

Pragmatic Innovations in Post-Acute and Long-Term Care Medicine

Feasible new, practical products or approaches intended to improve outcomes or processes in post-acute or long-term care

Bioethics Peer Review: A Structured Evaluation Framework for Long-Term Care Environments



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ABSTRACT

Health care environments—particularly the built environment—can function like health care interventions, achieving medicine-like effects that shape the lived experience of persons in long-term care (LTC). Despite a growing body of evidence-based design research illustrating the clinical and behavioral influence of environmental conditions, these findings are not consistently incorporated into new LTC construction and renovation. This reflects divergent trajectories of knowledge development across medicine, architecture, and LTC operations. Because shortcomings in environmental design fall outside medical oversight, research protections, and enforceable architectural standards, opportunities to support safety, well-being, and autonomy often remain unrecognized. To address this gap, we developed the Bioethics Peer Review for Long-Term Care Design, a multidisciplinary evaluative process grounded in clinical ethics consultation and aligned with the 5M geriatric framework. We describe the model, its rationale, and lessons learned from pilot applications in 2 LTC facilities.

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Keywords: Bioethics, evidence-based design, long-term care, evaluation, quality of life

Problem/Significance

Advances in medicine have extended longevity for many older adults. Although some return to previous lifestyles, others experience enhanced stability, social engagement, and reliable access to services within long-term care (LTC) settings. These benefits coexist with challenges related to autonomy, identity, and adjustment to communal living. As a result, LTC environments must simultaneously support safety, independence, individualized care, and operational feasibility.

Evidence-based design (EBD) demonstrates that architectural characteristics are associated with and likely affect health outcomes, cognition, behavior, and residents' quality of life.¹ Design decisions are associated with measurable changes in fall rates,² infection control,³ delirium incidence,⁴ behavioral symptoms of dementia,⁵ avoidable hospitalization,⁶ and staff retention.⁴ Because of these outcomes' association with specific design choices, the design stage carries ethical significance.⁷

Despite this evidence, EBD remains underused in LTC, even though design decisions of new facilities shape resident well-being for decades.^{1,7} Older adults are especially sensitive to environmental variables such as lighting, sound, spatial legibility, and mobility supports; deficits in these areas can disproportionately

affect autonomy and safety.^{5,8} Cross-cultural research further shows connections between environmental factors and quality of life in LTC homes.⁹ Pharmacologic interventions for geriatric syndromes—including delirium, frailty, dementia, and fall risk—often offer limited benefit. Environmental design therefore presents a parallel opportunity to reduce risk and support clinical goals.^{10,11}

Current LTC planning processes seldom integrate clinical and architectural evidence with the rigor that could be reasonably expected of health care settings. Path dependencies in those respective fields became entrenched before the impact of the environment on health and well-being was understood. The result is a misalignment between clinical needs and built conditions absent of mechanisms to bring them into alignment. Bioethics Peer Review for Long-Term Care Design (BPR-LTC) responds to this gap by adapting principles from clinical ethics consultation to the health care architectural domain, recognizing that the built environment functions as a health care intervention in its own right.⁷

Equity considerations are essential in this context because facilities serving racially minoritized, rural, or economically disadvantaged populations frequently operate with aging infrastructure and fewer capital resources. These disparities heighten risks associated with environmental design, reinforcing the need for evaluative frameworks that prevent inequities from being perpetuated through the built environment.^{12,13}

Innovation

BPR-LTC is not a design methodology or quality metric but an ethics-informed deliberative process that structures how empirical

This work was supported by a Greenwall Foundation grant (9550307276). The Greenwall Foundation had no role in the preparation of the paper.

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<https://doi.org/10.1016/j.jamda.2025.106088>

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evidence and values are integrated during design decision-making. BPR-LTC integrates the following: (1) empirical research from EBD, (2) the methods of clinical ethics consultation for navigating value-laden decisions, and (3) geriatric frameworks that center on the needs and vulnerabilities of older adults. Although each of these elements has independently contributed to aspects of LTC, they have rarely been coordinated during the formative stages of architectural planning. This synthesis represents the primary innovation of BPR-LTC.

Clinical ethics consultation offers well-established methods for elucidating stakeholder values and adjudicating complex disagreements.¹⁴ Similar tensions arise in LTC design, where decisions implicate autonomy, well-being, safety, and justice. Unlike clinical or architectural review alone, ethics consultation is uniquely positioned to surface value conflicts, authority asymmetries, and trade-offs that are otherwise normalized or obscured in design processes. BPR-LTC adapts these methods to create a structured, transparent design process.

To ground this work within geriatric practice, we incorporate the Geriatric 5M framework—Mind, Mobility, Medications, Multi-Complexity, and Matters Most—and add a sixth domain, Multi-Stakeholder, to capture the perspectives of families, staff, administrators, and regulators.¹⁵ Distinguishing this domain enables clear identification of competing commitments within design discussions.

By linking stakeholder perspectives, geriatric principles, and environmental evidence, the 5M+1 Model for Geriatric Design clarifies how values and empirical data interact within architectural decision-

making. This approach parallels analytical structures developed to examine epistemic authority in clinical decision-making¹⁶ and aligns with emerging frameworks for healthy senior living environments.¹⁷

The need for an ethics-informed evaluative structure becomes more apparent when considering that architectural decisions establish enduring conditions that shape resident autonomy, privacy, mobility, and risk. Unlike clinical interventions, which can be modified or discontinued, built environment choices persist for decades and create structural norms that influence staff practice patterns and resident behavior.⁷ These decisions are often made with limited resident representation, raising concerns about authority, justice, and transparency. By introducing a justificatory framework analogous to clinical ethics consultation, BPR-LTC addresses this gap and ensures that design choices are grounded in explicit values and evidence rather than implicit assumptions.

Implementation

Effective implementation of BPR-LTC follows a staged workflow aligned with typical design processes. During ideation/predesign, the approach helps clarify care models, resident needs, and architectural assumptions before they become structurally fixed. In schematic design, BPR-LTC supports evaluation of trade-offs and identification of evidence-informed alternatives.¹⁸ During operational planning, it helps ensure coherence between built features, staffing models, and regulatory requirements. Figure 1 shows a small part of an architectural plan annotated during the BPR-LTC process. A complete

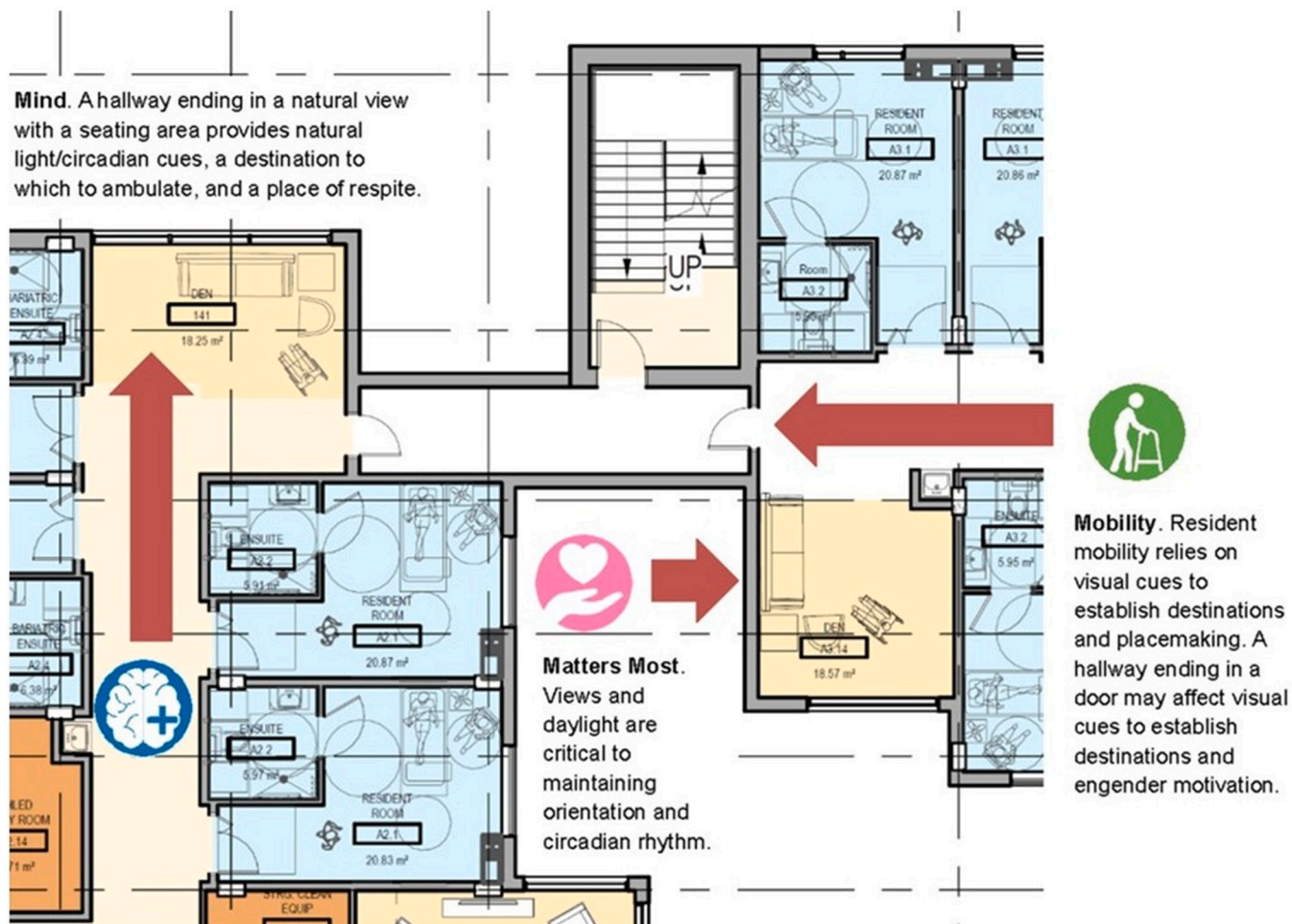


Fig. 1. BPR-LTC: architectural design annotated with the 5M+1 framework.

annotated drawing set allows decision-makers to see what values, priorities, or risks are expressed and consider trade-offs between competing goals. The design team and client can iterate to refine values concordant with institutional goals.

Implementation requires collaboration among 4 core participants: a geriatric clinical lead, a clinical ethicist, an architect, and an LTC operational leader. Additional contributors—such as dementia care specialists or rehabilitation clinicians—may be included depending on project scope.

A recent application illustrates this structure in practice: during early design planning for a memory care unit, the team confronted a tension between maximizing resident autonomy through freely navigable spaces and ensuring safety for individuals at high risk of elopement. Applying BPR-LTC clarified the underlying values at stake, identified relevant evidence related to wayfinding, supervision, and behavioral risks, and supported the development of design alternatives—such as cue-rich pathways and strategically positioned staff stations—that balanced autonomy and safety in a transparent, ethically grounded manner.

Examples from our applications include the following:

- Supervision and privacy: tension between line-of-sight care and resident privacy prompted reconfiguration of corridor alcoves and decentralized care stations.
- Delirium prevention: lighting and window placement were modified to better support circadian regulation.⁴
- Wayfinding: enhanced sensory cues and visual contrast improved navigation for residents with neurocognitive disorders.⁵
- Social interaction: unit configuration influenced resident interaction patterns, demonstrating opportunities for design to support social engagement.¹⁹

Contemporary LTC design literature further identifies opportunities for retrofit and new facility development consistent with BPR-LTC principles.^{20,21}

Evaluation

Having described the conceptual foundations and practical implementation of BPR-LTC, we now outline how the evaluative process unfolds in practice. BPR-LTC is an advisory framework that seeks to clarify value tensions rather than mandate particular design outcomes. The process includes the following: clarification of stakeholder values, identification of design-related tensions, assessment of relevant evidence and ethical considerations, integrative analysis, presentation of justified alternatives, and iterative refinement.

Drawing on EBD literature, existing medical and geriatrics frameworks of care, and proven methods of values clarification and incorporation,^{14,16} BPR-LTC informs design decision-making that has enduring implications. Recent reviews emphasize the need for structured evaluative mechanisms of this sort in LTC design.²² Moreover, literature on environmental justice emphasizes that environmental conditions disproportionately affect marginalized communities, underscoring the importance of applying BPR-LTC in ways that advance equity across diverse LTC settings.^{12,13}

Comment

Although outcome evaluation was beyond the scope of this initial work, in pilot evaluations at 2 facilities, design professionals and organizational leaders reported that BPR-LTC surfaced previously unrecognized concerns relevant to future construction. Applied

early—during ideation/predesign and business-case development—BPR-LTC can influence foundational decisions related to prototypes, room layouts, daylight strategies, and accessibility features.

Participants noted that BPR-LTC clarified intersections between ethical, clinical, and operational considerations, offering a common vocabulary for articulating and adjudicating trade-offs. This aligns with prior work illustrating the value of integrating ethical frameworks to reduce moral distress and improve interdisciplinary communication.^{23,24} BPR-LTC extends this insight to architectural decision-making, demonstrating the benefits of integrating ethical, clinical, and environmental evidence.

Equity considerations reinforce the importance of deploying BPR-LTC across resource-rich and resource-limited settings alike.¹² Facilities serving structurally marginalized populations may face greater risks associated with outdated or inadequate infrastructure.¹³ Applying BPR-LTC in these contexts can help identify design improvements that meaningfully support resident autonomy, well-being, and safety.⁷

System-level constraints—including capital budgets, regulatory requirements, staffing challenges, and construction logistics—shape what can be achieved in any project. BPR-LTC supports ethically grounded decision-making within these constraints by framing proposed design changes as justified options rather than prescriptive expectations.

Broader implementation of BPR-LTC could inform policy mechanisms such as quality metrics, accreditation standards, and regulatory guidance. Incorporating built environment considerations into such frameworks may help ensure that LTC environments better support resident well-being, autonomy, and equity.

At the policy level, BPR-LTC offers a structured means of translating design-related evidence and ethical analysis into standards aligned with Centers for Medicare & Medicaid Services expectations for quality and safety. Current regulatory frameworks do not systematically address environmental contributors to delirium, mobility restriction, sensory overstimulation, or social isolation, despite their clear relevance to resident outcomes. By making the ethical and clinical implications of design decisions explicit, BPR-LTC could inform Quality Assurance and Performance Improvement initiatives, guide capital planning, and support accreditation bodies in recognizing the built environment as a determinant of clinical quality. Integrating such considerations into policy and regulatory guidance would help ensure that LTC environments more reliably support resident well-being, autonomy, and equity.

Disclosure

The authors declare no conflicts of interest.

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The pragmatic innovation described in this article may need to be modified for use by others; in addition, strong evidence does not yet exist regarding efficacy or effectiveness. Therefore, successful implementation and outcomes cannot be assured. When necessary, administrative and legal review conducted with due diligence may be appropriate before implementing a pragmatic innovation.