Integrating Nature into Healthcare: Lessons from Khoo Teck Puat Hospital for the NHS

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About Me

I graduated from Bournemouth University with First Class Honours, followed by a Master's in Nursing. My dissertation focused on the benefits of horticultural therapy for older adults, which led me to set up a community allotment project in Dorset.

I went on to train in adult critical care nursing, completing the Intensive Care course and becoming an Early Mobilisation Champion in the ICU. Some of my most fulfilling moments have involved taking patients outside while still ventilated, or finding small, human ways to comfort them through touch, music, or simply washing their hair.

My interest in research developed during my postgraduate studies, leading me to join the Critical Care Research Department at King's College Hospital. As part of the ACET research team, I led studies across Anaesthetics, Critical Care, and Theatres, and have secured funding from the KCH Charity to research the new ICU garden project. I completed my Pre-Doctoral Fellowship with the NIHR.

Our team has won several awards, including the CRN South London Research Award and a Nursing Times Awards finalist spot. I've also presented my research proposal on ICU garden spaces to consultants, professors, and nurses to shape and strengthen the project.

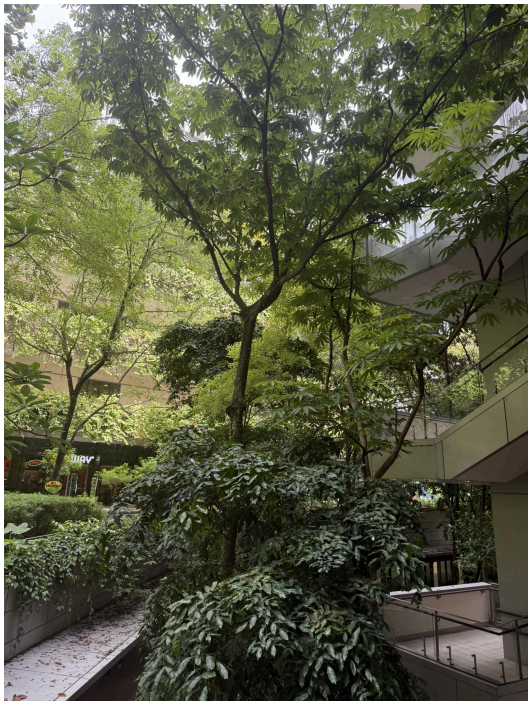
Introduction

Hospitals have long been places of intense stress and clinical sterility, yet a growing body of research suggests that introducing nature into healthcare environments can profoundly improve patient outcomes and wellbeing. As far back as 1984, a landmark study by Roger Ulrich demonstrated that surgical patients randomly assigned to a room with a window view of trees recovered faster, required less pain medication, and had fewer post-surgery complications than those with a view of a brick wall (Ulrich, 1984). Even brief encounters with greenery or garden views, as little as three to five minutes, have been shown to reduce anger, anxiety, and pain, and to induce relaxation in patients, measurable via reductions in blood pressure and muscle tension (Ulrich, 1992). These findings kicked off a resurgence of interest in "healing gardens" within hospitals. No longer dismissed as an architectural luxury, thoughtfully designed green spaces are now recognised as a therapeutic modality in their own right (Cooper Marcus &

Sachs, 2014). Such therapeutic benefits of nature are grounded in multiple scientific theories. Ulrich's Stress Reduction Theory hypothesis that natural scenes automatically engage our parasympathetic nervous system, helping shift us into a calmer state and facilitating recovery from stress (Ulrich *et al,* 1992). Similarly, the Attention Restoration Theory by Rachel and Stephen Kaplan suggests that exposure to effortless natural stimuli (like the sound of water or rustling leaves) replenishes our cognitive reserves and relieves mental fatigue (Kaplan, 1995). In healthcare settings, these effects translate into tangible clinical improvements. Patients with visual or physical access to gardens report better mood, less perceived pain, and greater overall satisfaction with their hospital stay (Van Iperen *et al,* 2023*)*. Remarkably, even staff and family members benefit, one survey in California found nearly all users of hospital gardens (including visitors and employees) experienced reduced stress and improved mood after spending time in the garden (Cooper Marcus and Barnes*,* 1995). Nature, it seems, offers a break from the high-tech, high-tension environment of modern medicine.

Integrating nature into hospitals is not a new idea. Historically, many 19th-century hospitals included courtyards and solariums, reflecting a belief in fresh air and greenery as part of healing (Van Iperen *et al,* 2023). However, with the advancement of medical science in the 20th century, architectural priorities shifted toward efficiency and sterility, often at the expense of green space (Warshaw, 2017). Today, evidence-based design is bringing the momentum back: many new hospitals around the world are deliberately incorporating gardens on rooftops, atriums, and courtyards as essential components of a healing environment (Nieberler-Walker *et al,* 2023). These spaces are not merely decorative; they are therapeutic landscapes designed to soothe, rehabilitate, and even clinically treat patients. For example, Horatio's Garden at Salisbury District Hospital in the UK offers a wheelchair-accessible outdoor space for patients with spinal injuries, providing a sanctuary filled with sensory planting, sheltered seating, and accessible garden paths. Patients there engage in gardening activities that form part of their rehabilitation, supported by trained volunteers, with research showing significant improvements in mood and mental wellbeing. Such success stories highlight the broader point: hospitals can be designed as restorative oases without compromising medical excellence (Horatio's Garden, 2025).

As a nurse in a busy London intensive care unit (ICU), I have witnessed first-hand the toll that a purely clinical environment can take on patients and staff alike. Critical illness often means long, isolating stays in windowless rooms filled with beeping machines. Families spend anxious hours in sterile waiting areas. Staff face relentless pressure in fluorescent-lit units with little respite. These experiences fueled my personal interest in the healing potential of nature, along with the passion gained from completing my MSc thesis about how horticultural therapy improves the wellbeing of older adults in the community. In 2024, I traveled to Singapore to study one of the world's most celebrated examples of biophilic hospital design: Khoo Teck Puat Hospital (KTPH). KTPH is globally renowned as a "hospital in a garden" , a facility deliberately designed to lower stress and blood pressure through immersive natural elements. During my visit, I was struck by how fundamentally different the atmosphere felt at KTPH. Instead of the typical concrete facade, I encountered lush terraced gardens flowing from every floor, open-air corridors, and an expansive roof garden filled with vegetables and fruit trees. It was immediately apparent that this was not just aesthetic greenery, but a carefully integrated part of patient care and hospital operations.

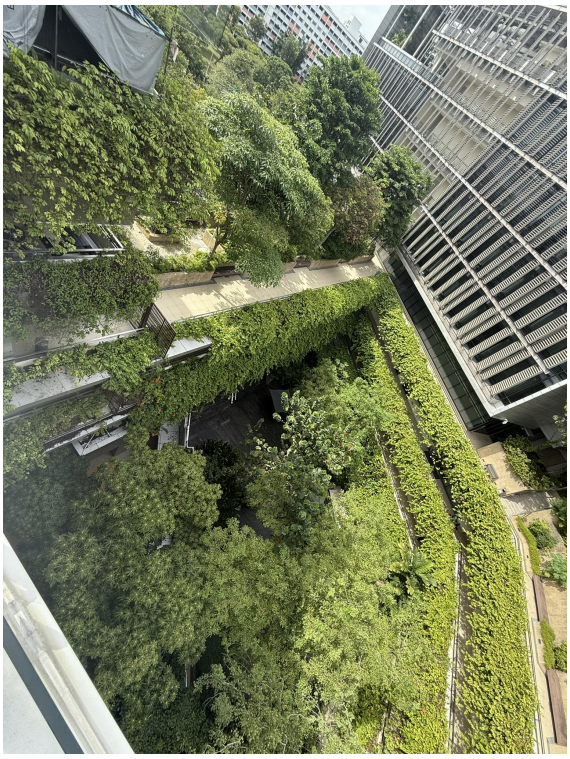


This presents my reflections and research insights from my journey, with the aim of informing the development of a roof garden for intensive care patients at King's College Hospital and sharing best practices across the NHS. I will begin by reviewing the broader context of nature-based initiatives in UK healthcare and identifying current gaps. I will then delve into the origins of KTPH, how forward-thinking leadership and policy support in Singapore enabled a hospital designed around nature. Next, I will describe in detail KTPH's roof garden and sustainable urban farm model, as well as the hospital's horticultural therapy programmes for patients with dementia. Throughout, I will relate these findings back to evidence from global research on healthcare design and patient outcomes. Finally, in the application section, I will reflect on lessons learned and provide concrete recommendations for adapting KTPH's model to the NHS context, including specific suggestions for King's College Hospital's planned ICU roof garden. By the end, I hope to demonstrate that integrating nature into healthcare is not only beneficial for patient and staff wellbeing, but is achievable and sustainable with the right strategies. In essence, nature can be a vital part of the cure, and hospitals that embrace green design and therapeutic gardens are leading the way toward a more humane, holistic health system.

Nature in the NHS: Current Initiatives and Gaps

In recent years, the UK's National Health Service (NHS) has shown a growing awareness of the value of green space and nature-based care within healthcare settings. A number of initiatives across the country point to an emerging "green care" movement, though efforts have been somewhat fragmented and driven often by charities or local champions rather than a unified national policy. This section reviews some key developments in the NHS related to hospital gardens and nature, highlighting both progress made and gaps yet to be addressed.

One significant catalyst has been the NHS Forest program, launched over a decade ago by the Centre for Sustainable Healthcare. The NHS Forest began with a simple but symbolic goal: to plant trees on healthcare estates to improve the environment and patient experience. Over time, it evolved into a broader network promoting all forms of green space on NHS land. Today, over 370 healthcare sites in the UK have joined the NHS Forest network, implementing projects such as therapeutic gardens for occupational therapy, staff allotments and orchards, wildflower meadows, outdoor gym trails, pond restorations, and even beehives (NHS Forest, 2021). This grassroots uptake demonstrates considerable enthusiasm among NHS hospitals and clinics to "green" their grounds. For example, many mental health units now have enclosed courtyard gardens to provide calming sensory experiences for patients, and several general hospitals have created quiet remembrance gardens or rooftop terraces for staff respite. The NHS Forest provides online resources and case studies to help sites pursue these ideas, emphasising that even small interventions (like planting a mini herb garden outside a ward) can humanise the care environment and engage patients in new ways. The breadth of projects, from dementia-friendly sensory gardens to staff vegetable plots, indicates a broad recognition that nature can serve multiple therapeutic and wellbeing purposes in a healthcare context.



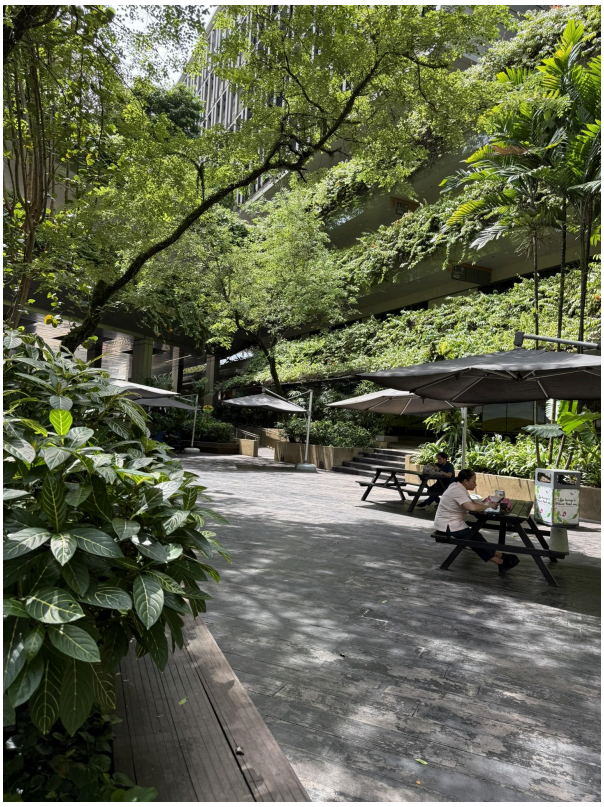
Another prominent development has been the creation of specialised healing gardens through charitable partnerships. A leading example is Horatio's Garden, a UK charity that builds and maintains gardens of sanctuary at NHS spinal injury centres. Begun in 2012 in Salisbury, Horatio's Garden has since established beautiful accessible gardens in multiple NHS spinal units across England, Scotland, and Wales (Cowan, 2024). These gardens, designed by award-winning landscape designers, are fully wheelchair-accessible and feature rich planting schemes, water features at wheelchair height, and "garden rooms" (sheltered areas) where patients can escape the clinical ward environment.

The impact on patients has been remarkable, 91% of patients report that Horatio's Garden improves their mental health, describing the space as more powerful in lifting mood than any medication. Patients who may be hospitalised for months following catastrophic injuries find solace and community in the garden, participating in gentle gardening workshops or simply sitting among flowers and feeling the sun on their face. Importantly, Horatio's Garden integrates a volunteer program: trained volunteers help tend the garden and spend time with patients over tea, contributing over 13,000 volunteer hours per year across the sites. This model of volunteer-supported therapeutic gardens has not only enhanced patient wellbeing but also demonstrated a replicable template- the charity's vision is to eventually have a Horatio's Garden in every one of the UK's 11 spinal injury centers. The success of Horatio's Garden underscores the potential of partnerships in bringing nature into NHS care environments, especially in specialty areas like rehabilitation where patients greatly benefit from motivational, multisensory spaces.

Beyond individual hospitals, the NHS at an organisational level has started to incorporate nature-based health into its strategic outlook. The NHS Long Term Plan (2019) explicitly championed the expansion of "green social prescribing" to improve mental health and combat loneliness, recognising that connecting patients with nature, whether through local walking groups, community gardening, or hospital-based green activities, can be a powerful preventative health measure (Mughal *et al,* 2022). Following this, NHS England launched a national Green Social Prescribing Programme with several "test and learn" sites, aiming to embed nature prescriptions into routine care for issues like anxiety, depression and chronic stress (Hervey 2024). While social prescribing often focuses on community settings (parks, farms, nature reserves), it reflects a wider cultural shift in healthcare towards treating nature as a legitimate healthcare intervention. In parallel, policy documents such as Public Health England's (2020) review "Improving access to greenspace" have gathered evidence that access to quality greenspace can reduce health inequalities and improve outcomes across society, urging local health systems to support parks and green infrastructure for public health benefits. There is growing acknowledgement that for urban populations, hospitals might be one of the few accessible green refuges, hence, making hospital campuses greener can extend benefits not just to patients but to the community at large, aligning with the NHS's prevention and public engagement goals (NHS England, 2022).

Concrete examples of NHS green space projects are increasingly visible. In London, a partnership between the Royal Horticultural Society (RHS) and NHS Trusts led to the creation of a new “wellbeing garden” at University Hospital Lewisham in 2022, transforming an unused outdoor area into a lush communal garden for patients, staff, and the local community (RHS, 2022). Funded in part by the National Garden Scheme and the Queen’s Nursing Institute’s Elsie Wagg Scholarship (which specifically supports nurse-led gardening projects), the Lewisham garden now hosts raised beds where patients grow herbs, quiet nooks for reflection, and space for rehabilitation exercises. Early reports from staff indicate it has become a “vital hub” for improving staff morale as well as patient mood. Similarly, in Lancashire a group of GP nurses used a QNI grant to build a health garden in a care home’s grounds post-Covid, providing a safe outdoor visiting space and a “swap and share” allotment scheme for the community (NHS, 2024). These projects serve as blueprints for how even modest funding and local leadership can repurpose underused NHS land into therapeutic green assets that engage community volunteers and deliver health and wellbeing benefits.

Despite this clear momentum, there remain significant gaps and inconsistencies in how nature is integrated across the NHS. One major gap is the lack of formal requirements or guidelines for including green space in new hospital designs. Unlike Singapore (as we will see with KTPH’s case), the UK’s healthcare design standards have not mandated gardens or access to outdoors as a norm. Many new hospitals built in the 2000s and 2010s still prioritised indoor, controlled environments over open-air spaces. When budgets are tight, courtyards and roof terraces are often the first to be cut from plans; a phenomenon noted by designers globally (Development Asia, 2017). Thus, the provision of hospital gardens in the NHS often depends on whether individual leaders champion them. Some NHS Trusts have excelled in this area, while others have minimal green space. The result is inequity; a patient’s access to nature during treatment may be a matter of luck based on where they are admitted. For instance, mental health hospitals often have generous gardens (since outdoor therapy is recognised in psychiatry), but general acute hospitals in dense cities like London may have little more than a few planters at the entrance.

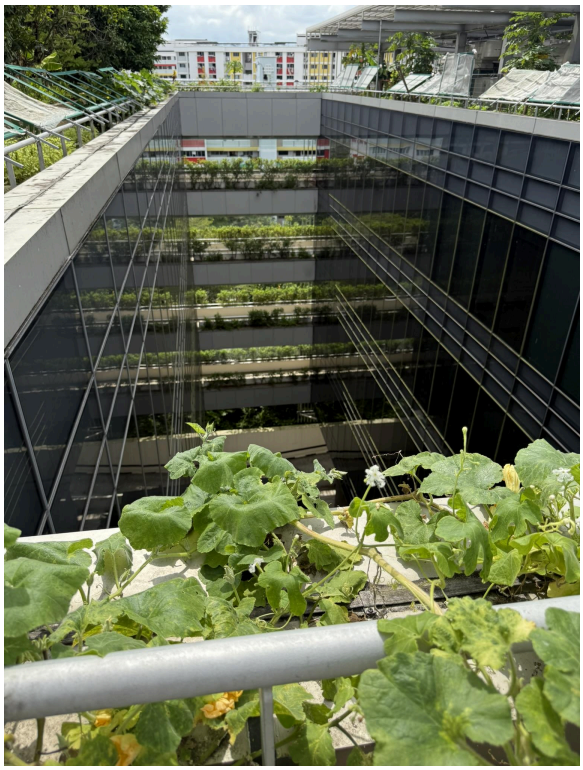


Maintenance and funding present another challenge. Many NHS hospitals that do have gardens rely heavily on charitable donations or volunteer groups for upkeep, as hospital maintenance budgets typically cover clinical infrastructure first. Horatio’s Garden, for example, raises funds to employ head gardeners and relies on volunteers daily, a model that works well for that charity,

but not every hospital has a dedicated charity to sustain a garden. The NHS “green space” projects are frequently siloed as optional extras rather than integrated into core operations. The idea of horticultural therapy, using gardening as part of treatment, is still not mainstream within NHS clinical services (barring some exceptions in mental health and occupational therapy). There can also be cultural and bureaucratic barriers: infection control concerns about soil or pollen, health and safety worries about patients outdoors, or simply a lack of awareness among clinicians about the evidence supporting nature-based interventions.

Nevertheless, attitudes are evolving. The Covid-19 pandemic was something of a turning point that highlighted the importance of access to fresh air and nature for both patients and staff. Many NHS staff found refuge in hospital grounds during stressful pandemic waves, spurring some Trusts to invest more in outdoor break areas and “wobble rooms” (staff wellbeing spaces, sometimes with plants and soothing decor). There is also a stronger sustainability push via the Greener NHS initiative, primarily aimed at carbon reduction, it also encourages biodiversity on NHS sites and recognises the co-benefits to patient health of greener environments (NHS England, 2024). For example, a hospital in Manchester appointed a “Nature Recovery Ranger” to enhance green spaces on its campus as part of its Green Plan, noting improvements in staff engagement and local community relations (NHS Forest, 2025).

In summary, the NHS is inching toward a greener future, with numerous promising projects proving the concept that hospital gardens and nature-based care can thrive even in a public healthcare system with limited resources. We have seen that where gardens do exist in the NHS, be it a spinal unit sanctuary or a small roof terrace, patients and staff respond with enthusiasm and measurable improvements in wellbeing. The challenge ahead lies in moving from isolated pockets of excellence to a more consistent, strategic incorporation of nature into healthcare environments. There remains no NHS-wide mandate that “every hospital should have a garden,” but perhaps the accumulating evidence and examples will inform future policy and capital investment. This is where learning from global best practices becomes invaluable. By examining how a hospital like KTPH in Singapore successfully integrated nature from the ground up, we can glean insights on how to overcome obstacles and design hospitals that heal with nature at their core. The next sections will explore how KTPH came to be and what makes its model effective, as a prelude to adapting those lessons back to the NHS context.



Origins of Khoo Teck Puat Hospital: Building with Nature at the Core

Khoo Teck Puat Hospital in Singapore did not become a “hospital in a garden” by accident, it was the result of visionary planning, supportive policy, and creative funding that put nature at the heart of its conception. Understanding the origins of KTPH provides a blueprint for how a healthcare institution can be intentionally designed to harness the healing power of nature. In this section, we explore how and why KTPH was built with nature as a central focus, including the policy decisions, leadership vision, and financing that enabled its unique design.

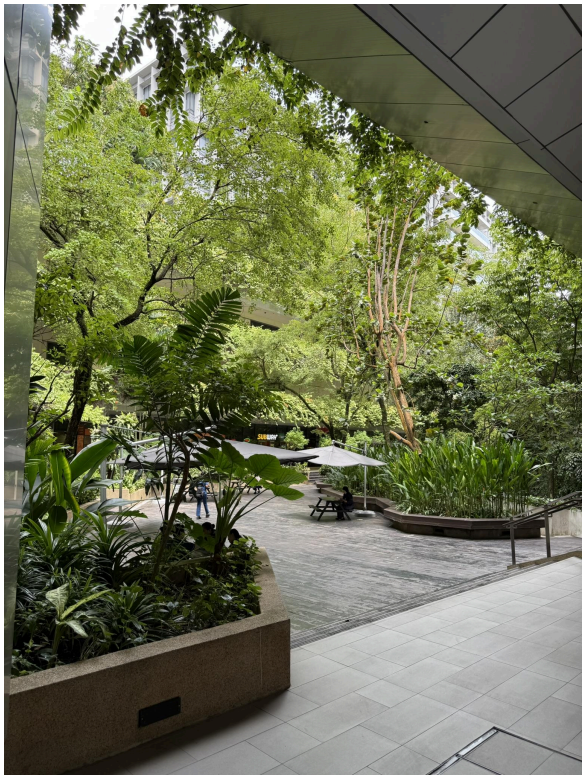
By the early 2000s, Singapore’s Ministry of Health recognised the need for a new regional hospital to serve the fast-growing population in the northern part of the island. The project was initially referred to as the new “Alexandra Hospital @ Yishun,” as it was slated to replace an older facility (Alexandra Hospital) with a modern campus in Yishun. In 2005, during site selection, the planning team was presented with multiple location options in Yishun. One stood out, a plot adjacent to a stormwater collection pond (Yishun Pond) and public parkland. As recounted by Mr. Liak Teng Lit, the CEO of the health system, choosing that site was “a no-brainer” because of the opportunity to create a restful, waterfront healing environment. The vision from the outset was extraordinary: instead of a hospital that loomed imposingly and displaced green space, they imagined a hospital that would “humbly fit in” with the landscape and even enhance it. Commitments were given to local officials that the hospital would not “take away” from the community but rather contribute to it. This mindset, that the hospital should be good to both people and nature, set the stage for a very different kind of design process.

Critical to KTPH’s origin was the leadership vision emphasising nature for health. Mr. Liak Teng Lit, as CEO of Alexandra Health (the cluster managing the project), was a driving force behind the hospital’s biophilic design. He famously challenged the architects with an unconventional brief: the hospital should be designed such that “one’s blood pressure lowers when he/she enters the hospital grounds.” (International Living Future Institute 2018). In other words, the mere experience of arriving at KTPH should have a physiologically calming effect, counteracting the typical anxiety of visiting a hospital. To achieve this, Liak insisted on seamlessly integrating the building with gardens, water, and abundant greenery. The winning architects (CPG Consultants with HOK) responded with a concept of a V-shaped hospital block embracing a central forested courtyard and opening toward Yishun Pond. The ‘V’ shape was not only symbolic but functional: it caught natural breezes blowing over the pond and funneled them through the hospital, reducing the need for air conditioning (Kishnani 2017). From the outset, the design

incorporated biophilic principles- natural light, ventilation, and views were maximised for patient areas, and every opportunity was taken to insert gardens at multiple levels of the structure. Even the upper-floor corridors were open-sided to allow wind and bird sounds, and balconies were decorated with scented flowering plants so that patients could literally “smell the flowers” from their beds. This level of biophilic design ambition was unprecedented in a large acute care hospital.

Singapore’s policy and development climate in the mid-2000’s was also conducive to such innovation. The government had been promoting “garden city” and environmentally sustainable development agendas, meaning a hospital that pushed green design would earn support. KTPH eventually achieved the Building and Construction Authority’s Green Mark Platinum Award (the highest green building rating in Singapore), notably, it was the first hospital to ever receive Platinum, reflecting features like being 40% more energy efficient than baseline and incorporating solar panels and water recycling. The integration with Yishun Pond was facilitated by inter-agency collaboration: the hospital team worked with national water and parks authorities to naturalise the concrete stormwater pond into a landscaped lake with wetlands. Costs for park improvements were shared, since the pond makeover would benefit both hospital users and the public. As a result, by opening day KTPH not only had its own grounds but essentially a *400% increase* in accessible blue-green space due to the adjacent park enhancements. This reflects a policy willingness to blur the boundaries between public infrastructure and healthcare for mutual benefit, an approach that could be instructive for NHS hospital planners working with local councils on green initiatives.

Funding and naming of KTPH also played a role in its beginning. During the planning phase, an extremely generous donation came from the family of the late Khoo Teck Puat, a prominent Singaporean banker and hotelier. The Khoo family donated $125 million towards the hospital’s construction, one of the largest charitable gifts to healthcare in Singapore’s history. In recognition, the hospital was named after Khoo Teck Puat, replacing its working title as Yishun General Hospital. This influx of the donation was crucial, it not only helped finance state-of-the-art facilities, but it arguably also gave the hospital team more freedom to pursue quality-of-life features like gardens. With strong government backing and private funding combined, KTPH’s total project cost came to around $700 million (£400 million). The donors and stakeholders were invested in making KTPH a showcase hospital. Indeed, there was perhaps the lucky alignment between the donor’s legacy (Khoo Teck Puat was known for his love of gardens and owned hotels with lavish landscaping) and the design ethos. It’s a



reminder that engaging donations or charitable support can be a game-changer in building therapeutic environments; many NHS hospitals too have charitable funds for garden projects (e.g. the NHS charity-funded Maggie's Centres).

From concept to execution, KTPH's planning emphasised nature, community, and sustainability as core goals alongside clinical excellence. This is exemplified by the hospital's biodiversity targets. Unusually, KTPH's CEO and planners set quantitative targets for the flora and fauna the hospital campus should sustain: they aimed for at least 100 species of butterflies, 100 species of birds, 100 species of fish, and similarly large varieties of plant life to eventually make their home in the hospital's grounds. This was essentially a prescription for biodiversity. Since opening, these targets have been impressively met or exceeded, by 2020 the hospital grounds recorded over 80 species of butterflies which currently stands at 114 species (up from just 3 species before development) 96 species of birds, 36 species of dragonflies and 100 species of fish. The inclusion of such targets in the project brief signals how deeply ecological values were embedded. KTPH was consciously designed not just as a place to treat illness, but as an ecosystem that coexists with the local environment, enhancing it. Green plot ratio, a measure of total green area to site area, reached almost 4 at KTPH, meaning the hospital achieved nearly four times as much green surface as the footprint of its land. Compare this to typical urban hospitals that often have a green plot ratio well below 1. This required creative design: KTPH's structures feature green roofs, vertical green walls, planter boxes on every ledge, and a massive open courtyard. The architects described it as creating an illusion that the buildings are "wrapped around a forest". Notably, 18% of the hospital's floor area is dedicated to gardens and water features, and about 40% of those spaces are open to the public, reflecting an intent to invite the community in, rather than fence the hospital off.

Policy-wise, KTPH also benefited from Singapore's emphasis on hospital quality and patient-centered care in the 2000s. The Ministry of Health encouraged new ideas to improve patient experience, and KTPH became a test bed. Post-occupancy, it was studied by Singapore's Centre for Liveable Cities (2017) as a model of "Building with Nature" in urban design. The hospital's design and outcomes were so notable that in 2017 it won the inaugural Stephen R. Kellert Biophilic Design Award, an international prize for buildings that successfully integrate nature and architecture. In short, from government forums to industry awards, KTPH's approach was validated, which in turn likely helps sustain policy support for its continued innovation (and replication in other new hospitals like Ng Teng Fong General Hospital, which followed with similar principles).

To sum up, the origins of Khoo Teck Puat Hospital highlight a blend of visionary leadership, supportive policy, and strategic funding. A clear vision: “lower people’s blood pressure through design”, guided every decision, and it resonated with larger national goals of livability and sustainability. Inter-agency cooperation allowed the hospital to extend its reach beyond its walls into the surrounding environment, turning a stormwater pond into a shared healing landscape. Funding provided the freedom to pursue ambitious design features that might otherwise be value-engineered out. And a mindset of measuring success not only in patient numbers but also in bird and butterfly species symbolised a truly holistic definition of health. In a sense, KTPH’s birth was driven by a philosophy that healthcare should nurture life in all its forms, human and non-human, an ethos that has paid dividends in patient wellbeing, community goodwill, and even international recognition.

For NHS leaders and planners, KTPH’s story is instructive. While the context differs, it shows that when building a new hospital (or refurbishing an old one), putting nature at the core is achievable if made an early priority. It requires commitment, “a rooftop garden is a concept that usually gets axed when value engineering comes in”, KTPH’s landscape architect noted, but KTPH’s management held firm. It also may require looking beyond the traditional healthcare silo, collaborating with city planners, tapping charitable funds, engaging local communities. The next section will discuss one of the gems of KTPH’s design: the expansive roof garden and sustainable urban farming program. This element in particular has generated global interest and offers practical ideas for how a hospital can operate and fund a green space in the long run.

KTPH’s Roof Garden: Sustainable Urban Farming in a Hospital

One of the most striking features of Khoo Teck Puat Hospital is its series of roof gardens, the largest of which functions as an organic urban farm atop the hospital’s outpatient clinic block. This rooftop is a vibrant, productive landscape that engages volunteers, produces food for the hospital, and sustains itself through innovative practices. The KTPH roof garden has won awards and international praise, becoming a model for sustainable healthcare design. In this section, we describe the development of the roof garden, how it is managed and maintained, and the creative ways it is funded, including plant and vegetable sales, volunteer programmes, and a farm-to-table loop with the hospital kitchen.

KTPH was designed with seven roof gardens in total, each with different themes and purposes.

These range from small therapeutic gardens adjacent to specific wards (like a dementia garden on one level, discussed later) to the large community farm on the top of one wing. The decision to include extensive rooftop gardens required a strong commitment. During design, the landscaping team acknowledged that “a rooftop garden is a concept that usually gets axed when cost-cutting comes in” because of maintenance challenges. Soil, water, tools, and people all need to reach the roof, and upkeep can be labor-intensive. To address this, KTPH’s architects deliberately made the rooftop easily accessible via lifts and wide stairs, facilitating the transport of materials and visitors. This infrastructure investment, essentially building the hospital to accommodate gardening activities, was crucial. It meant the rooftop could be actively used, not just a showcase visible from windows. KTPH’s management was fully on board, seeing the rooftop farm as integral to their vision rather than an optional add-on. This top-level buy-in ensured that the garden survived value engineering and opened with the hospital in 2010.

The outset of the main roof garden has a community story behind it. While KTPH was under construction, a nearby community garden in Yishun was going to be closed due to redevelopment. The hospital invited those local gardeners (many of them elderly residents) to continue their farming on the hospital’s roof once it opened. This outreach sowed the seeds for a strong volunteer base and gave the roof farm a community-focused identity from the start. When I visited, I met several of the volunteer gardeners, mostly retirees in their 60s, 70s and even 80s, who take enormous pride in tending the crops. Today, 28 volunteers regularly work in the KTPH rooftop farm, the oldest of whom are in their early 80s. Many are local residents who find purpose and social connection through this activity. The hospital employs a small horticulture team to coordinate operations (one staff horticulturalist oversees the garden), but the day-to-day labor is largely done by volunteers, rain or shine. Walking through the neat rows of vegetables and fruit trees, I was struck by the volunteers’ dedication, some treated it almost like a full-time job, arriving early in the morning to water and staying through the heat to harvest produce. Speaking with them, they mention not only the joy of gardening but also the satisfaction of giving back to the community “growing the plants makes me feel calm and happy but then seeing people buy them makes me feel so happy and excited. We are so passionate about what we do”.

The scale and biodiversity of the roof farm are impressive, especially given its urban hospital setting. The rooftop garden at KTPH cultivates 130 species of fruit trees, 50 species of vegetables, and 50 species of herbs. Strolling through, I saw this diversity: banana and papaya trees providing shade for understorey plants, trellises woven with passion fruit vines and gourds, plots of leafy greens like bok

choy and spinach, rows of eggplants, tomatoes, and local Southeast Asian herbs. There were also medicinal plants and ornamentals at the periphery. In total, the farm spans roughly 1,800 m² of rooftop- a patchwork of plots interspersed with walking paths and seating pergolas. Importantly, the farm operates on organic principles. I noted the use of rain barrels and composting bins; the volunteers explained that they recycle food waste from the hospital kitchen into compost to enrich the soil, creating a closed nutrient loop. An automatic irrigation system fed by collected rainwater and the adjacent pond is used to water the plants during dry spells, which reduces reliance on hospital water. These sustainability measures keep operating costs low and align with the hospital's environmental ethos.

Management of the rooftop garden is a collaborative effort. KTPH's administration provides structural support (access, utilities, initial soil and equipment) and one or two landscaping staff, but much of the organisational aspect is volunteer-driven. A volunteer leader (in my visit, this role was filled by a very passionate man, Simon, who had been with the program for many years) helps coordinate schedules, assign plots, and train new volunteers. The hospital runs a "Yishun Health Gardening Club", effectively, which falls under its community engagement department. Volunteers must undergo some safety orientation - after all, they are working on a hospital roof, and while it's safe and fenced, there are guidelines to follow. The collaboration is symbiotic: volunteers benefit from exercise, purpose, and social ties, while the hospital benefits from maintained gardens and the goodwill generated. Many of the volunteers spoke about how the garden supported both their physical and mental wellbeing. One shared that it helped to "keep their mind going", while another reflected, "It's tiring work, but it keeps me going". A third added, "Now I'm retired, there's nothing else to do but garden". There are volunteer appreciation initiatives; Simon shared that the hospital organises occasional educational trips and workshops for the gardening volunteers as a reward. They recently had a trip to Malaysia to say thank you for all their hard work. This helps retain enthusiasm and recognises their contribution as part of the care team.

One might wonder: does a farm on a hospital roof truly justify itself? In KTPH's case, the answer is yes, not only for therapeutic and aesthetic reasons, but also financially and operationally. The produce grown is put to good use, embodying a "farm-to-hospital" model that is still quite rare globally. A portion of the fruits, vegetables, and herbs harvested is donated or sold directly to the hospital's kitchen. KTPH's kitchen, which prepares meals for patients and a public food court, incorporates this ultra-local produce into its menus. Simon explained that, as one magazine humorously put it, the hospital had managed to replace "notoriously off-putting hospital meals with

ones made from fruit and veggies grown on-site." This not only improves nutrition but reinforces to patients and staff that the greenery is benefiting them in many ways. There is something profoundly comforting about knowing the soup you're having was made with herbs picked from just a few floors above.

Surplus produce and propagated plants are also sold to generate income back into maintaining the garden. Twice a week, the hospital hosts a small market stall in the atrium (or just outside, weather permitting) where the volunteers sell freshly harvested vegetables, potted plants, and saplings to visitors, staff, and the public. When I attended one of these sessions, it was bustling, nurses were buying sweet potatoes and curry leaves to take home for dinner, visitors were picking up potted pandan plants as gifts, and some people came by specifically because produce from KTPH has a reputation for quality and organic methods. These sales have become a key funding mechanism: the revenue helps cover the costs of seeds, soil, tool repairs, and other garden supplies. In other words, the garden largely pays for itself. The hospital's finance department reportedly views it favorably since it does not drain operational funds; any shortfall is minimal and often offset by sponsorships or research grants (the garden has been the subject of a few studies on urban farming and healthcare, which brought in small grants).

Sustainability is also ensured through smart design choices. The roof was built to handle the weight of soil and increased footfall, and it is sectioned into raised planters and green plots with proper drainage to avoid water leakage into the building. The selection of plant species also helps, the diversity means something is always in season, and many plants (like the fruit trees and perennials) are low-maintenance once established. Pest control is done naturally when possible; volunteers use biological methods like planting marigolds to deter pests or manually removing caterpillars, reducing the need for chemical pesticides in a hospital environment. These practices align with infection control as well, by avoiding harsh chemicals, there is less risk of any airborne irritants affecting patients. The facilities management team did have to assuage typical hospital concerns: for instance, ensuring that soil and plant debris don't clog drains or that there are no mosquito-breeding

puddles (critical in a tropical climate with dengue fever risk). Regular maintenance routines and the design of the waterproof membrane have prevented such issues, and in fact the garden likely *reduces* mosquito breeding by eliminating standing water through its irrigation design.

The roof garden's impact on the hospital environment cannot be overstated. It dramatically improves the microclimate, studies found the interior courtyard of KTPH to be about 2°C cooler than outside the hospital, thanks in part to all the rooftop and facade greenery reducing heat gain. This cooling effect and natural ventilation save on air-conditioning costs, contributing to the hospital's energy efficiency goals. Biophilic design benefits staff too: many hospital employees use the roof garden as a tranquil break area. I saw a few doctors in scrubs eating lunch under a pergola amid the vines, and nurses often take a stroll through the garden after a hectic shift. The presence of nature provides a mental reset.

What's interesting at KTPH is that the roof farm is not typically open to inpatients, without supervision. During my visit, I learned that due to safety and acuity, most patients don't physically go up to the roof garden. It's considered a community and staff space primarily, and an amenity for ambulatory patients or visitors. Acutely ill patients are instead provided with ground-level garden access or can view the greenery from their wards. This was initially surprising, one might think a healing garden should be directly accessible to patients. However, the hospital reasoned that many inpatients are too unwell to navigate to the roof, and the environment (with tools, farm equipment around) might not be ideal for frail patients. To mitigate this, the volunteers and staff will sometimes bring the roof garden to the patients- by delivering fresh flowers, or engaging recovering patients in simple gardening tasks in easier-access gardens (more on that in the next section on therapy). Still, the model has merit: by keeping the roof farm as a robust community operation, it stays productive and well-maintained, and its therapeutic benefits "trickle down" through produce, views, and the general ambience it creates. Simon the operations manager expressed some regret that patients couldn't routinely visit the big roof farm, but he noted that volunteers benefit greatly and the produce indirectly benefits patients. From an NHS perspective, this is a noteworthy operational point: a hospital roof garden could serve multiple user groups (staff, community, ambulatory patients) even if critical care patients themselves might only enjoy it via a window or supervised trips. Designing different zones, some for patient therapy, some for community gardening, might be a way to maximise use while managing risk.

To further sustain the garden, KTPH has woven it into its identity and programming. They conduct public tours of the hospital gardens, showcasing the roof farm as a highlight. Local schools have brought students to learn about hydroponics and healthcare innovation. The hospital even entered some of its giant gourds and prize fruits in local agricultural competitions,

winning ribbons that are now proudly displayed, a charming melding of healthcare and farming achievements. In short, the roof garden has become a point of pride and a symbol of KTPH's commitment to wellbeing and community. By funding itself through produce sales and engaging volunteers, it stands as a sustainable model that could be mirrored elsewhere.

In summary, the KTPH roof garden demonstrates that with planning and community engagement, a hospital can host a thriving urban farm that *feeds* its people in both body and spirit. Key factors to its success include: strong initial design accommodations (structural support, accessibility), an active volunteer workforce (with coordination and recognition), integration with hospital food services (closing the loop from seed to plate), and small-scale commercial activity (plant/produce sales) to offset costs. It is a living example of a hospital embracing the idea that "food is medicine" not only by serving healthy produce to patients but by the very act of growing that food in a healing space. For a hospital in London or elsewhere in the NHS, KTPH's roof garden offers an inspiring template: even in a dense urban healthcare campus, there is potential to transform rooftops into green sanctuaries that benefit staff wellbeing and community nutrition, and perhaps eventually, patient recovery spaces.

Having examined KTPH's physical gardens and their operations, we turn next to the hospital's use of horticulture as a therapy, in particular, programmes designed for patients with dementia and other conditions, where gardening activities themselves are part of treatment. This will illustrate how the presence of nature at KTPH, though seemingly passive décor, plays an active role in patient care.

Horticultural Therapy at KTPH: Dementia Care and Patient Wellbeing

One of the most innovative aspects of Khoo Teck Puat Hospital's approach is the use of horticultural therapy programmes to improve patient wellbeing, particularly for vulnerable groups like patients with dementia. Horticultural therapy (HT) is defined as the use of plants and plant-based activities in therapeutic and rehabilitative processes to achieve specific clinical goals. At KTPH and its associated facilities, gardening and nature activities have been woven into patient care, demonstrating measurable benefits such as improved mood, cognitive stimulation, and reduced agitation in patients with cognitive impairments. In this section, we

outline the design and outcomes of KTPH's horticultural therapy initiatives, ranging from on-ward programmes like "Garden by the Bed" for acute patients, to specialised therapeutic gardens for dementia, and discuss how these contribute to patient wellbeing.

KTPH's ethos of integrating nature "throughout" the hospital meant that gardens were not only for passive enjoyment but also intended as active therapeutic spaces. One standout initiative is called "Garden by the Bed." Faced with the reality that many acute care patients (especially frail elderly or those with dementia) were too unwell to walk down to the ground-floor gardens or up to the roof farm, a senior occupational therapist, Ms Giang Thuy Anh, devised a way to bring the garden directly to them. The concept is simple yet powerful: portable garden trolleys are brought to patients' bedsides in the wards, allowing them to experience gardening and nature without leaving the ward environment.

Each mobile "garden by the bed" unit is essentially a small raised garden on wheels, imagine a waist-high planter box filled with soil, flowers, and herbs, equipped with tools and watering cans. Therapists and volunteers wheel these mini-gardens into the geriatric and medical wards. Patients can touch and smell the plants, help water them, and even do light tasks like planting seedlings in pots, all from the comfort of their bedside or chair. The goal, as Ms Giang explained in a Straits Times interview, is to "improve the well-being of the patients…Many of our patients in acute care wards are not fit enough to go to the garden. That's why we want to bring the garden to them". This program is now active in six geriatric acute wards at KTPH. The therapeutic rationale is multifold. For patients with dementia or delirium, the garden trolley provides sensory stimulation and a sense of normalcy, the sights of green foliage and colorful blooms, the smell of basil or jasmine, the texture of soil, all help ground them in the present and can evoke positive memories (many older patients reminisce about gardens they tended in younger days). This can reduce agitation and confusion by engaging them in a meaningful activity. For patients with depression or who are withdrawn, nurturing a plant can give a sense of purpose and accomplishment. Physically, the act of watering or repotting can serve as a gentle exercise to maintain fine motor skills and range of motion, complementing occupational therapy goals. As one HT practitioner noted, with these activities "they're having fun and not realising they're using their muscles" a principle that applies across ages.

The outcomes observed from "Garden by the Bed" have been encouraging. Nurses on those wards reported that during the gardening sessions, patients (even those who are usually restless or anxious) become calmer and more engaged. Anecdotally, patients sleep better on days they've had the gardening activity, and they often look forward to these sessions, asking "when are the plants coming?". Some of the more cognitively intact patients even "adopt" a plant

on the trolley, caring for it daily as a motivator to get out of bed. This aligns with wider research: a 2020 systematic review and meta-analysis found that patients with dementia benefit from horticultural therapy by significantly reducing agitated behaviors, increasing time spent actively engaged, and decreasing time spent doing nothing or being isolated (Lu *et al,* 2020). These findings mirror the experience at KTPH- the garden visits tend to brighten the mood on the whole ward. Family members have also given positive feedback; seeing their loved ones smile while touching a plant or reminiscing about a flower often provides relief to families who usually see them in distress.

Another facet of horticultural therapy at KTPH is the use of therapeutic gardens linked to specific wards or rehab areas. For instance, the hospital campus includes a dedicated dementia garden (sometimes referred to in literature as a memory garden). This garden is designed with safety features and familiar landscaping to cater to patients with Alzheimer's or other dementias. It is fenced and enclosed to prevent wandering, has non-toxic plants, circular paths (so patients won't encounter an endpoint that might frustrate them), and plenty of seating. In planting this garden, designers chose many plants with nostalgic or sensory value: for example, frangipani trees and jasmine for fragrance (common in old Singaporean gardens), edible plants like pandan and curry leaf to stimulate appetite and recollection of cooking, and brightly colored flowering shrubs to capture attention. The Earthbound Report noted that KTPH created gardens "tailored to the needs of particular patients, such as the dementia garden" as complementary to the large roof garden (Williams, 2020). This dementia garden is adjacent to a geriatric ward or the rehabilitation centre, enabling supervised patient visits. Therapists use it for structured horticultural sessions, for example, a weekly gardening club for patients undergoing rehabilitation or a day program for those with mild dementia. Patients might do tasks like watering plants, potting simple cuttings, raking leaves, or just strolling and naming the plants they recognise. These activities aim to maintain cognitive function (naming plants, recalling gardening processes), encourage social interaction (the sessions are often group-based, fostering peer interaction), and provide *sundowning* relief (evening periods of agitation common in dementia can be eased by a calming garden walk).

The outcomes from such therapeutic gardens align with research globally. Studies have found that spending time in gardens can improve the quality of life and behavioral symptoms of people with dementia, including reductions in agitation and improvements in mood and sometimes appetite (Zhao *et al,* 2020). Horticultural tasks can also give a sense of independence and competence to people whose cognitive abilities are declining, as Alzheimer Scotland (2024) notes, gardening allows individuals to exercise choice, reminisce, and engage in meaningful activity, serving as a powerful non-pharmacological intervention. At KTPH, the staff have

observed dementia patients in the garden often become more lucid and communicative, at least temporarily. A consultant geriatrician, Dr Ng Chong Jin, has spoken about how horticultural therapy provides cognitive benefits, patients get stimulation of multiple brain areas (visual, tactile, olfactory) and often show increased alertness and pleasure during and after the sessions.

Additionally, horticultural therapy has been used in KTPH's rehabilitation programmes for post-stroke or post-surgery patients. The act of gardening can be a form of occupational therapy to improve fine motor skills, balance, and coordination. I observed a physio session where instead of the usual rubber ball exercises, a patient was tasked with pruning a plant and then carrying a watering can, cleverly disguising repetitive movements in a purposeful activity. The patient, who had a hemiplegic arm from a stroke, was beaming as he managed to water a row of flowers with his good arm while stabilising the can with his recovering arm, accomplishing a therapeutic exercise that might otherwise have been mundane. This kind of engaging rehab can increase patient motivation to participate fully in therapy, potentially improving outcomes.

KTPH's horticultural therapy efforts also extend to its adjacent facility, Yishun Community Hospital (YCH), a step-down care and rehabilitation hospital connected to KTPH. YCH has its own healing gardens and HT programmes, often run in concert with KTPH's therapists. For example, long-stay elderly patients at YCH (some of whom have dementia or depression) may attend gardening workshops led by trained volunteers or staff from KTPH's gardening club. There is cross-participation where volunteers from the roof garden program help out with patient gardening days. This integrated approach across the healthcare campus ensures that even as patients transition from acute care to rehab, their access to nature and gardening continues.

From a clinical perspective, horticultural therapy at KTPH is not seen as an "alternative therapy" on the fringes; it's increasingly part of standard care plans, especially in geriatric and rehabilitative medicine. Doctors write orders for patients to attend gardening sessions just as they would for physiotherapy. The hospital's electronic medical records even have a coding for HT sessions to document patient participation and progress. This institutional acceptance is critical. It validates horticultural therapy as a professional practice (indeed, KTPH employs trained horticultural therapists, individuals certified or experienced in using gardening for therapy, working alongside OTs and physiotherapists). Moreover, KTPH's approach yields organisational benefits: happier patients, possibly shorter stays (calmer, engaged patients might eat better and cooperate more with rehab), and reduced use of psychotropic medications for agitation. While hard data on length of stay or medication reduction at KTPH have not been published to my knowledge, the literature elsewhere supports these potential benefits (for example, some dementia care homes have reported reduced antipsychotic use when residents engage in gardening activities).

The KTPH team has shared their horticultural therapy model beyond the hospital. They give talks in the community about therapeutic gardening and have collaborated with Singapore's National Parks Board on a Therapeutic Horticulture Program at a nearby public park (Yishun Pond Park's therapeutic garden). These sessions bring seniors from the community, including those with mild cognitive impairment, to engage in guided gardening, a preventive approach to keep elders healthy and socially connected. In a way, KTPH is influencing public health by exporting the idea that nature is healing, whether within hospital walls or outside.

In summary, KTPH's horticultural therapy programmes for patients, especially those with dementia or undergoing rehab, underscore a crucial lesson: having gardens is wonderful, but actively using gardens in clinical therapy amplifies their benefits. Designing a hospital with gardens creates the opportunity; it takes creative clinical staff to turn that opportunity into patient outcomes. KTPH has shown that even acute care patients can safely engage with nature through innovations like mobile garden trolleys, and that doing so can improve their hospital experience and possibly clinical metrics like agitation and orientation. For dementia care, KTPH's tailored garden and HT sessions align with global best practices for non-drug interventions that maintain quality of life. As we look to apply these insights to the NHS, it will be important to consider not just building gardens, but also training and empowering staff (occupational therapists, activities coordinators, volunteers) to use those gardens therapeutically. The evidence base is growing that horticultural therapy is effective: systematic reviews conclude it can improve cognitive function, reduce aggression, and increase positive emotions in people with dementia (Zhao *et al,* 2020), and it can benefit older adults without dementia by improving mood and physical function (Giang *et al,* 2024). KTPH provides a living case study of these principles in action within a general hospital.

Having explored both the physical infrastructure (roof gardens) and programmatic innovations (horticultural therapy) at KTPH, we now turn to the final part: translating these learnings to the UK context. What can the NHS and specifically King's College Hospital take away from KTPH's model? How might we adapt these ideas (roof gardens, volunteer gardening, therapeutic horticulture) to our climate, culture, and health system? The next section will offer reflections and recommendations for implementing a roof garden for ICU patients at King's and for integrating nature into NHS healthcare more broadly.

Applying Lessons from KTPH to the NHS: Recommendations for King's College Hospital and Beyond

The experience of Khoo Teck Puat Hospital vividly illustrates that integrating nature into a hospital's design and operations can yield significant benefits for patients, staff, and the wider community. For NHS hospitals, many of which are grappling with aging infrastructure, tight budgets, and the pressures of improving patient experience, KTPH offers a hopeful blueprint. The challenge is how to adapt and implement those ideas in the UK context, where climate, financial models, and organisational culture differ from Singapore's. In this final section, I reflect on key lessons learned from KTPH and propose practical strategies for applying them to the NHS, with a focus on the planned roof garden for intensive care patients at King's College Hospital. The recommendations are structured to be actionable steps, balancing the idealism of KTPH's example with the realism of NHS constraints. Underpinning these proposals is a core philosophy validated by both research and my observations: healing environments are not a luxury but a necessity for holistic care, and with creativity and commitment, even high-tech settings like ICUs can be made more humane through nature.

1. Secure Leadership Commitment and Multidisciplinary Planning: The first lesson from KTPH is that visionary leadership and clear goals are essential. King's College Hospital (KCH) should begin by establishing a high-level commitment that the new intensive care roof garden is a priority, not an afterthought. This could be formalised in the project charter for the new ICU unit e.g., include the objective "to create a healing garden accessible to ICU patients, families, and staff" as a key deliverable. Having the hospital executive team and ICU clinical leaders openly champion the garden sets the tone for all stakeholders. An early multidisciplinary steering group should be formed, including ICU doctors and nurses, hospital estates/facilities staff, infection control, therapists, and representatives from patient experience or the hospital charity. This group can oversee design and integration of the garden from the ground up. Engaging clinicians from ICU is crucial to address concerns and shape the garden to patient needs, for instance, ICU nurses can advise on how beds or ventilators might be safely moved into the garden, and physiotherapists can suggest design elements that facilitate patient mobilisation (like smooth paths for walking practice). Involving infection control from the start will help develop protocols (for example, guidelines on soil handling or ensuring no stagnant water to breed insects) to alleviate safety concerns. Essentially, early and

broad engagement mirrors how KTPH's garden was part of initial planning, this ensures the garden isn't seen as a side project of one department, but as a collective aligned with the hospital's healing mission.

2. Design for Accessibility, Safety, and Flexibility: When designing an ICU roof garden in the NHS, certain adaptations will be needed for climate and patient acuity. Unlike tropical Singapore, London's weather is temperate with cool winters, so the garden should be designed to be usable year-round perhaps a combination of an open-air section and a sheltered conservatory-like area. A "Balcony of Hope" model (like the ICU terrace in Seville) could be instructive: a partially covered terrace that allows bed access and protection from wind or rain. Materials must be healthcare-grade: non-slip flooring, high-quality drainage, and avoidance of allergenic plants. Safety is paramount: railings must be secure (likely higher and perhaps glass to avoid blocking light), and any water features must be shallow or contained. However, these concerns are surmountable- indeed, other hospitals have done it (the ICU "Secret Garden" in Derriford Hospital, Plymouth, indicates a UK model). The design should incorporate direct access from the ICU (e.g. large doors that can accommodate a bed or wheelchair) so that no complicated transport is needed to get patients out. It is also wise to include a mix of seating and quiet nooks for family members. Essentially, the garden can serve a dual purpose as an ICU patient therapy area and a family respite area. Flexibility in design will allow it to benefit staff as well; a corner of the garden could be a staff break spot with some privacy from patients. In planning this, one can look at existing successful therapeutic gardens in hospitals, many have zones or sections (e.g. a more active rehab zone vs. a quiet reflective zone). Designing with input from end-users (patients who have been in ICU, or their family members) can yield insightful ideas, for example, a former ICU patient might emphasise the importance of shade and avoiding bright direct sunlight (ICU patients' eyes can be sensitive after days indoors), or the need for a call bell extension in the garden. In short, by building in accessibility and patient centred details, the garden will truly function as an extension of the ICU rather than a separate ornamental space.

3. Address Maintenance and Funding via Creative Models: One of the fears in the NHS is that a garden will be hard to maintain with limited estates budgets. KTPH's model provides inspiration: tap into volunteer and community resources, and create revenue trickles that sustain the garden. King's (and other NHS hospitals) can partner with local organisations such as horticultural societies, gardening charities (like Thrive or local allotment clubs), or even corporate volunteer programmes to establish a volunteer gardener group. London has a rich network of community gardeners who might be eager to be involved in a hospital project. By vetting and training a set of volunteers, KCH could ensure the roof garden is tended to without overburdening NHS facilities staff. Additionally, KCH's

own patient and public involvement (PPI) groups or Friends of the Hospital could be drawn in. Often, former patients or retirees like to give back by volunteering on site. To fund initial setup and ongoing costs (plants, soil, etc.), multiple sources can be combined: hospital charity appeals, targeted grants (for instance, the National Lottery Community Fund or charitable trusts that support health and social care innovation might fund a therapeutic garden project), and small-scale enterprise. KTPH's produce sales concept might be replicated in a UK fashion, perhaps the garden could include some allotment planters where staff and patients grow vegetables, and the produce is sold in the hospital farmers' market or used in the canteen. While the ICU garden might not be as production-oriented as KTPH's large farm, even a modest herb garden that supplies the hospital kitchen with fresh herbs or garnishes for patient meals can be symbolically and practically valuable (improving meal taste and nutrition). If space allows, a small plant nursery corner could propagate easy plants (like spider plants, succulents) to sell in the hospital gift shop or at fundraisers, generating a bit of income and raising awareness of the garden. Importantly, the hospital should dedicate at least a part-time staff role to coordinate the garden (this could be a horticultural therapist or a volunteer manager with gardening expertise). This role can ensure continuity, organise volunteer schedules, interface with hospital departments, and plan seasonal planting. Including this in the budget is wise, again it might be funded through charitable sources or justified by the garden's therapeutic function (possibly falling under patient experience or rehabilitation budgets). By diversifying funding and maintenance responsibility, the garden is more likely to thrive long-term rather than become neglected after initial enthusiasm.

4. Leverage Horticultural Therapy for Patient Care: A key recommendation for King's is to not view the garden as merely a nice space, but to actively incorporate it into patient care plans. The ICU patient population is unique, many are sedated or on life support, but there are also patients recovering or long-stay patients for whom psychological health is a concern. King's could develop protocols to allow stable ICU patients to spend time in the garden as part of their recovery. For example, physiotherapists could include walking to or within the garden as a rehab goal for post-operative ICU patients. Even 15 minutes outside can improve a patient's mood and perhaps delirium, as suggested by accounts of carers seeing "improved patient condition after taking patients for 15-min garden walks" (Nieberler-Walker *et al,* 2023). For those who cannot be moved, simply arranging ICU room assignments so that those rooms overlook the garden (if feasible) could provide a visual therapeutic benefit similar to that in Ulrich's classic study (Ulrich, 1989). Moreover, adopting KTPH's "Garden by the Bed" idea on ICU wards could be transformative. Even if an ICU patient can't go to the garden, a modified mobile nature unit could be brought to them, something as simple as a rolling stand with potted

lavender or rosemary and a small water feature for sound, or virtual reality nature experiences if physical plants aren't possible. The point is to use the existence of the garden as a catalyst to incorporate nature in all ICU patient interactions where possible. King's could collaborate with occupational therapists from other specialties (e.g. neuro-rehab) to run pilot horticultural activities for long-term ICU patients (some ICU patients who are conscious but ventilator-dependent could potentially engage in planting seedlings in pots from their bed, with help). Family members could also be invited to wheel their loved one to the garden when they visit, turning visiting time into a therapeutic outing.

Beyond ICU, the hospital should consider extending horticultural therapy to other wards, for example, care of elderly wards or neuro-rehabilitation units could share use of the roof garden at allocated times for group planting sessions or gentle exercise in greenery. In the NHS, there is increasing interest in social prescribing and non-pharmacological therapies, so a well-utilised hospital garden could become a cornerstone for such initiatives, demonstrating internally that complementary therapies have a place in acute care. It might even be possible to conduct a small study or quality improvement project at King's to formally evaluate the effects of ICU patients spending time in the garden (measuring indicators like delirium incidence, patient stress scores, or family satisfaction). Evidence collected locally would help convince any skeptics and could be presented to Trust management or at conferences to encourage further support and replication.

5. Embrace Community and Cross-Sector Partnerships: KTPH flourished in part because it erased the boundary between hospital and community. NHS hospitals can likewise invite the community in, safely and constructively. King's could host community events in the garden (say, an annual open house during NHS Sustainability Day or mental health awareness week, where local residents can tour the garden and learn about its benefits). Partnerships with local schools could bring students to learn about science or to do art inspired by the garden, simultaneously enriching education and cementing community goodwill. Local mental health charities might run a session in the garden for their clients, or gardening clubs might hold a workshop. The more the garden is a shared community asset, the more social value it creates. However, for an ICU garden, access would have to be controlled; perhaps community use is limited to times when it won't disturb patients, or a separate entrance is provided so visitors don't go through the ICU itself.

On the funding side, forging relationships with organisations like the Royal Horticultural Society (RHS) or the National Garden Scheme (NGS) can unlock resources. The RHS, for instance, has been actively partnering with healthcare facilities to create gardens (as seen with the Lewisham hospital project). They have expertise and may provide design assistance or plants.

The NGS, which supports gardens and health charities, could be a potential funder or promoter for a well-designed ICU garden project; they have historically funded nursing initiatives in gardens (like the QNI scholarships).

6. Monitor and Celebrate the Benefits: Once the garden is in place, it will be important for King's (and any implementing hospital) to monitor its usage and benefits, and to celebrate successes. Keeping simple statistics for example how many patients visited the garden, how many staff use it daily, any notable patient recoveries aided by the garden, will help build the case to hospital administrators that it's a worthy investment. Patient and family testimonials can be powerful; capturing quotes like "being able to go to the garden was the highlight of my hospital stay" can justify the approach to any sceptics. Additionally, linking the garden to the hospital's strategic goals (e.g., patient experience scores, staff wellbeing- which is a focus of the NHS People Plan) can secure its position. A well-utilised garden can even improve a hospital's image and ratings: patient satisfaction surveys might reflect the availability of the garden as a positive element of care.

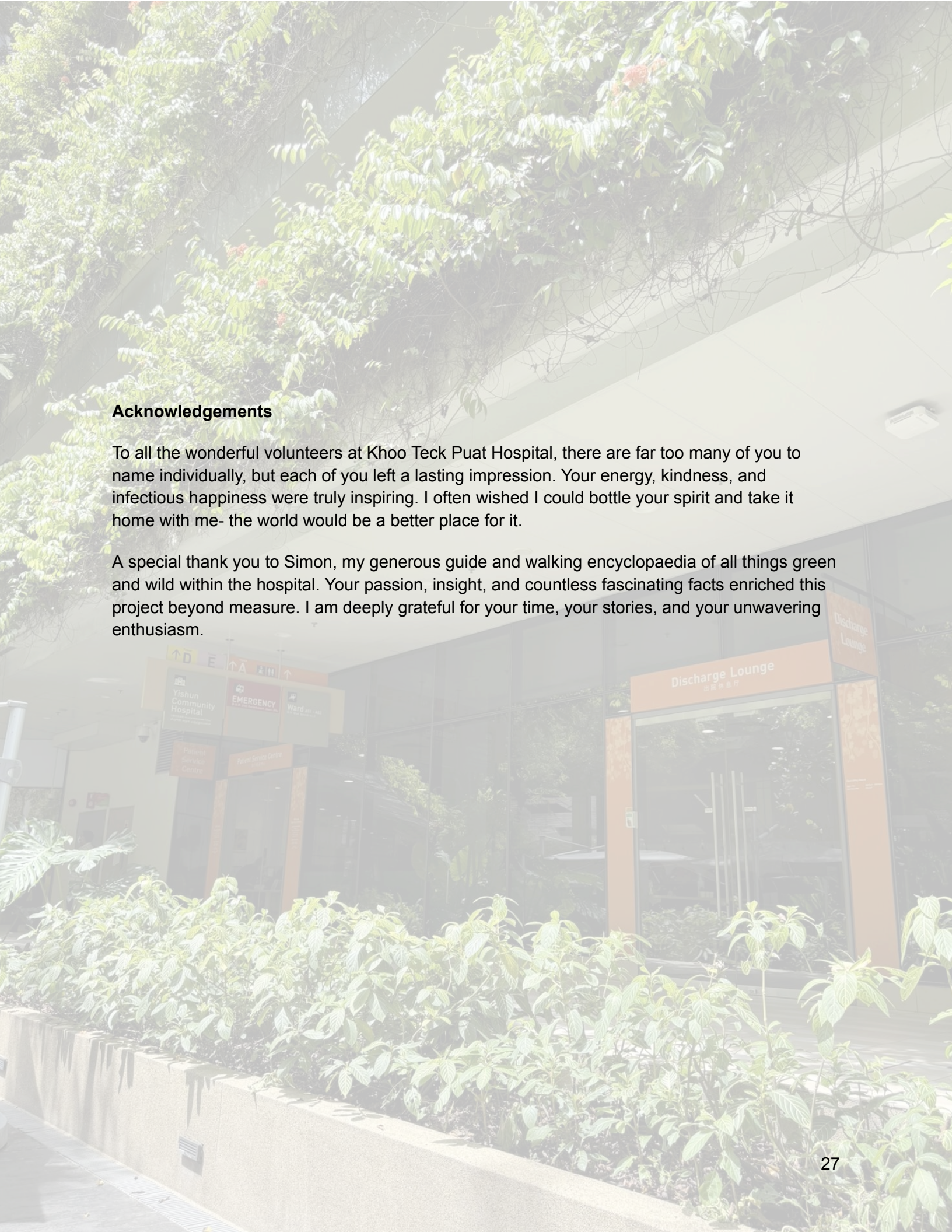
King's should also integrate the garden into its staff wellbeing initiatives. After the pandemic, NHS staff burnout is a huge concern, and trusts are implementing measures to support staff mental health. A garden retreat for ICU nurses and doctors to decompress after traumatic cases could become a critical part of the wellbeing offering. Staff support sessions or peer meetings could be held in the garden rather than a windowless room, likely improving their efficacy.

Finally, sharing best practices across the NHS will amplify impact. King's could publish a case study or host other trusts to visit the ICU garden once it's established. In doing so, it continues the spirit of the Churchill Fellowship- disseminating knowledge gained globally for local benefit. If multiple NHS hospitals start adopting roof gardens or horticultural therapy programmes, collectively they can push policy. Perhaps in the future, NHS England might include healing gardens in design guidelines for new hospitals (the current "New Hospital Programme" could take note of these examples to ensure the £3.7bn investment in upcoming hospitals includes green design). By demonstrating a successful project, King's could influence that wider policy change.

In conclusion, bringing nature into healthcare as KTPH did is as much a cultural journey as a physical one. It challenges the long-held notion that serious hospitals must be entirely clinical and controlled. But evidence and experience show that even in intensive care, patients are still human beings with innate connections to nature, connections that, when honored, can aid healing. My exploration of KTPH has convinced me that healing gardens and horticultural therapy are not adjuncts; they should be part of the standard toolkit of patient care. The task

ahead for us in the NHS is to apply these insights creatively within our system's framework. It will require breaking some silos (between facilities and clinical services, between hospital and community), and perhaps taking some bold steps (allocating funding for a gardener, persuading a sceptic or two). Yet the potential rewards calmer patients, faster recoveries, empowered staff, and hospitals that uplift rather than depress the human spirit, are well worth the effort.

As King's College Hospital prepares to implement an ICU roof garden, I hope that the vision is to create a healthcare environment that truly cares in every sense, embracing the therapeutic power of nature to heal bodies and minds. I carry with me the memory of stepping onto KTPH's lush roof garden: the sight of butterflies between plants, a volunteer watering the plants with a smile, and in the distance a patient looking out from a balcony with greenery at arm's length. In that moment, the hospital felt not like a fortress of illness, but a sanctuary of life. By learning from the KTPH model and grounding it in research and local initiative, NHS hospitals can move closer to the ideal of healing not only through medicine, but through the environment. It is my sincere hope that in a few years' time, an ICU patient at King's will feel the sun and breeze from a garden, families will find moments of peace in the greenery amid crisis, and staff will recharge among plants and wildlife, a daily reminder that growth and recovery are possible even in the hardest of times.



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