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Space and care in cancer: A meta-analytic explanation of the role of spatial environments in cancer experience and treatment

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ABSTRACT

Cancer has traditionally been conceptualized as a solely somatic disease; however, emerging evidence underscores the extent to which its treatment and lived experience are profoundly mediated by spatial factors. This study undertakes a qualitative meta-synthesis of interdisciplinary literature to critically examine how diverse spatial environments—architectural, relational, ecological, and symbolic—constitute integral dimensions of cancer care. Drawing on empirical and theoretical contributions from psycho-oncology, environmental psychology, nursing science, and therapeutic design, the analysis advances the argument that space operates not as a passive setting but as an active co-constituent shaping physiological, psychological, and existential outcomes. The synthesis reveals that therapeutic architecture, relational closeness, ecological embeddedness, and symbolic spatial cues significantly affect patient well-being, caregiver capacity, and the efficacy of care delivery systems. These findings challenge the prevailing biomedical paradigms that marginalize spatial determinants and instead support the adoption of a relational-material framework for understanding and enhancing care. Spatial dimensions of healing—encompassing safety, familiarity, identity reinforcement, and continuity—are shown to promote resilience and agency, particularly within vulnerable settings such as home-based palliative care and survivorship programs. The paper concludes by emphasizing the imperative for spatial literacy within oncology education, practice, and policy. It calls for a reconceptualization of care environments that bridges the gap between empirical insights and clinical implementation, thereby advancing a model of cancer care that is ethically grounded and spatially responsive.

INTRODUCTION

Cancer is often framed as the quintessential bodily illness—a cellular malfunction manifesting in tumors, tissue invasion, and physiological decline. Yet, this reductive framing obscures the profound ways in which cancer transcends the biological to entangle the spatial. Bodies do not experience illness in a vacuum. They inhabit and are inhabited by space—material, social, architectural, and symbolic. Recent studies confirm this interplay, showing how

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both physical environments and digital spaces actively shape health behaviors and outcomes through their material and narrative dimensions (Soroori Sarabi et al., 2020). From hospital corridors to domestic bedrooms, from the sterile geometries of oncology wards to the informal warmth of support centers, cancer is not only treated in space but constituted through it. This paper argues that space, broadly conceived, is not merely the backdrop against which cancer unfolds, but an active participant in shaping the illness experience, modulating care practices, and even influencing physiological outcomes.

In recent decades, growing interdisciplinary attention to the spatialities of care has challenged biomedical paradigms that divorce illness from environment. Research from environmental psychology, health architecture, and psycho-oncology has increasingly recognized that healing is not only pharmacological but atmospheric; not only chemical, but relational and environmental. For example, studies on therapeutic architecture emphasize that design elements—such as natural light, acoustic comfort, and spatial orientation—can influence stress responses, immune function, and patient adherence (Beggs, 2015; Jellema, Annemans, & Heylighen, 2019). Simultaneously, psychosocial oncology has illuminated how the relational and symbolic dimensions of space—privacy, safety, social proximity—mediate the psychological and existential aspects of cancer (Frisone, 2021; Mulcahy, Parry, & Glover, 2010). Yet, despite this emergent literature, mainstream oncological discourse continues to under-theorize the role of space, often reducing care to technical interventions and neglecting the environments in which these occur. Studies demonstrate this pattern extends beyond healthcare - when adopting new paradigms, systems often prioritize technical implementation over critical ethical dimensions, creating similar gaps in education and technology sectors (Rahmatian & SharajSharifi, 2021).

This paper contends that understanding cancer care—and cancer itself—requires a meta-analytic revaluation of space as a determinant of experience and outcome. Drawing on a wide body of empirical research, the analysis synthesizes findings across clinical, architectural, and psychosocial studies to trace the diverse ways spatial configurations impact cancer trajectories. It explores not only the physical architecture of care (e.g., hospital design, domestic spaces), but also the spatialities of relational care (e.g., proximity, presence, and embodied co-existence), ecological environments (e.g., access to green space), and even metaphysical or spiritual dimensions of space (e.g., spaces for reflection, ritual, and symbolic meaning). Through this synthesis, the paper advances a theoretical framework that treats space not as passive container but as co-agent in the ontology of cancer—implicating both care and cure.

By foregrounding space as a constitutive element of cancer experience, this paper aims to unsettle the mind–body–environment divides that undergird much of biomedical thought. In doing so, it contributes to a more holistic, materially attuned, and ethically responsive understanding of cancer—one that recognizes care not only as a clinical practice, but as a spatial and relational endeavor. This framework aligns with broader findings that personality structures and social compatibility are deeply entangled with environmental context, influencing how individuals navigate systems of care and risk (Jamali, Salehi, & Chorami, 2022).

METHODOLOGY

Research Design

This study adopts a qualitative meta-synthesis approach, aimed at systematically integrating and reinterpreting a heterogeneous body of empirical literature that addresses the interrelations among cancer care, spatial environments, and psychosocial well-being. Distinct from statistical meta-analysis, this interpretive and integrative methodology draws upon interdisciplinary sources spanning oncology, health architecture, psycho-oncology, environmental psychology, and caregiving research. The objective is to extract recurring spatial themes, delineate conceptual patterns, and critically examine how various dimensions of space—physical, relational, ecological, and symbolic—function as integral components within the continuum of cancer care.

Inclusion Criteria

Studies were included in the meta-analytic synthesis if they met the following criteria:

- Focused on patients with cancer and/or their caregivers.

• Addressed spatial dimensions either explicitly (e.g., architectural or environmental design) or implicitly (e.g., relational environments, emotional safety, or existential space).

• Published in peer-reviewed journals or institutional repositories.

• Employed empirical methods (quantitative, qualitative, or mixed-methods), or constituted critical/theoretical reviews grounded in data.

• Published between 1980 and 2023 to capture both foundational and contemporary perspectives.

Studies excluded were those that addressed space only metaphorically without linking it to care practices, or those that treated space solely as geographic location without analytic depth.

Data Sources and Search Strategy

The corpus of literature was compiled through a structured document review informed by thematic relevance. Key sources included high-impact journals in psycho-oncology, health design, palliative care, and environmental health, as well as theses and policy position papers. Foundational studies such as Spiegel et al. (1981), which highlight the psychosocial context of group therapy environments, were included alongside architectural investigations (e.g., Beggs, 2015; Frisone, 2021) that foreground design as therapeutic agency. Supplemental attention was paid to works engaging with caregiving environments (e.g., Hinds, 1985; Lewis, 1990), spiritual and ecological care settings (e.g., Nakau et al., 2013), and institutional versus home-based models (e.g., Gomes & Higginson, 2006).

Analytical Framework

Thematic synthesis was employed as the primary mode of analysis. After extraction, the data were coded according to four major spatial dimensions:

1. **Architectural and Institutional Space** – physical configurations of hospitals, treatment centers, and residential settings.

2. **Relational and Emotional Space** – interpersonal and affective dynamics within care encounters.

3. **Ecological and Environmental Space** – natural surroundings, green spaces, pollution, and climate influences on illness.

4. **Existential and Symbolic Space** – places for meaning-making, spirituality, and narrative reconstruction.

Within these categories, subthemes were inductively derived (e.g., sensory regulation, home-like design, co-presence, anticipatory grief spaces). Iterative reading and re-coding refined the conceptual map to emphasize the dynamic interactivity between space, care, and corporeality in cancer trajectories. In support of this map, studies of systemic transformations demonstrate that such multidimensional frameworks - addressing physical, relational and ethical dimensions simultaneously - yield the most comprehensive understanding of complex phenomena (Rahmatian & SharajSharifi, 2022).

Validity and Reflexivity

To enhance the validity of interpretation, methodological triangulation was applied by cross-referencing findings from different disciplinary lenses. The author's background in nursing informed an embodied, practice-aware reading of the material, while the use of architectural and ecological perspectives counterbalanced potential clinical reductionism. Reflexivity was maintained through memoing and positional reflection, particularly when interpreting studies with spiritual or cultural components.

FINDINGS

The qualitative meta-synthesis of interdisciplinary studies in cancer care revealed four central spatial dimensions shaping the lived experience of patients and caregivers: architectural and institutional space, relational and emotional space, ecological and environmental space, and existential and symbolic space. These dimensions not only frame the physical setting of care but also act as mediating factors in patients' psychological, physiological, and existential well-being. (fig.1)

1. Architectural and Institutional Space

Studies showed that design features in treatment environments—such as natural lighting, acoustic comfort, spatial orientation, and access to nature—have a direct impact on anxiety reduction, immune function enhancement, and treatment adherence. More humanized and de-medicalized spaces, such as those found in Maggie's Centres, exemplify architecture as a form of therapeutic care.

2. Relational and Emotional Space

Findings highlighted that the cancer experience is deeply shaped by emotional proximity, physical co-presence, psychological safety, and spaces that allow emotional expression. Supportive environments—ranging from group therapy settings to home-based counseling rooms—facilitate meaning-making, reduce isolation, and foster resilience among both patients and caregivers.

3. Ecological and Environmental Space

Access to green space, natural light, and environmentally supportive settings was associated with improved mood, reduced fatigue, and even increases in natural killer (NK) cell activity. Conversely, exposure to environmental pollutants correlated with increased cancer risk and diminished quality of life, underscoring the spatial politics of environmental inequity.

4. Existential and Symbolic Space

Numerous studies emphasized the importance of spaces that allow for spiritual reflection, narrative reconstruction, and emotional reconciliation, particularly in end-of-life contexts. These may include prayer rooms, healing gardens, or familiar domestic spaces imbued with symbolic meaning—spaces that help patients reclaim identity and restore inner coherence.

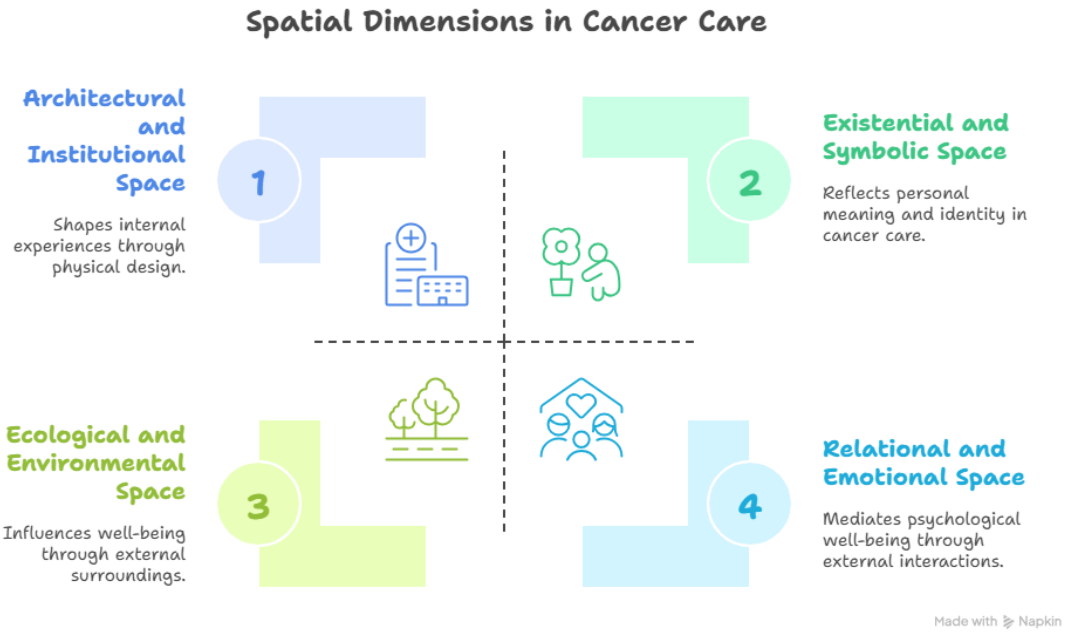

Fig1. Conceptual framework of spatial dimensions in cancer care, created using Napkin AI based on synthesized findings from the qualitative meta-synthesis.

Spiegel, Bloom, and Yalom (1981) conducted a pioneering randomized prospective outcome study examining the psychological impact of supportive group therapy for women with metastatic breast cancer. The intervention involved weekly support group meetings over the course of one year, focusing on the emotional and relational challenges of living with terminal illness. The group sessions encouraged participants to confront issues related to dying, improve their interactions with family, friends, and healthcare providers, and strive for meaningful living despite their prognosis. The study involved 86 patients, who were assessed at four-month intervals using standardized psychological measures. Results demonstrated that the treatment group experienced significantly better psychological outcomes than the control group. Specifically, they showed lower scores on the Profile of Mood States (indicating reduced mood disturbance), used fewer maladaptive coping mechanisms, and displayed less phobic behavior. These findings provided compelling evidence that psychosocial interventions—even for patients facing terminal cancer—can enhance emotional well-being, reduce distress, and foster healthier coping

strategies. The authors discussed potential mechanisms behind the intervention's success, including the therapeutic value of peer support, emotional expression, mutual validation, and the development of a safe environment to confront existential concerns. Although the study did not focus on physical space or architectural design, it underscored the importance of providing structured, emotionally supportive environments—suggesting that psychosocial care settings must foster openness, connection, and psychological safety to yield meaningful therapeutic benefits.

Hinds (1985) conducted a seminal study examining whether the needs of families caring for cancer patients at home were being adequately addressed. Using a stratified random sample based on patient sex and cancer site, 83 family members (43 men, 40 women, average age ~54) were interviewed in their homes to assess perceived caregiving needs, coping capacity, and utilization of available support services. The study applied descriptive statistics and chi-square analyses to identify key trends and associations. Findings revealed substantial unmet needs in both physical and psychosocial caregiving domains. Approximately 31% of families reported difficulties coping with the physical aspects of care, such as managing symptoms and assisting with daily activities. More critically, the psychosocial burden emerged as a prominent challenge. The most frequently cited unmet need was for a safe, supportive space where caregivers could openly discuss their fears and emotional struggles. Despite this, awareness and use of community support services remained remarkably low—only 23% of families were aware of such services, and a mere 8% had accessed them. The study concluded that existing models of cancer care often fail to sufficiently integrate or prioritize family support, particularly in home-based contexts. Hinds emphasized the need for innovative, family-focused approaches to care that actively engage caregivers, provide psychological support, and improve access to community resources. While the study did not focus on physical environments, the call for dedicated spaces for emotional processing indirectly suggests the value of spatial and systemic support for caregivers.

Lewis (1990) provided a foundational analysis of how cancer impacts not only the diagnosed individual but the entire family system, emphasizing the need to recognize and support family members as secondary patients in the cancer care process. The article synthesizes empirical and clinical findings on the psychological, relational, and developmental consequences of cancer for spouses, partners, and school-age children, highlighting the family's evolving identity in response to illness and the associated emotional, logistical, and role-based adjustments required for coping. Spouses, particularly male partners of women with breast cancer, commonly experience distress during diagnosis, treatment, and recurrence, with effects including depression, marital strain, disrupted work life, and altered sexual intimacy. Longitudinal studies cited showed that while patients' psychological distress may decline over time, spousal distress can persist or increase. Family members—especially adolescents—may also experience profound emotional disruption, including fear, frustration, and a sense of role reversal, often exacerbated by inadequate communication or support systems. Lewis proposed a framework of nine categories of family-focused support services: informational, anticipatory, interpretive, skill-based, problem-focused, and physical care services, among others. These services should be tailored to help families understand the illness, communicate effectively, manage caregiving responsibilities, and maintain psychosocial equilibrium. Importantly, the article emphasized the need for healthcare providers to proactively offer these supports rather than rely on families to seek them out. Lewis called attention to the environments—both physical and relational—within which support services are delivered, advocating for accessible, well-resourced systems that recognize families as integral to the healing process.

Given, Given, and Kozachik (2001) presented a comprehensive and early landmark review of the essential role family caregivers play in the home-based care of patients with advanced cancer. As cancer care transitioned increasingly from hospital to outpatient and home settings, the burden of direct and indirect care has shifted significantly onto family members—often with minimal preparation or support. The article delineated the types of care responsibilities (e.g., symptom management, medication administration, emotional support, coordination of care, and financial oversight) and emphasized that these demands become more complex as the disease progresses. The authors categorized care into *direct* (e.g., pain management, bathing, administering medications) and *indirect* (e.g.,

scheduling appointments, managing finances, monitoring symptoms) and highlighted how both types intensify with advanced illness. The paper also emphasized that caregivers frequently experience high levels of anxiety, depression, fatigue, sleep disturbances, and physical decline, often paralleling the patient's deterioration. These burdens are exacerbated when caregivers lack sufficient information, technical training, or emotional support. To mitigate these challenges, the authors advocated for a structured, collaborative approach between healthcare teams and family caregivers. They recommended educational interventions, psychoeducational programs (e.g., the COPE model), tailored informational resources, and the inclusion of caregivers in care planning. While not centered on architectural or environmental design, the article underscored the need for organized, accessible support infrastructures that enable effective caregiving at home and allow caregivers to balance multiple life roles.

Wennman-Larsen and Tishelman (2002) conducted a qualitative study to explore the expectations and hopes of family caregivers who were providing end-of-life care for relatives with cancer in advanced palliative home care settings. As the trend toward home-based end-of-life care grows, caregivers are increasingly expected to assume complex care responsibilities, often with limited personal or institutional support. Through interviews with 11 caregivers at the point of their relative's enrollment in advanced home care, the study identified two major thematic domains: *role transition into caregiving* and *transition into a new life situation*. Caregivers reported a profound sense of responsibility for the physical, emotional, and logistical aspects of caring for their dying loved ones. This transition often came with limited preparation and support, exacerbating feelings of burden and isolation. Although professional care teams were expected to assist with clinical tasks, caregivers expressed limited confidence that they would receive emotional or existential support—particularly for their own anticipatory grief and post-death adjustment. The caregivers distinguished between theoretical support systems (services that exist on paper) and those they felt empowered or inclined to use in practice, pointing to a significant gap between service availability and accessibility. The study emphasized that individualized caregiver expectations and emotional needs must be acknowledged and addressed in home care planning to ensure that this model truly functions as a viable and humane alternative to institutional care. While not focused on physical design, the research implies that supportive environments—both relational and systemic—are essential to sustaining family caregivers in the home. These findings align with broader research demonstrating that spatial environments and relational frameworks fundamentally shape behavioral outcomes and therapeutic responses, where comprehensive approaches addressing spatial literacy, environmental justice, and systemic support structures are essential for promoting resilience and agency in vulnerable populations (Maleki Borujeni et al., 2022).

Zhang and Siminoff (2003) conducted a qualitative study exploring how family caregivers influence treatment decision-making in patients with advanced lung cancer. Based on interviews with 37 patients and 40 caregivers from 26 families, the study revealed that family disagreements were common, particularly regarding routine treatment decisions, discontinuation of curative therapies, and consideration of hospice care. In 65% of families, caregivers disagreed with patients about specific medical choices, such as selecting doctors, whether to continue aggressive treatment, and how to manage end-of-life care. These disagreements often reflected deeper dynamics, including the caregivers' reluctance to accept the patient's deteriorating condition or death, as well as differences in coping strategies. Caregivers were generally more inclined to pursue continued treatment, viewing it as a way to extend life or "buy time," whereas patients were often more focused on quality of life and symptom relief. The study found that prior family dynamics, personal experiences with illness, and the caregiver's understanding of death played significant roles in shaping attitudes toward treatment decisions. In many cases, caregivers acted as patient advocates, challenging physicians, seeking second opinions, and pushing for more aggressive interventions. However, this advocacy could also create tension when caregivers' preferences conflicted with the patient's wishes. In some instances, caregivers' overprotectiveness led to frustration in patients, who felt infantilized or pressured to follow medical advice against their own preferences. Hospice care, while acknowledged by some patients as beneficial, was often avoided as a topic of discussion by caregivers

who feared that such conversations would signal giving up or accelerate emotional decline. The study concluded that family influence is a critical factor in the treatment trajectory of patients with advanced cancer and that differences in decision-making perspectives between patients and families can both support and complicate care planning. These findings underscore the need for clinicians, especially nurses, to actively mediate family-patient communication, recognize differing emotional timelines, and support both parties in aligning care decisions with the patient's values and goals.

Friedman, Freyer, and Levitt (2005) reviewed the evolving needs and care models for survivors of childhood cancer, emphasizing the importance of structured, long-term follow-up to address the physical, psychosocial, and educational challenges faced by this growing population. As survival rates have improved significantly due to advances in therapy, the focus has shifted toward ensuring quality survivorship care that mitigates late effects of treatment and supports lifelong health. The article outlined several care models, ranging from specialized survivorship clinics to integrated primary care approaches, with particular emphasis on multidisciplinary systems capable of adapting to the changing needs of survivors over time. These models vary based on institutional resources and patient demographics but share key components: surveillance for late effects, psychosocial and educational support, transition planning from pediatric to adult care, and integration with ongoing clinical research. The authors highlighted the importance of individualized care, as not all survivors require the same intensity or scope of services, and needs may evolve with age and life circumstances. Importantly, the review called attention to the operational and functional aspects of care delivery, including staffing, infrastructure, and coordination among providers. While the physical environment was not a central focus, the study implied that care settings should facilitate continuity, accessibility, and a supportive atmosphere conducive to long-term engagement. Future research is needed to evaluate which models most effectively promote health outcomes and patient satisfaction among diverse survivor populations.

Gomes and Higginson (2006) conducted a systematic review of 58 studies across 13 countries, comprising data from over 1.5 million cancer patients, to identify the key factors influencing whether patients with terminal cancer die at home or in institutional settings. The review introduced a conceptual model categorizing influencing factors into three domains: illness-related, individual, and environmental. Among the 17 variables with high-strength evidence, six were most strongly associated with an increased likelihood of dying at home: low functional status, an expressed preference to die at home, access to home care and its intensity (i.e., frequency of home visits), living with relatives, and extended family support. These factors were found to significantly increase the odds of home death, with some odds ratios as high as 11.1. Environmental factors, particularly those related to healthcare access and social support, emerged as the most influential in determining place of death. Patients receiving intensive home care were significantly more likely to die at home, while previous hospitalizations or high hospital bed availability increased the likelihood of hospital deaths. Social conditions—such as living arrangements, family structure, and caregiver preferences—played a crucial role, as patients who lived with others or had extensive family support were more often able to remain at home. However, disparities were noted based on ethnicity and socioeconomic status, indicating potential inequities in access to home-based end-of-life care. The authors argued that initiatives to promote home deaths must be multidimensional, focusing not only on expanding home care services but also on public education, caregiver empowerment, and consistent risk assessment. They emphasized that policies should address both individual patient preferences and broader structural supports to ensure that dying at home is a viable option for those who desire it.

Mulcahy, Parry, and Glover (2010) examined the psychological and social toll of prolonged wait times in cancer care within Canada's public health system and explored how cancer patients navigate and resist the passive role often imposed on them. Using qualitative methods, the study drew on narratives from individuals affiliated with Gilda's Club, a community-based support organization offering psychosocial resources to those affected by cancer. The research highlights both the trauma of waiting and the empowering alternatives to traditional patient roles fostered by supportive, non-clinical spaces. Participants described waiting as emotionally and existentially taxing—characterized by fear,

uncertainty, and a loss of agency. Yet, through their involvement in Gilda's Club, many found a space to resist being merely "patients"—a term here connoting enforced passivity and compliance. Instead, these individuals reasserted control by sharing experiences, becoming more informed, engaging in advocacy, and participating more actively in healthcare decision-making. The study conceptualized this process as a form of resistance that counters the depersonalizing effects of institutional care delays. While not focused on physical or architectural environments in hospitals, the study underscored the significance of alternative, non-medical spaces like Gilda's Club in mitigating psychological harms. Such spaces offer a contrast to the bureaucratic, time-constrained hospital system, creating relational environments that support autonomy and emotional well-being. The authors suggest that integrating similar supportive environments into standard cancer care models could address a critical gap in patient-centered oncology practice.

Surbone et al. (2010), writing on behalf of the MASCC Psychosocial Study Group, presented a position paper underscoring the critical role of psychosocial care as an integral component of supportive cancer care. The paper provides a comprehensive review of the psychosocial needs of cancer patients and their families across the entire cancer trajectory—from diagnosis through survivorship or end-of-life care—and argues for a paradigm shift toward a holistic, patient-centered care model that incorporates cultural, spiritual, and relational dimensions alongside medical treatment. The authors identify and categorize psychosocial concerns according to different stages and populations, including survivors, patients with advanced disease, family members, and caregivers. Key unmet needs include emotional and spiritual distress, fear of recurrence, financial strain, social isolation, and difficulties with reintegration after treatment. Importantly, the paper highlights that the psychosocial impact of cancer extends to family systems and that caregiving roles, especially in under-resourced or culturally diverse settings, entail significant emotional and economic burdens. The position statement also emphasizes the need for culturally sensitive and spiritually attuned care. It advocates for dedicated spaces and trained personnel to address spiritual concerns, suggesting that spiritual care should be standardized as part of cancer services. Additionally, it calls for the development and implementation of context-specific models of psychosocial intervention, including tiered and community-based approaches that accommodate local resources and cultural values. In terms of environment, the authors note the importance of physical spaces that facilitate spiritual and psychological support, such as rooms designated for reflection or counseling, and stress the importance of an environment that supports interdisciplinary collaboration. This call for environmental responsiveness aligns with broader efforts to create care settings that are not only clinically effective but also emotionally and spiritually supportive.

Artherholt and Fann (2011) provided a comprehensive review of contemporary environmental care in oncology, emphasizing the growing recognition of its importance throughout the cancer care continuum—from diagnosis to palliative stages. Historically underprioritized, environmental care has increasingly been integrated into clinical guidelines, most notably through the 2008 Institute of Medicine report and ongoing advocacy by organizations like the International Psychosocial Oncology Society. The review synthesized key developments in screening, diagnosis, treatment, service delivery models, psychoneuroimmunology, and cognitive effects associated with cancer and its treatments. The authors highlighted that psychological distress—broadly defined to include emotional, social, and spiritual dimensions—affects 20–40% of cancer patients, yet many remain untreated due to systemic and structural gaps. Screening tools like the Distress Thermometer and PHQ-2 are shown to be effective, but their utility depends on linkage to available follow-up care. Integrated environmental interventions, including cognitive-behavioral therapy, supportive-expressive therapy, and collaborative care models, have demonstrated benefits in reducing distress, improving quality of life, and possibly even extending survival. Telehealth and phone-based environmental interventions were identified as especially beneficial for rural or mobility-constrained patients. Although not explicitly focused on physical or architectural space, the article did reference the need for clinic-based screening infrastructure, collaborative care teams, and the role of biobehavioral mechanisms—

such as stress and inflammation pathways—in linking psychological states with cancer progression. It also examined cognitive impairments, including chemotherapy-associated cognitive dysfunction ("chemo brain"), and advocated for early detection and self-management support. These implementation challenges reflect broader patterns in healthcare innovation where technological advancement often outpaces the development of supportive frameworks and institutional readiness. Recent systematic reviews demonstrate that while clinicians acknowledge emerging technologies' potential for transforming care delivery and diagnostic capabilities, adoption barriers persist around ethical integration, professional accountability, and the need for comprehensive educational and regulatory scaffolding (Tomraee et al., 2022).

Høybye (2012) explored the intricate interplay between spatial environments and caregiving practices in the context of hematological cancer treatment, contributing to a broader understanding of what constitutes a "healing environment." Conducted as an ethnographic study at the Department of Haematology, Odense University Hospital, Denmark, the research spanned from March to September 2011 and employed participant observation and qualitative interviews. The sample included 20 patients, with four followed longitudinally. Thematic analysis yielded five core concepts: *practices of self*, *creating personal space*, *social recognition*, *negotiating space*, and *ambiguity of space and care*. These themes underscored the fluid and negotiated nature of hospital space, revealing how patients interact with and adapt to their environment in ways that affect their experience of healing. Rather than perceiving healing as a direct outcome of architectural design, the study emphasized that healing is shaped through dynamic relationships between individuals, space, and care practices. Patients redefined sterile hospital settings through personal items, privacy rituals, and interactions that invoked a sense of homeliness. The study also highlighted how care environments must accommodate the changing emotional and physical states of patients, advocating for flexible, patient-centered spatial design. Ultimately, the research suggested that effective healing environments transcend fixed design solutions by supporting patients' autonomy, identity, and emotional well-being within a socially and physically adaptable care context.

Jacobsen and Wagner (2012) advocated for the formal integration of psychosocial care into standard oncology practice, presenting it as a new quality benchmark in cancer care. Drawing from extensive research that links unmet psychosocial needs to poorer patient outcomes, and conversely, from growing evidence on the benefits of psychosocial interventions, the authors outlined three strategic approaches to embed psychosocial care into routine clinical workflows: the development of standards, the dissemination of clinical practice guidelines, and the implementation of quality measurement tools. The article reviewed significant progress in each area. It highlighted the 2008 Institute of Medicine report as a pivotal moment in recognizing psychosocial care as essential to comprehensive cancer treatment. Furthermore, professional organizations like the National Comprehensive Cancer Network (NCCN) and the International Psychosocial Oncology Society (IPOS) have issued clinical guidelines to assist healthcare providers in assessing and managing psychological distress, depression, anxiety, and other related issues. The authors also discussed the need for validated metrics that assess the quality and consistency of psychosocial care delivery across institutions, pointing to distress screening tools and quality indicators as emerging solutions.

Northouse et al. (2012) provided a comprehensive review of the environmental challenges faced by family caregivers of cancer patients and evaluated the efficacy of caregiver-focused interventions. The review synthesized findings from five meta-analyses and additional research, highlighting the broad and significant impacts of caregiving on physical health, psychological well-being, immune function, sleep, and financial security. Despite the availability of effective interventions, these are rarely implemented in standard clinical practice. Caregivers often experience emotional strain, burnout, and disruptions to their personal and professional lives, underscoring the need for systemic support. Research-tested interventions—such as psychoeducation, skill-building programs, and counseling—were shown to reduce caregiver stress, improve coping, enhance quality of life, and even positively influence patient outcomes, including reduced symptom burden and improved survival in some cases. The authors identified persistent gaps in care delivery for caregivers, exacerbated by the

absence of standardized assessment tools and the limited integration of caregiver support into routine oncology workflows. They proposed actionable recommendations: creating practice guidelines for caregiver support, identifying caregiver advocates within healthcare settings, establishing routine referral pathways to support organizations, and advocating for policy changes that formally recognize and fund caregiver services.

Fann, Ell, and Sharpe (2012) addressed the persistent gap between the recognized need for environmental care among cancer patients and its inconsistent delivery in clinical settings. Despite robust evidence showing the prevalence of psychological distress and the availability of effective interventions, many patients do not receive adequate environmental support during their cancer journey. The authors identified organizational shortcomings—rather than a lack of evidence or treatment options—as the primary barrier to effective environmental care integration. The article advocated for the *collaborative care model* as a practical and scalable solution. This model includes systematic distress screening, care coordination by trained managers, oversight by mental health specialists, and stepped-care strategies that adjust interventions based on patient response. Evidence from clinical trials demonstrated the feasibility and effectiveness of this approach, particularly in managing depression among cancer patients. The model's adaptability makes it suitable for a broader range of environmental concerns, including anxiety, social isolation, and logistical challenges related to care access. Importantly, the authors emphasized that integration should span the entire cancer continuum—from diagnosis through survivorship or end-of-life care—and extend across all care settings, including outpatient, inpatient, and primary care environments. While the article did not focus directly on architectural or spatial design, its emphasis on integration and accessibility implies the need for clinical spaces that support multidisciplinary collaboration and private, supportive environments for environmental consultations.

Krumwiede and Krumwiede (2012) conducted a hermeneutic phenomenological study to explore the lived experiences of men diagnosed with prostate cancer, focusing on how they perceive and cope with the illness. Ten Caucasian men aged 62 to 70, all living in community settings, were interviewed using open-ended, semistructured methods. Guided by van Manen's four existential themes—lived space (spatiality), lived body (corporeality), lived time (temporality), and lived other (relationality)—the analysis sought to understand the emotional, physical, temporal, and relational dimensions of their experience. Key themes included *living in the unknown*, where men described anxiety stemming from uncertainty and inadequate or conflicting medical information, and *yearning to understand and know*, highlighting their proactive search for information and connection with others to make sense of their condition. The theme of *struggling with the unreliability of the body* revealed the emotional and physical toll of symptoms such as incontinence and sexual dysfunction, while *bearing the diagnosis of cancer* underscored the psychological impact of waiting for diagnosis and treatment. *Shifting priorities* and *feeling comfort in the presence of others* emphasized the transformative effect of cancer on personal values and the crucial role of support from spouses, healthcare professionals, and peers. Spatial elements were directly addressed under the "lived space" theme, which illustrated how prostate cancer disrupted men's sense of comfort and familiarity, particularly in medical settings. The presence—or absence—of empathetic and competent nursing care strongly influenced patients' perceptions of safety and dignity in these spaces. This study underscores the importance of considering environmental, relational, and existential dimensions in nursing care for prostate cancer patients.

Nakau et al. (2013) conducted a pilot study to evaluate the effects of integrated medicine delivered in an urban green space on the spiritual and emotional well-being of cancer patients. Recognizing the multidimensional nature of spirituality and the limitations of conventional medical environments in addressing these needs, the study explored the therapeutic potential of nature-based interventions. Twenty-two cancer patients participated in a 12-week program combining forest therapy, horticultural therapy, yoga meditation, and support group sessions—each conducted weekly in a natural outdoor setting. The intervention was assessed using a range of validated tools measuring spiritual well-being (FACIT-Sp), quality of life (SF-36), fatigue (Cancer Fatigue Scale), psychological state (POMS-

SF and STAI), and natural killer (NK) cell activity. The findings demonstrated significant improvements in both spiritual and functional well-being following the intervention. Participants also reported enhanced quality of life, reduced cancer-related fatigue, and improvements in mood and anxiety levels. Moreover, a notable increase in NK cell activity suggested a potential immune benefit associated with the integrative, nature-based approach. This study emphasized the therapeutic value of green environments in cancer care, particularly for spiritual and psychological support. The integration of natural elements and holistic practices into treatment environments represents a meaningful extension of traditional care, offering patients a restorative and emotionally supportive space outside the clinical setting. The findings support the inclusion of flexible, nature-integrated spaces within cancer care models to foster well-being.

Bloom et al. (2015) analyzed ten significant trends reshaping cancer care delivery and their implications for spatial planning within academic medical center (AMC) cancer facilities. Recognizing that evolving practices—such as personalized medicine, increased reliance on clinical trials, and team-based care models—are transforming the logistical and operational demands placed on healthcare environments, the authors examined how these shifts influence the distribution, configuration, and functionality of cancer treatment spaces. The article identified a tension between centralization and decentralization: while some services (e.g., complex diagnostics, specialized treatment technologies) are increasingly concentrated at main hospital campuses, others (e.g., chemotherapy and supportive care) are moving toward satellite facilities to improve patient accessibility and reduce capacity burdens. The authors emphasized the growing need for flexible, adaptive design strategies that can respond to fluctuating patient volumes, multidisciplinary collaboration, and evolving technologies. The study also highlighted the importance of integrating supportive, complementary, and palliative care services into spatial planning to enhance patient experience and quality of life. Overall, the article stressed that successful space planning is not about expanding square footage indiscriminately but rather about designing "better space"—environments that are efficient, responsive to new models of care, and attuned to both clinical and psychosocial needs of cancer patients. AMCs must continuously evaluate how facility planning aligns with clinical priorities and patient-centered care objectives in order to maintain effective, future-ready oncology services.

Beggs (2015) presented a thesis exploring how architectural design can actively contribute to the healing of cancer patients, particularly those undergoing chemotherapy. Drawing on interdisciplinary research from neurobiology, environmental psychology, and architectural theory, the work emphasized that healing environments—those which stimulate the senses and reduce stress—can trigger the body's internal neurochemical "pharmacies," such as the release of endorphins, to support both physiological and psychological recovery. The thesis distinguished between *curing*, which pertains to eliminating disease symptoms, and *healing*, which involves alleviating emotional and existential distress. Stress, noted as a major barrier to healing, is exacerbated by the sensory-deprived, institutional atmosphere common in many contemporary hospitals. In contrast, environments that engage the senses—through natural light, greenery, calming acoustics, and tactile materials—can counteract stress and foster a healing response by enhancing mood, immune function, and pain management through endogenous neurochemicals. Through case studies and a critical comparison of traditional and modern care environments, the research culminated in design proposals for Grand River Hospital in Kitchener, Ontario. These interventions aimed to transform cancer treatment spaces into holistic environments that support well-being on multiple levels—physically, psychologically, and emotionally. The project underscored the need for healthcare architecture to prioritize human experience and sensory vitality, positioning architecture as an active agent in therapeutic processes.

Weis (2015) provided a concise editorial overview of the rationale, structure, and challenges associated with delivering psychosocial care to cancer patients, particularly within the German healthcare system. Framing psychosocial distress as a spectrum—from common emotional reactions to clinically significant psychiatric comorbidities—the article highlighted that approximately one-third of cancer patients experience mental health disorders, with breast cancer patients showing the highest prevalence (41.6%). These findings underscore the necessity of

early screening and intervention. The paper advocated for a *stepped-care model* that begins with systematic screening of distress and tailors interventions based on patient needs. Interventions range from psychoeducation and counseling to individualized psychotherapy. Tools such as the Distress Thermometer and validated psychiatric assessments play a key role in triaging care. Weis emphasized that while early detection of distress is critical, it must be embedded within structured psychosocial programs to yield meaningful improvements in patient outcomes. Key barriers to psychosocial care include patients' limited understanding of the benefits of such interventions, stigma, and systemic issues like insufficient referrals or lack of infrastructure. The article also noted disparities in service delivery between urban and rural areas. Within certified cancer centers in Germany, psycho-oncological services are mandated, but actual implementation remains uneven due to resource constraints. Environmental considerations were implicitly acknowledged in references to the need for structured delivery systems, liaison services within hospitals, and the importance of spaces conducive to counseling and group support. The editorial concluded that integrated psychosocial care—supported by national guidelines, rehabilitation services, and community-based counseling—is vital to improving the quality of life for both patients and families.

Grassi, Spiegel, and Riba (2017) reviewed the state of psychosocial care in oncology, emphasizing the necessity of integrating psychological assessment and intervention into standard cancer treatment. The authors highlighted that cancer imposes substantial psychological burdens on patients and families, including distress, anxiety, depression, demoralization, and post-traumatic stress. In response, the field of psycho-oncology has developed validated screening tools and international guidelines for identifying and managing these concerns, which are now increasingly recognized by leading cancer organizations. The review discussed recent advances in both psychosocial and psychopharmacological interventions. These include structured psychotherapies such as cognitive-behavioral therapy, supportive-expressive therapy, and meaning-centered psychotherapy, as well as targeted pharmacologic treatments for mood and anxiety disorders in cancer patients. The authors underscored the importance of timely distress screening as a "sixth vital sign" and advocated for its routine use in clinical settings to personalize supportive care plans. Though the article did not directly address spatial or environmental aspects of care settings, it called for a systemic, multidisciplinary approach that supports the psychological well-being of patients across the continuum of cancer care. Such integration implies a need for environments—both institutional and interpersonal—that enable screening, intervention, and ongoing psychosocial support as standard components of comprehensive oncology practice.

Law et al. (2018) conducted a qualitative study exploring how colorectal cancer patients and their caregivers experience social support within the cancer treatment setting. The study aimed to understand not only who is perceived as supportive during treatment but also the timing, nature, and functional aspects of that support. Twenty in-depth interviews were conducted with a mix of patients and caregivers, and data were analyzed using the framework method to identify recurring themes. Three primary themes emerged: (1) the *treating team as a source of support*, where patients and caregivers emphasized the emotional reassurance and practical assistance provided by clinicians, particularly in navigating treatment-related uncertainty; (2) *changes in existing social supports*, which reflected the relational distancing and altered social dynamics that often follow a cancer diagnosis; and (3) *differing dimensions of support*, including the value of shared experiences with other patients, as well as practical, financial, and emotional support structures. A notable finding was the significance of incidental support—brief yet meaningful interactions with staff or fellow patients—which contributed to a broader "sphere of care" within the treatment environment. The study highlighted how the treatment setting itself—through its personnel, structure, and social context—functions as a vital source of psychosocial support. The authors suggested that health care providers consider the emotional and interpersonal needs of both patients and caregivers when designing care interventions and treatment environments. Enhancing this "sphere of care" could foster more comprehensive and compassionate oncology support systems.

Datzmann et al. (2018) conducted a large-scale,

semi-individual cohort study to evaluate the associations between outdoor air pollution, residential green space, and the incidence of several cancer types in Saxony, Germany. Drawing on routine health care data from approximately 1.9 million individuals initially cancer-free in 2008–2009, the researchers tracked new diagnoses of mouth and throat, non-melanoma skin (NMSC), prostate, breast, and colorectal cancers from 2010 to 2014. Environmental exposures included particulate matter (PM_{10}), nitrogen dioxide (NO_2), and residential green space measured by the Normalized Difference Vegetation Index (NDVI). Multilevel Poisson regression models adjusted for demographic, behavioral, and socioeconomic confounders were used to estimate risk. The study found significant positive associations between PM_{10} and increased risks for mouth and throat cancer (53% increase per 10 $\mu g/m^3$) and NMSC (52%). Weaker but notable associations were found for prostate (23%) and breast cancer (19%). NO_2 showed similar but attenuated associations. Conversely, increased residential green space was associated with reduced cancer risk, particularly for NMSC (16% decrease) and mouth and throat cancer (11% decrease), suggesting a potentially protective environmental effect. No significant associations were observed for colorectal cancer. The findings highlight the dual influence of built and natural environments on cancer risk and underscore the importance of urban planning that mitigates pollution and enhances green space availability. This study is notable for its attention to how environmental context—both harmful (air pollution) and restorative (green space)—can influence cancer incidence across multiple sites, supporting the integration of environmental health considerations into public health and spatial planning strategies.

Bar-Sela et al. (2019) investigated the barriers to providing spiritual care among healthcare professionals treating advanced cancer patients in 14 Middle Eastern countries, with a focus on a subgroup of practitioners who value spiritual care but do not regularly provide it. Utilizing survey data from 770 physicians and nurses, the study explored discrepancies between perceived importance and actual practice of spiritual care and assessed personal and systemic factors contributing to this gap. The findings revealed that while a majority (82%) of respondents believed spiritual care should be offered at least occasionally, only 56% reported providing it accordingly. Among those who acknowledged its importance but failed to offer it, two significant predictors emerged: a low personal sense of spirituality and lack of formal training in spiritual care. Only 22% of respondents had received such training. Notably, the study found that providers in more socioeconomically developed countries were paradoxically less likely to offer spiritual care, suggesting that cultural and systemic structures may influence engagement in this domain. Although the study did not directly investigate spatial or environmental aspects of care settings, it emphasized the relational and reflective dimensions of caregiving. The authors argued for targeted training that encourages healthcare workers to explore their own spirituality, which in turn could enhance their capacity to address patients' spiritual needs in emotionally supportive ways, particularly in palliative settings.

Jellema, Annemans, and Heylighen (2019) investigated how cancer care facilities influence the well-being of patients, their relatives, and care professionals, emphasizing spatial aspects that contribute to these experiences. Through qualitative methods, the study engaged 15 participants—comprising five patients across four hospitals, five relatives, and five healthcare professionals—using in-depth interviews, photovoice, and walking interviews to capture users' spatial experiences and perceptions. The findings highlighted that cancer care environments serve not merely as settings for treatment but as active mediators in patients' confrontation with illness. The spatial features of these environments were shown to influence psychological and emotional coping by providing a sense of containment and continuity amidst the unpredictability of cancer care. Key spatial factors included the presence and management of boundaries, transitions, and routes within the facilities. These aspects helped patients and relatives navigate the clinical experience while creating opportunities for distancing from the more clinical or institutional features of hospitals. Participants valued spaces that offered sensory comfort, a welcoming atmosphere, and elements that mimicked the familiarity of home. This was particularly important at entrances and waiting areas, where initial impressions set the tone for interactions within the space. The study called for flexible spatial arrangements that can accommodate users' evolving needs, while simultaneously preserving a sense of

spatial stability. Overall, the research underscored the importance of designing cancer care environments that are adaptable, supportive, and attentive to the holistic needs of all users.

Frisone (2021), in her doctoral thesis *The Architecture of Care: The Role of Architecture in the Therapeutic Environment – The Case of the Maggie's Cancer Care Centre*, conducted an in-depth investigation into how architecture can become a form of therapeutic support for individuals affected by cancer. Focusing on the Maggie's Centres in the UK—renowned for their psychologically supportive, non-clinical design—she explored how built environments can promote psychological flexibility and emotional well-being among cancer patients and their caregivers. The thesis used a two-stage, phenomenological ethnographic methodology. The first phase involved analyzing the architectural features of 26 Maggie's Centres, while the second involved immersive fieldwork at three specific sites. The study identified core architectural qualities—*movement, hybridity,* and *ambiguity*—that, in synergy with Maggie's psychosocial support programme, contributed to what Frisone terms a *therapeutic environment*. These qualities support transitions through trauma and foster a space where users feel safety, agency, and emotional connection. Central to the thesis is the concept of *psychological flexibility*, derived from Acceptance and Commitment Therapy (ACT), and how architecture—particularly when guided by an emotionally attuned and open-ended architectural brief—can actively facilitate this trait. Maggie's buildings were shown to create environments that diminish feelings of medicalization, enabling users to regain a sense of identity and control. Frisone concluded that Maggie's Centres represent an emerging *paradigm* in the commissioning of architecture—one where design is fundamentally treated as a form of care. She proposed that these principles are not only applicable to healthcare but could extend to non-clinical and community spaces, offering a model for a more holistic and humane approach to architectural practice.

Wickramasinghe et al. (2022) explored the novel application of digital twin technology to enhance the personalization of cancer care, particularly in the context of uterine cancer. Digital twins—virtual replicas of physical systems—have been increasingly adopted across various industries, and this article positions them as a promising tool in healthcare to advance precision medicine. The authors classified digital twins into three models: Grey Box, Surrogate, and Black Box, based on systems and mathematical modeling principles, and focused their framework on the use of Black Box models for cancer treatment planning. The article outlines a conceptual framework that integrates clinical insights, digital health infrastructure, and computational modeling to simulate and optimize individualized treatment pathways. By leveraging real-time data and predictive analytics, digital twins could theoretically mirror the evolving health status of a patient and forecast responses to different interventions. This vision holds potential for dynamically adapting cancer care plans, thereby improving treatment efficacy and patient outcomes. Although the article primarily discusses technological and computational innovations, it implicitly gestures toward a transformative shift in the patient-care environment—one that is data-rich, adaptive, and deeply personalized. The framework emphasizes interconnectivity and context-aware decision-making but does not directly address spatial or architectural aspects of the care environment.

CONCLUSION

This paper has argued that space, in its manifold expressions—architectural, relational, ecological, and symbolic—is not an incidental backdrop but a constitutive dimension of cancer care. Through a meta-analytic synthesis of empirical studies spanning oncology, psychosocial care, environmental psychology, and health architecture, the analysis demonstrates that the spatiality of care environments plays a pivotal role in shaping patients' physiological outcomes, psychological resilience, and existential experiences. Whether through the sensory modulation of therapeutic architecture, the co-presence and intimacy facilitated in supportive social spaces, or the healing potential embedded in natural environments, space emerges as an active participant in the ontology of cancer—not merely reflecting but co-producing health, suffering, and recovery.

What this study makes evident is that the prevailing biomedical paradigm, which largely treats space as neutral or secondary, is insufficient for

capturing the complexity of cancer experience. Instead, the findings support a relational-material model of care, wherein environments are viewed as dynamic agents that mediate affective, cognitive, and immunological processes. From hospital design to domestic caregiving contexts, from community-based spiritual centers to urban green spaces, spatial configurations function as extensions of care. These environments can either attenuate or exacerbate stress, alienation, and vulnerability, depending on how they are structured and inhabited.

Importantly, this analysis also reveals spatial inequities and systemic omissions. Many of the spatial practices that most effectively support cancer patients—such as the provision of emotionally safe settings, integrative green space therapies, or culturally responsive design—remain peripheral to institutional care models. The under-integration of such approaches underscores a gap between what the empirical literature affirms and what clinical practice currently delivers.

To address this, healthcare systems must reimagine cancer care as fundamentally spatial and relational. This entails embedding spatial competence within oncology training, prioritizing spatial design in policy and funding decisions, and elevating architecture, ecology, and sociality as core components of therapeutic planning. The imperative is not merely to expand the physical footprint of cancer facilities but to cultivate environments—material and symbolic—that affirm dignity, foster agency, and support holistic well-being. Future research should continue to investigate how spatial interventions might modulate biomarkers, enhance treatment adherence, and support caregivers, thereby enriching both theoretical and practical understandings of healing.

CONFLICT OF INTEREST

No conflict of interest declared by the Authors.

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