subcutaneous cannula (22,24,25). The hypodermis, or subcutaneous fat tissue, is the deepest layer of the skin, containing nerves, lymphatic, and blood vessels, which are connected by dense fibers that stretch through the fatty tissue. The entire absorption process of fluids and substances occurs in the capillaries of the blood and lymphatic vessels, which allow diffusion through their walls, enabling the even distribution of substances throughout the body.

This method can be used for the replacement of electrolytes lost due to illness, vomiting, or diarrhea, as well as the administration of certain medications to alleviate symptoms in palliative care. It was first described in 1865 as a rehydration method for patients with cholera (26). This method is increasingly being used as an alternative to intravenous infusions, particularly in patients who have difficulty taking fluids or medications orally. If a patient cannot take medication orally, subcutaneous administration should be considered, as intravenous infusions are invasive, and intramuscular injection is painful, especially in cachectic patients (2,22,27)

The procedure of hypodermoclysis should be performed by a competent nurse or technician in hospital settings or facilities providing 24-hour care and extended treatment (2,27). In home care settings, hypodermoclysis is administered by a home care nurse/technician according to a written order from the attending physician, or it can be performed by a family member, caregiver, or attendant who has received appropriate training and acquired the necessary

knowledge and skills (2,25,27). The mobile palliative team also conducts the full procedure of hypodermoclysis and educates family members.

Recommended locations for placement include the front of the upper arm, abdomen, thigh, scapula (in restless patients), and the upper chest below the clavicle, with special caution in cachectic individuals (Figure 2) (2,19,22,28). It is essential that the patient has at least one centimetre of subcutaneous tissue (2).

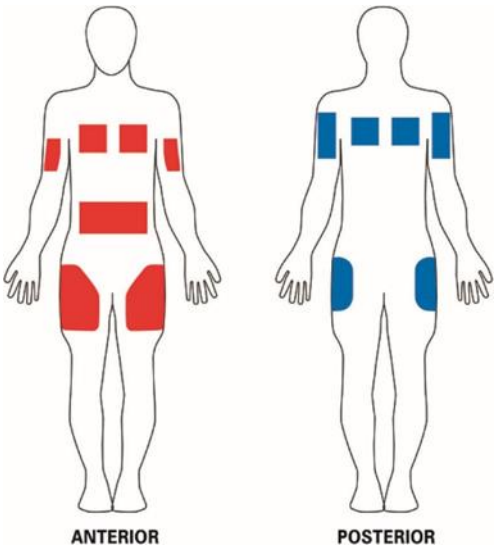

Figure 2. Recommended locations for Hipodermocrysis placement (29)

Subcutaneous cannulas should not be placed on areas of skin folds, breast tissue, regions above tumour formations, limbs affected by lymphedema or edema due to the possibility of reduced absorption, the abdomen in the presence of ascites, bony areas with insufficient soft tissue, skin damaged by radiation due to potential sclerosis and decreased blood flow, areas near joints due to discomfort and increased risk of dislocation, or on infected, damaged skin or bruises (28). In the event of localized reactions, a new cannula should be placed at an alternative location. If the reaction recurs, it may be necessary to dilute the medication. The cannula can remain in place for at least 72 hours, and if there are no signs of reaction, it can remain for up to seven days (24,28).

Subcutaneous infusion is indicated for nausea, vomiting, poor absorption of oral therapy (e.g., in ileostomy patients), dysphagia, diarrhea, dehydration, non-operable gastrointestinal obstruction, poor peripheral venous access, and when the rectal route for medication administration is not applicable (30). Contraindications include emergency situations where rapid fluid replacement is required (shock, severe dehydration, circulatory failure), patients with coagulation disorders, renal failure, cardiac decompensation, ascites, edema, or lymphedema (31).

Subcutaneous drug administration

There are various opinions and data in the literature regarding the use of specific medications through hypodermoclysis (2). In the book by M. Ljubičić (9), it is stated that the use of antibiotics, diazepam, chlorpromazine, and prochlorperazine is prohibited due to the risk of necrosis. However, other sources approve the use of certain antibiotics such as ceftriaxone, teicoplanin, amikacin, cefepime, and gentamicin, as well as antipsychotics (17,22,30,32). Table 1 lists the medications that are permitted for use through hypodermoclysis.

Safety of Subcutaneous Infusion

The most common complications that may occur with subcutaneous infusion are rare, but they should still be considered. These include local reactions (edema, erythema, ecchymosis), infection, hematoma, tissue necrosis, catheter obstruction, and fluid overload (2,17,22,25,30). Pain at the infusion site is rare but possible, especially if the subcutaneous catheter is improperly placed into muscle tissue or there is skin tension caused by administering large volumes of fluid or a solution containing potassium ions (31). The risk of blood vessel perforation is minimal, and bleeding is rare in patients without coagulation disorders (31).

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Table 1. List of medications that are permitted for use through hypodermoclysis (17,22,30,32,33)

Group	Drug	Dose
Pain killers	Buprenorfin*	#
	Diclofenac*	75-150 mg/day
	Dipryone	1g up to every 6 hours
	Fentanyl	100-1000 mcg/day
	Hydromorphone*	50% of oral dose
	Ketorolac*	30-90mg/day
	Methadone*	50% of oral dose
	Morphine*	50% of oral dose
	Naprexen	55-600 mg/day
	Petidin*	#
	Tramadol*	100-600mg/day
Antibiotics	Amikacin*	#
	Ampiciline	500mg/day
	Cefepeme*	1g/day
	Cefotaxime	500mg/day
	Ceftazidime	500mg/day
	Ceftriaxone*	1g/day
	Gentamicine*	#
	Teicoplanin*	#
	Tobramycin	75mg/day
Benzodiazepine and antipsychotics	Diazepam*	#
	Haloperidol*	2,5-10mg7day
	Clonazepam*	5-8mg/day
	Clorazepate*	#
	Chlorpromazine*	#
	Levopromazine*	5-100 mg/day
	Lorazepam*	#
	Midazolam*	10-120mg/day
Antiemetics and muskarine drugs	Atropine*	1.2mg/ once a day
	Butylscopalomine*	#
	Cylizine	25-50mg every 8 hours (max 150mg/day)
	Glycopyrronium*	#
	Granisetron	3-9mg/day
	Levopromazine	5-25 mg/day
	Metoclopramide*	30-120 mg/day
	Ondasetron*	8-24mg/day
	Papaverine*	#
	Promethazine	12-25mg/day
Coritcosteroides	Dexamethasone*	4-40mg/day
	Methylprednisolone*	#

Group	Drug	Dose
	Famotidine	#
	Furosemide*	20-40mg
	Clodronate*	#
	Pamidronate*	#
Other	Octreoide	50-600mcg/day
	Phenobarbital	200mg/day
	Ranitidine	50-150mg/day
	Scopolamine	60-180 mg/day
	Zoledronate*	#

*safe for elderly patients (32)

no information available

Furthermore, since the medications and solutions approved for subcutaneous infusion are also indicated for intravenous use, accidental intravenous administration due to puncturing a blood vessel does not pose a significant safety risk (31). Tissue necrosis can occur if inappropriate infusion solutions (hypertonic, hypotonic, solutions with high concentrations of potassium chloride) are used (34). Inflammatory reactions such as abscesses or cellulitis are rare but possible (23,31,35).

Parenteral fluid administration carries the risk of fluid overload, which may result in peripheral or generalized edema, acute heart failure, and pulmonary edema. (25). The use of hyaluronidase, an enzyme that accelerates fluid absorption and distribution, could potentially heighten the risk of circulatory overload.

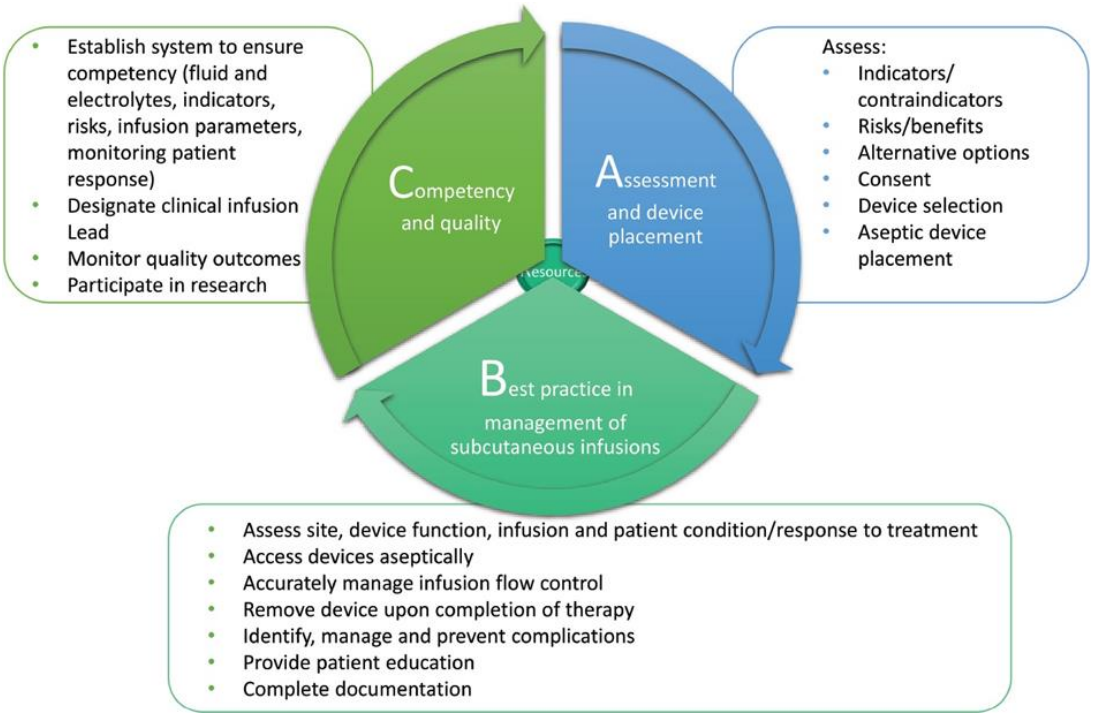

Figure 3. ABC model of subcutaneous route application (38).

However, due to the slower infusion rate, the likelihood of fluid overload with standard subcutaneous infusion remains lower compared to intravenous administration (25,36,37). Besides these complications, bleeding may occur when metal needles (Baby system) are used. An agitated or disoriented patient may accidentally dislocate the metal needle by pulling on the infusion set, so non-metal infusion sets are recommended (25).

Factors contributing to complications range from improper skin preparation before puncture or non-adherence to aseptic technique during the procedure, leading to an increased risk of infection. Frequent application of subcutaneous infusion at the same site leads to tissue damage. A weakened immune system following chemotherapy also contributes to the development of infections (2,17,22,30).

Complications can be prevented by using aseptic technique, rotating the injection site each time the subcutaneous catheter is placed, and educating the patient's family on the signs of infection (1,24). To minimize risks when administering subcutaneous infusion, the ABC model approach is recommended (Figure 3) (38).

The ABC model represents a systematic approach to subcutaneous infusion in any environment. It includes assessing and placing the infusion system, applying the best practice evidence during the intervention, and evaluating the quality of the procedure (32).

Advantages of Hypodermoclysis

Hypodermoclysis offers several advantages over intravenous infusion (Table 2), including ease of administration, cost-effectiveness, and suitability for fluid replacement in patients with challenging venous access. According to studies, it is quicker to set up (1,36,39,40), has a wider range of applications (home, hospital, hospice, institutions for the elderly and disabled) (31,39), reduces the number of hospitalizations due to the need for rehydration (23,40,41), and increases patient mobility and comfort (31,36,39). Subcutaneous infusion can be used at the patient's home, is less painful, and is less likely to result in complications compared to intravenous infusion (36,40).

Discussion

By reviewing sources from 1995 to 2015 (1,4,13,15,36,39) and comparing them to recent publications (2,11,24,25,33,42,43), we can document the consistency or stagnation of clinical practices. In the case of hypodermoclysis, this comparison demonstrates that it has predominantly remained a specialized intervention, primarily utilized in specific patient populations such as those in palliative care or geriatrics. This persistence, despite significant evidence supporting its safety, cost-effectiveness, and ease of administration, highlights a critical issue. The lack of substantial change in its clinical utilization over time raises relevant questions regarding the barriers to its broader adoption. These barriers may include insufficient awareness among healthcare providers, inadequate training in subcutaneous infusion techniques, or a preference for intravenous hydration, which is often perceived as the more conventional or reliable method. Identifying and addressing these barriers is crucial for advancing evidence-based practice and expanding the use of hypodermoclysis in clinically appropriate settings. Only difference noted across research findings is that, initially, hyaluronidase was commonly co-administered with subcutaneous fluids to enhance their absorption into the systemic circulation (44,45). However, more recent literature reviews suggest that routine use of hyaluronidase is often unnecessary. Its declining use in clinical practice is primarily due to concerns about potential allergic reactions, the risk of fluid overload, and the high cost associated with the enzyme (42). As a result, standard subcutaneous infusion without hyaluronidase has become the preferred approach in most palliative care settings, given its safety, simplicity, and sufficient clinical effectiveness.

Table 2. Advantages and Disadvantages of Subcutaneous Infusion Compared to Intravenous Infusion (1,23,25,31,36,39–41)

Advantages	Explanation	Disadvantages	Explanation
Easier placement/maintenance	It is easier to insert the catheter and administer fluid replacement or therapy. Fewer puncture incidents, easier monitoring of the patient's condition, and less time needed. Applicable in almost any setting (at home, in the hospital).	**Administration of large amounts of fluid replacement**	It is not possible to administer large amounts of fluid. The maximum is 1500-2000 ml per application site, with an average rate of up to 1000 ml over 5 hours.
Minimal staff education required	It can be performed by medical professionals with minimal education, as it is much simpler to set up and maintain than intravenous access.	**Use in resuscitation and patients with reduced tissue perfusion**	contraindicated in resuscitation scenarios and in patients with compromised tissue perfusion.
Cost	Cheaper than intravenous access.	**Correction of severe electrolyte imbalances**	Not suitable for correcting severe electrolyte imbalances.
Patient comfort	More comfortable than intravenous access, does not require patient immobilization.		
Risk of thrombophlebitis	None.		
Risk of infection	Minimal.	**Patients with bleeding**	Contraindicated in patients with bleeding or coagulation disorders
Risk of fluid overload	Minimal, slower fluid administration compared to intravenous access. Lower risk of pulmonary edema or hyponatremia than intravenous access.		
Risk of abscess or cellulitis	Minimal, can be resolved with local therapy.	**Hypertonic fluids or solutions without NaCl**	contraindicated for the administration of highly hypertonic solutions or fluids without sodium chloride (NaCl)
Risk of localized edema	Relatively common, occurring in 1-4% of cases but harmless.		
Risk of exposure to bodily fluids	Can occur if an agitated patient suddenly pulls out the needle, though the risk is lower compared to intravenous access. It should not be used if blood appears in the catheter during insertion.		

Recent research underscores the advantages of subcutaneous infusion as a method for parenteral fluid and nutrient administration, particularly in vulnerable populations such as the elderly (46). One study focusing on hospitalized older adults demonstrated that subcutaneous infusion was associated with fewer adverse effects compared to traditional intravenous infusion, making it a preferable option when considering patient safety and comfort (46). Furthermore, in clinical scenarios where the insertion or maintenance of intravenous access is difficult, such as in patients with fragile veins, cognitive impairment, or in home-care settings, subcutaneous infusion presents a safer and more practical alternative for both fluid and medication delivery (2,27).

The simplicity of the technique is well-documented. For instance, Vidal (2016) (47) found that primary caregivers, after receiving only basic training, could effectively and safely administer subcutaneous infusions at home. This finding highlights the potential for broader implementation, particularly in settings with limited access to healthcare professionals or institutional care. Supporting these findings, Rodríguez-Campos et al. (2016) (43) explored subcutaneous infusion administration by non-professional caregivers who were trained by a nurse. This study, conducted with 272 patients, involved a total of 903 subcutaneous catheters being placed. The most common reasons for requiring subcutaneous access were inadequate symptom management (162 cases) and difficulty with oral intake (107 cases). Non-professional caregivers, trained by nurses, administered therapy in 80% of cases, with 2% of patients developing a local infection under non-professional caregiver care, compared to 1.8% of patients under professional nurse care (43). These findings support the simplicity and low risks of administering subcutaneous infusion after appropriate training.

The frequency of subcutaneous infusion use in palliative care is highlighted by a study conducted by Borela et all in 2022 (18). The sample consisted of 160 patients requiring palliative care at two institutions: a general hospital (Hospital Estadual de Ribeirão Preto, HERP) and a specialized cancer treatment facility (Instituto Nacional de Câncer, INCA). In the general hospital (HERP), 384 procedures for fluid replacement (either intravenous or subcutaneous catheter) were performed, with only 52 subcutaneous procedures, representing 13.2% of the total. At the cancer hospital (INCA), 97 procedures were recorded, of which 25 were subcutaneous catheter placements, representing 25.89% (18). This difference in frequency suggests that specialized institutions like INCA may be more familiar with, or more confident in, the use of hypodermoclysis as part of their standard palliative care protocols. There was also a difference in the reasons for selecting intravenous or subcutaneous routes. At HERP, antibiotic therapy (34.7%) and analgesia (34%) were most commonly administered, while at INCA, analgesia (37.7%) and hydration (23.3%) were more prevalent (18). This disparity supports the conclusion that subcutaneous infusion is still underutilized, and that additional education for healthcare providers and students is necessary to encourage wider use. This conclusion is supported by Hayes et al. (2024) who reaffirm that subcutaneous infusion is simpler, safer, and more cost-effective than intravenous administration. These characteristics make it particularly appropriate for palliative care, where comfort and ease of use are essential (25,42).

Lastly, a 2023 study aimed to establish formal guidelines for subcutaneous infusion, resulting in 42 evidence-based recommendations (38). This is especially relevant given that Croatia's current national guidelines date back to 2009, with the last revision in 2011 (30). Additionally, the study defined the ABC model for the application of subcutaneous infusion.

Limitations and recommendations for future studies

Despite the robust body of literature underscoring the advantages and potential of subcutaneous infusion in palliative care, several limitations are evident. The reviewed studies vary widely in methodology, sample size, and healthcare settings, which limits the generalizability of findings across different patient populations and healthcare systems. For

instance, the data from Borela et al. (2022) (18) reveal a significant disparity in the frequency of subcutaneous infusion use between general and specialized institutions, suggesting institutional biases or differing levels of practitioner familiarity with the technique. While advantages over intravenous infusion are well-documented, long-term outcomes and broader comparisons are lacking. Patient and caregiver perspectives are also underexplored. Future research should focus on larger, multicenter studies, evaluate educational interventions, and update outdated national guidelines to support wider adoption of subcutaneous infusion. Further exploration is also needed into educational interventions for healthcare providers and informal caregivers, particularly in countries where subcutaneous infusion remains underutilized.

Conclusion

Although supported by decades of evidence, hypodermoclysis remains underutilized, particularly outside of specialized settings such as palliative care. Its proven safety, simplicity, cost-effectiveness, and suitability for home-based administration make it an ideal method for fluid and medication delivery in terminally ill patients. One would expect that with technological progress and clinical advancements, the use of hypodermoclysis might have either significantly increased or been replaced by more modern alternatives. However, a thorough literature overview indicates that there has been no significant change in its usage in clinical environments over the past several decades.

To fully realize the potential of hypodermoclysis in palliative care, there is a clear need for updated national guidelines, structured training programs, and stronger support within healthcare system. These efforts are vital to normalize hypodermoclysis as a standard, evidence-based practice that prioritizes patient comfort, especially in end-of-life care.

Disclosure

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Hipodermokliza u palijativnoj skrbi

Sažetak

Uvod: Starenjem populacije raste učestalost onkoloških i drugih neizlječivih kroničnih bolesti, što povećava potrebu za palijativnom skrbi. Pacijenti u završnim fazama bolesti često imaju smanjeni unos hrane i tekućine, što dovodi do dehidracije, a otežano gutanje onemogućuje oralnu primjenu lijekova. Iako je intravenska primjena standard, u starijih osoba često je otežana zbog oštećenih vena i prethodnih terapija. Supkutana infuzija (hipodermokliza) predstavlja jednostavniju i manje invazivnu alternativu, osobito prikladnu za kućnu i hospicijsku skrb.

Cilj: Pregledom znanstvene i stručne literature predstaviti najnovija saznanja u učinkovitosti, sigurnosti, primjenjivosti i trenutnim preprekama šire primjene hipodermoklize u palijativnoj skrbi.

Metode: Provedeno je sustavno pretraživanje literature u bazama podataka PubMed, Scopus i Web of Science za radove objavljene između 1995. i 2024. godine. Uključena su istraživanja koje su se bavila odraslim pacijentima u palijativnoj skrbi i izvještavala o primjeni, ishodima i sigurnosti hipodermoklize.

Rezultati: Od 169 identificiranih radova, uključeno ih je 13. Rezultati sugeriraju da je hipodermokliza i dalje nedovoljno korištena unatoč dokazanoj učinkovitosti, niskoj stopi komplikacija (1–4%), isplativosti i primjenjivosti za administraciju od strane neprofesionalnih njegovatelja. Najčešće prepreke uključuju nedostatak edukacije među zdravstvenim djelatnicima i zastarjele kliničke smjernice.