**Toward a Sustainable Care Robot Ecosystem: A Service Model Framework and Nursing-Home Service Model** M. J. Lim, W. K. Song. *Gerontechnology* 25(s*)*

**Purpose** Conventional care robot development has largely focused on device-level functionality and technological performance, leaving gaps in real-world applicability, integration with existing care services, and long-term sustainability. This study aims to establish a Care Robot Service Model Framework that systematically integrates user needs, stakeholder roles, service workflows, and economic feasibility. Based on this framework, we further propose a care robot service model applicable in nursing-home. **Method** A multi-layered methodological approach was applied, incorporating the Dual ICF framework [1] for needs analysis, Stakeholder Maps [2] to define interactions, Service Blueprints [3] for process modeling, and the Business Model Canvas [4] to examine operational feasibility. Finally, 4P (public private people partnership) workshops [5] were conducted to iteratively refine the framework. Using this methodology, the framework was applied and tested in a nursing home located in South Korea, enabling real-world assessment of task-specific robot deployment and organizational adaptation. **Results:** Using this framework, we conducted focused field implementation in a nursing home in South Korea, where nighttime monitoring was consistently identified as the most burdensome and high-risk tasks. The nursing home implemented a nighttime monitoring model to reduce the burden of repetitive manual patrols and improve resident safety. The configuration included: a mobile monitoring robot capable of autonomous nighttime patrols, ceiling-mounted monitoring sensors for movement and wandering detection, and a centralized monitoring console enabling real-time alerts and faster response. The implementation demonstrated significant quantitative and qualitative improvements. Quantitatively, manual patrol time decreased drastically from 110 to 20 minutes per day, and the average response time to risk situations improved from 3 minutes to under 30 seconds. Additionally, system optimization reduced unnecessary patrol alarms by 62%. Qualitatively, caregivers reported reduced fear of falls and improved workflow continuity, as the automated reporting system eliminated the need to vacate the care station during patrols. **Discussion** While the nighttime monitoring showed meaningful potential in improving safety and reducing caregiver burden, the nursing home faced several systemic challenges during implementation. First, facilities encountered difficulty prioritizing which care burdens to address, given multiple high-strain tasks. Second, device selection required extensive evaluation of safety, usability, workflow compatibility, and resident acceptance. Third, securing funding for robot acquisition and monitoring system installation proved challenging. Fourth, substantial training for caregivers and residents was required, and workflows needed adjustment during the adaptation phase. Fifth, robot adoption required organization-wide workflow changes, including role redistribution, emergency protocols, and data management systems. Finally, concerns about maintenance, technical support, and response to device malfunction emerged as critical operational barriers. These findings demonstrate that a service model–based approach—rather than a device-centered approach—supports strategic and sustainable robot adoption in institutional care. Aligning robot functions with prioritized care tasks provides practical entry points for robot-supported caregiving and offers actionable insights for policy development and future scale-up.

**References**

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