

RESEARCH ARTICLE

Towards sustainable integration of healing garden at healthcare facilities

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Abstract - Healing gardens serve as natural environments that counterbalance the high stress levels experienced by patients and alleviate the emotional impact of being hospitalised, ultimately contributing towards their healing progress and overall well-being. Although healing gardens have become a visible trend in healthcare design, the effectiveness and longevity of these spaces for healing purposes remain questionable. This paper examines the wide-ranging benefits of healing gardens by reviewing relevant literature published between 2000 and 2024. It also outlines the key elements defining the functional and inclusive nature of healing gardens, specifically in healthcare settings, as well as the challenges associated with the development and expansion of healing gardens at healthcare facilities. The findings hope to provide a holistic understanding of the importance and complexity of healing garden development and its sustainability in healthcare facilities, offering valuable insights to healthcare designers, planners, and policymakers.

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1. Introduction

Recent years have witnessed a growing realisation among healthcare facilities on the importance of garden spaces and healing environments for patient recovery. While the healing garden concept stems from varied schools of thought, terminologies, and underlying theories, it remains tailored to specific patient populations with the main objective of promoting a healing effect from nature (Mahmud et al., 2019; Uwajeh et al., 2018; Paraskevopoulou, 2018). The presence of garden spaces at healthcare centres has demonstrated multifaceted public health benefits for both physical and mental health wng (Gregis, 2021). It also offers opportunities for social interaction and cohesion, thereby establishing a sense of safety and strengthening the community (Koprowska et al., 2018). Such effects are exemplary not only to patients seeking healthcare services but also to other visitors and staff of the healthcare centres. The advantages of garden spaces in healthcare facilities extend beyond their aesthetic value and can profoundly influence individuals' physical, mental, and emotional well-being (Hastuti & Lorica, 2020). Incorporating garden spaces into a physical healthcare setting can offer soothing outdoor vistas that can have a calming impact, promote social support and privacy, and help reduce stress (Uwajeh, 2018). Previous research suggests that exposure to natural settings, including gardens, can reduce stress, anxiety, and pain while fostering feelings of comfort, serenity, and overall satisfaction with the medical process (Yin et al., 2024). Gardens can also improve the overall approach to patient care by providing opportunities for socialisation, physical exercise, and spiritual reflection.

According to Hunter-Jones et al. (2020), establishing a service setting that can improve the patient experience is key in healthcare. This is because people often associate their experiences in healthcare centres with emotions such as stress and hopelessness. Negative emotions and discomfort are common during patient warding, while service personnel are emotionally and physically burned out (Shaqiqi et al., 2024). These have inspired experts such as landscape architects and designers to build healthcare centres connected to an open-air area known as a healing garden, allowing patients to recover in a clinical environment (Beh et al., 2025; Wi & Samad, 2022). Such a concept is grounded on the idea that exposure to natural elements improves human health and well-being, with proven benefits in reducing air pollution (Moradpour, 2020), heat (Park et al., 2017), noise (Koprowska et al., 2018), and psychophysiological stress (Corazon et al., 2019), while encouraging physical activities (Gianfredi, 2021) and social interaction (Wilkie et al., 2020).

2. Materials and Methods

The purpose of this study is to explore the benefits, key elements, and challenges of developing healing gardens in healthcare facilities. It adopted a thematic approach (Guest et al., 2011), where the data were obtained from more than 70 studies published between 2000 and 2024. A systematic literature search was conducted in reputable electronic databases such as Scopus, Web of Science (WoS), and Google Scholar using keywords including "healing garden", "therapeutic garden", "restoration garden", "healthcare setting", and "horticultural therapy". To ensure relevance, the article selection was limited to studies examining healing gardens in healthcare settings, including their benefits, key elements, and development challenges. Figure 1 shows the multi-step thematic analysis processes, which involved data extraction, initial coding, theme identification, validation and synthesis. Previous studies have reported that spending time in a healing garden can improve overall health, particularly physical, mental, and social well-being, as well as cognitive function (Berman et al., 2012; Youn et al., 2025; Carroll et al., 2024; Triguero-Mas et al., 2015).

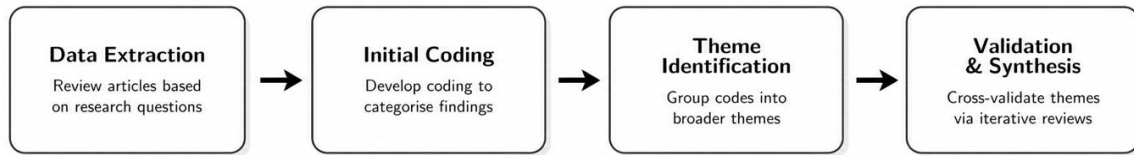


Figure 1. Thematic analysis approach (Yusoff, 2025)

2.1 Physical Wellness

Having garden spaces at healthcare facilities can directly enhance patients' physical well-being (Wang & Tzortzi, 2023). It allows patients to engage in light exercises and physical activities such as walking, yoga, stretching, and sensory pathways (Noseworthy et al., 2023). By being physically active, patients can improve their strength, boost their immune system, enhance relaxation to relieve pain, and ultimately increase their overall well-being. These physical activities also serve as a vital preventive factor against various non-communicable diseases, including mental health conditions, cancer, diabetes, hypertension, obesity, and cardiovascular diseases (Howart et al., 2020). Some healthcare gardens provide large areas with plants, flowers, and exercise equipment, such as reflexology paths. Frequent exercise in gardens can improve lung function, strengthen the heart muscle, and raise blood oxygen levels (Zhu et al., 2024). Furthermore, reflexology paths are commonly found in garden spaces at healthcare centres or therapeutic gardens to support patients' recovery. Walking on reflexology paths has been reported to improve blood circulation through reflex points on the soles of the feet, positively contributing to general health and well-being (Kapikiran & Özkan, 2021). This treatment aims to enhance bodily function, thereby improving corresponding organs and balancing bodily energy.

2.2 Mental Wellness

Healing gardens in healthcare facilities have been shown to offer significant mental health benefits, such as supporting psychological well-being, reducing stress, and enhancing overall quality of life for patients, staff, and visitors. Past research consistently demonstrates that healing gardens are effective, cost-efficient interventions for improving mental health in healthcare settings (Wang & Tzortzi, 2023; Oliveira et al., 2023). Belčáková et al. (2018) proposed a mental map of the healing garden philosophy, which posits that patients who regularly spend time at the healing garden gain extra health benefits in terms of improved mood level, stress reduction, and feeling calm with fresh air (Di Sivo & Balducci, 2019; Setyani & Theresia, 2020). Patients who stay for a long period in healthcare facilities may experience stress and boredom, which can have negative impacts on their mental health and behaviours. Therefore, having a garden with various plantings and sensory engagement will help regulate their emotions and alleviate tension and anxiety. Furthermore, healing gardens not only provide significant benefits for patients' mental health but also foster a supportive environment for healthcare staff (Duzenli, 2017; Cordoza et al., 2018; Naderi & Shin, 2008). For instance, nursing staff may experience high stress levels caused by the demanding nature of their work. High patient loads and long working hours can lead to emotional instability and burnout, necessitating nurses to have a naturally calming space that can cultivate mood enhancement, emotional equilibrium recovery, and improved mental well-being. This will benefit the staff by increasing their focus, improving job performance, and reducing mental fatigue.

The benefits of healing gardens also extend to caregivers, guidance, caretakers, and family members who may feel anxious, tense, and nervous about supporting patients undergoing medical treatment or surgical operations. Studies have demonstrated that biophilic design enhances human well-being by re-establishing interactions with natural elements within the built environment (Tyng & Samad, 2021; Totaforti, 2018). Healing gardens may help caregivers find respite from depression and the mental strain of their caregiving role by providing more shade, animal sounds, and water features, which serve as calming factors (Ulrich et al., 2020; Mohed & Ismail, 2015). The discussion thus far suggests that healing gardens offer significant benefits to various healthcare stakeholders, including staff, visitors, and patients. These facilities are designed to promote recovery, relaxation, and peace while providing a restorative environment for people in outdoor spaces (Fumagalli et al., 2020).

2.3 Social Wellness

Garden facilities at healthcare centres are not merely aesthetically pleasing; they play an essential role in enhancing self-esteem and social interaction (Mugion & Menicucci, 2020). These healing spaces offer a shared environment where medical professionals, caregivers, and patients can meaningfully engage and connect. Designers create healing gardens with open areas that encourage socialisation and allow everyone to spend quality time together. Having a garden within a healthcare facility promotes social contact and a feeling of community while providing a safe environment for sharing emotions. Moreover, healing gardens serve as a welcoming space for all to improve their social interaction. Patients may feel lonely due to having a small network of social supporters to rely on amid their health problems (Hawker & Romero-Ortuno, 2016). Subsequently, garden spaces provide patients with a diverse environment for social activities such as conversing, exchanging stories and experiences, establishing friendships, and finding mutual comfort and strength, which can foster a sense of community and support. Such interactions address patients' boredom and loneliness, especially among those undergoing long-term medical treatment, thereby strengthening supportive relationships between patients and caregivers (Hastuti & Lorica, 2020). Howarth et al. (2020) found that gardens can boost patients' social confidence

and morale, especially for those who are socially isolated and lonely. This suggests that healing gardens offer opportunities for social interaction that can improve the quality of healthcare by fostering meaningful connections and relationships, which are essential for emotional and psychological healing.

2.4 Elements of Healing at Garden

Studies on the relationship between stress and health indicate that healing and restoration are necessary to mitigate its detrimental effects. The debate of how nature might improve health has gained significant attention and is influencing hospital and healthcare architecture today (Cervinka et al., 2014; Nedučín & Kurtović-Folić, 2010). The physical area of a healing garden does not support patients, users, and staff experiencing a 'healing environment' without integrating the right elements of healing. An effective healing garden will engage all five senses, including sound, touch, visual, smell, and taste (see Figure 2).

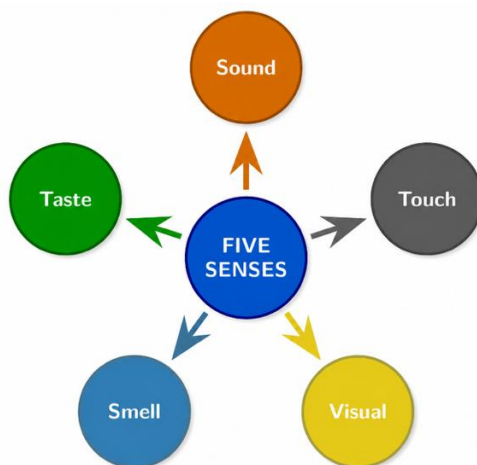


Figure 2. Five sense elements for healing gardens

The sound elements of a healing garden include water features, birdsong, and wind, which can bring users a sense of peace. For example, a healing garden designed with the sound of water flowing and trickling will provide an inherent sense of calm that helps patients reduce stress and feel relaxed (Çulha et al., 2023). In addition to water sounds, designers often create healing gardens in open outdoor spaces. According to Mugion & Menicucci (2020), birdsong in a healing garden can foster a sense of well-being and a clear mind among patients by providing a connection to nature. The sound of wind gently blowing through leaves has also been recognised as a therapeutic element that can soothe the body and mind, thereby fostering a sense of peace. The touch element is equally crucial for the effectiveness of a therapeutic garden (Wang & Tzortzi, 2022). Touch is a neurological and biological process that affects one's connection with the natural surroundings. The touch element can stimulate curiosity and redirect the brain's focus, thus reducing stress and anxiety. This is often illustrated in healing garden spaces through the inclusion of pebble paths, textured plants, and water fountains (Kim et al., 2023). Interacting with these elements is beneficial for patients, especially those with sensory processing issues.

An effective healing garden should also include visual therapy elements. Alkaisy et al. (2021) defined visual therapy as the use of colourful elements such as flowers, diverse plantings, lighting, art, and stone benches. The inclusion of blooming plants, colourful flowers, and natural lighting has been effective in motivating patients to take walks in the healing garden, thereby boosting their recovery while increasing staff productivity (Iyendo & Alibaba, 2014). Colour has also been reported to have a significant therapeutic impact on human health and emotional response. Figure 3 illustrates various functions of colours and their effects in stimulating the healing process. For example, therapists use light blue as a therapy colour to calm and treat patients with Seasonal Affective Disorder (SAD); yellow improves focus and concentration; while green is a harmony and balance colour often associated with a healing environment and the ability to reduce anxiety (DeVault, 2024). Hence, designers often create garden areas with colourful elements that attract people and provide psychological and emotional benefits. The colour element not only enhances the aesthetic appeal of the healing garden but also contributes towards improving mental and emotional health. Furthermore, scent is an essential component of a healing garden, enhancing its therapeutic properties. The elements of smell in healing gardens include the scents of flowers, sweets, soil, and herbs (Weber & Heuberger, 2008). Scent can evoke a wide range of memories, emotions, and personal experiences. At healthcare centres, designers often incorporate common aromatic plants, such as rosemary, *pandan* (*pandanus amaryllifolius*), jasmine (*jasminum* spp.), and lavender, to complement medical treatment. Past research indicates that aromatic plants release volatile organic compounds into the surrounding environment, which interact with the olfactory system and stimulate brain responses that can elevate mood and mental health (Pálsdóttir et al., 2021). This shows that the scents of certain plants can improve cognitive function and contribute to a therapeutic environment.

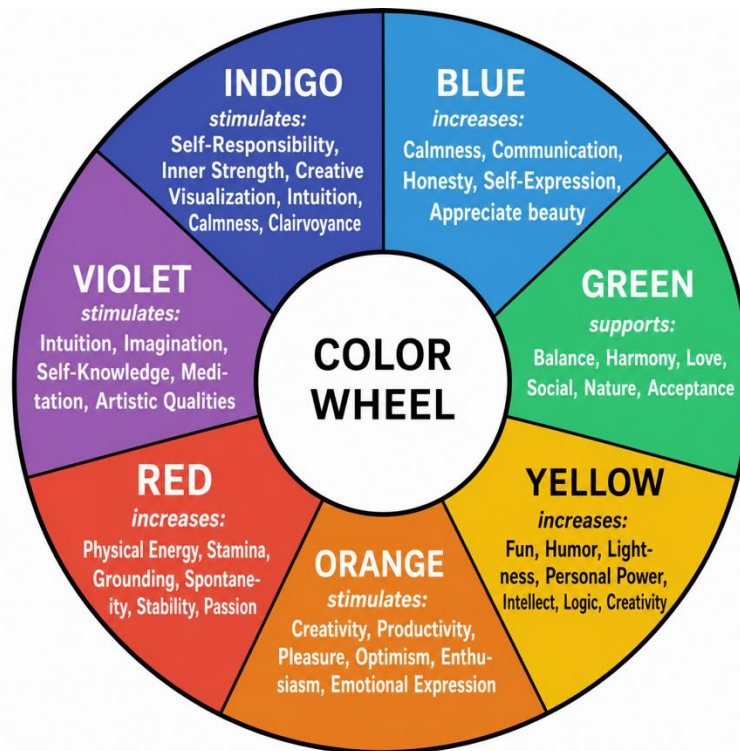


Figure 3. Therapy colours (Modified from Divers, 2023)

Taste has also been proposed as an important element for effective healing gardens. However, it is rarely incorporated into a healing garden due to health and safety concerns, as not all plant types are safe for consumption. Some designers instil elements of taste through plants such as roselle and blackberry, which are relatively easy to cultivate. Roselle contains vitamin C and antioxidants that can boost the immune system and reduce skin redness (Chiu et al., 2022), while blackberries offer cardiovascular benefits that can protect against heart disease and prevent cancer. Despite these benefits, designers must include suitable, edible plants in healing gardens to prevent food poisoning and ensure safe consumption. Incorporating all five senses in a healing garden can help create a therapeutic space that encourages rest, speedy recovery, and enhanced well-being. These sensory features not only provide aesthetic appeal but also serve as important environmental components that can improve patients' health and overall therapeutic experience (Whitehouse, 2001) by offering emotional balance, sensory stimulation, and a connection to nature (Szabo et al., 2023). By integrating touch, smell, sight, and taste, designers can create immersive environments that support the healing process.

3. Results and Discussion

The establishment of a healing garden at healthcare facilities offers huge benefits for patients, visitors, and staff by improving their physical, mental, and social health. Past research indicates that exposure to green spaces is positively correlated with one's physical, psychological, and social well-being (Yang et al., 2021). Despite these benefits, developing a healing garden can face several challenges, including limited space, plant selection, budget constraints, and design considerations.

3.1 Limited Space

Having limited space is one of the main reasons halting the development of a healing garden in healthcare centres. Research shows that the absence of natural elements, particularly in high-rise and multi-storey hospitals, can be attributed to the use of space for essential medical facilities (e.g., wards, emergency rooms, operating theatres) and other facilities (e.g., waiting areas, parking spaces) (Belčáková et al., 2018). Subsequently, healing gardens are often overlooked in the planning process for building healthcare centres due to the ongoing push to maximise space for clinical objectives (Souter-Brown, 2014). Additionally, some healthcare centres allotted a small space for the healing garden, disproportionate to the number of users. This limits the therapeutic benefits of the natural environment, causing an unpleasant experience and additional stress for patients.

3.2 Plant Selection

Other obstacles to developing healing gardens in healthcare centres are plant selection and plant arrangement (Zhong et al., 2024). Green plants and flower arrangements have been reported to promote psychological and physiological improvements (Khan et al., 2016), thus minimising patients' hospital stay. Consequently, plant selection is necessary to ensure the effectiveness and sustainability of a healing garden in healthcare facilities. These difficulties include avoiding invasive species, maintaining appropriate conditions, addressing allergy concerns, considering the plants' medicinal

value, and ensuring patient safety. Further research has brought attention to these subtleties and emphasised the importance of careful plant selection in fulfilling the healing garden's intended therapeutic purposes.

Plant selection also correlates with environmental sustainability, as it is significantly influenced by the local climate and environmental factors. According to Huang et al. (2024), plant selection should be based on plants' suitability for the healthcare centre's climate. For example, plants that need a lot of sunlight may not grow well in places with little natural light. Selecting the right plants is crucial for maintaining the garden's sustainability and aesthetic value. Additionally, the selection of plant species should consider factors such as colour, form, texture, scent, and ease of care, thereby encourage creativity and facilitate a range of activities. Due to health and safety concerns, designers are reminded to avoid plants that are poisonous (e.g., Ragweed), thorny (e.g., roses, cactus), or can trigger allergies (Lu et al., 2021). These plants can pose direct threats to patients and make them feel insecure while using the healing garden. Furthermore, pollen- and allergen-producing plants can trigger allergic reactions that exacerbate respiratory conditions and cause discomfort, thereby impeding therapeutic effects. Azalea plants, hibiscus, and hydrangeas are examples of plants with minimal allergenic properties and are commonly used for their aesthetic appeal (Hoover, 1995; Qinhuia & Liang, 2016).

3.3 Budget Constraint

Budget constraints also pose a prominent challenge in creating garden spaces at healthcare facilities. Many healthcare centres are focusing their expenditures on personnel, medical supplies, and infrastructural improvements, particularly post-COVID-19. These financial burdens pose significant challenges for healthcare centres in setting aside funds for initiatives that go beyond basic medical needs (Whitehouse, 2001). As a result, projects such as developing garden areas are considered non-essential compared with commitments to medical treatment. Furthermore, establishing a healing garden will entail additional financial responsibilities for operational costs, including landscaping, irrigation, and maintenance. These costs extend beyond the initial stages of construction and are essential for preserving the gardens' long-term usability and visual appeal. Garden development incurs high maintenance costs, including regular upkeep, landscaping, and plant replacement (Zhong et al., 2024), which are vital for maintaining health, safety, and aesthetic appeal. An irrigation system is also necessary, especially in areas with unpredictable weather patterns, such as Malaysia. This further increases operating costs due to water tariffs and system upkeep. While the provision of walkways, benches, and signage contributes to the functionality and aesthetic appeal of the garden space, periodic maintenance and upgrades are necessary to guarantee the usability, accessibility, and safety of these components. Subsequently, the costs of maintaining garden spaces may pose a significant financial burden for healthcare centres. Since garden spaces have been shown to benefit patients' recovery, Din et al. (2023) believe that investing in the development and maintenance of healing gardens will extend these benefits to other users and reduce medication and hospitalisation costs, thereby underscoring their significance.

3.4 Design Considerations

To build healing garden areas for healthcare facilities, several factors must be considered to ensure they effectively promote recovery and well-being for patients, visitors, and staff. Nevertheless, these factors may pose major issues during the planning and execution stages. Catering to the varied demands of patients with various health issues and degrees of mobility can be challenging when designing the garden layout. For instance, the design must account for the needs of patients with mobility disabilities, including wheelchair-accessible pathways and seating areas. Addressing all levels of patient health may be a difficult task for designers. To effectively accommodate all users, it is necessary to carefully consider universal design principles when creating inclusive and accessible garden settings.

Moreover, design considerations can challenge designers to ensure the design is safe for users. Gardens also must be free of dangerous surfaces and equipped with handrails and suitable lighting to ensure safety (Ulrich, 2002). Garden development cannot be designed without meeting specific standards, as it can negatively impact users and patients receiving medical treatment. These rules specify the precise accessibility requirements that must be met, often requiring careful planning (Nieberler-Walker et al., 2024) and potentially sacrificing the garden's aesthetic and practical aspects. While various courtyard garden designs at healthcare facilities have been introduced, their healing properties remain underutilised (Almhafdy et al., 2013). Applying sustainable elements, such as establishing gardens in practical, self-sustaining ways, creating gardens with nature and people in mind, and implementing energy-efficient, resource-efficient, and environmentally friendly landscape features, will provide calming surroundings that soothe and rejuvenate.

4. Conclusions

Healing gardens are designed to offer restorative and therapeutic benefits, providing natural, calming spaces that support physical, emotional, and mental well-being. However, inadequate understanding of the interaction between people and garden environments can lead to misconceptions about the design and purpose of healing gardens in healthcare facilities. Furthermore, improper planning, unsuitable settings, or poorly integrated therapeutic elements may hinder the gardens' intended benefits. Addressing these challenges requires an integrated approach involving multiple professional disciplines, including landscape architects, engineers, healthcare planners, therapists, and facility administrators, who work together on healing garden designs to ensure the desired effect and sustainability. Despite the numerous benefits of healing gardens in healthcare facilities, there is a need for a specific policy to guide their development and long-term maintenance. This will allow the allocation of funding for healing garden development and ultimately enhance the health and well-being of their users and the garden's sustainability. While this thematic review provides meaningful insights, it is limited by the reliance on secondary data and a focus on recent literature. Future studies may benefit from insights from

both healthcare garden users and providers to better understand their experiences with garden performance and the challenges providers face in maintaining these spaces.

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Declaration of Competing Interest

The authors declare that there are no conflicts of interest regarding the publication of this manuscript.

CRedit Authorship Contribution Statement

Fatimah Mahmud: Conceptualisation; Resources; Writing - original draft; Editing
 Noor Nadia Farahanna Che Man: Resources; Writing-Review and Reviewing
 Zetty Ain Kamaruzzaman: Research ideas; Resources; Writing-Review and Reviewing
 Azi Izwani Nor Hamzah: Research ideas; Resources; Writing-Review and Reviewing
 Huynh Kim Think: Resources; Writing-Review and Reviewing

Availability of Data and Materials

The data supporting this study's findings are available on request from the corresponding author.

Ethics Declarations

This study did not involve human or animal participants, nor did it require ethical approval.

Generative Artificial Intelligence Declarations

The author(s) declare that no generative AI or AI-assisted technologies were used in the writing of this manuscript. All content, including text, figures, and tables, was created by the author(s).

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