Impact of smart fecal sensing technology on caregiver workload and patient dignity in long-term care: A pilot study F.J. Chuang, Y.H. Chiu, C.H. Chen. *Gerontechnology* 25(s)

Purpose Bowel incontinence management is a major challenge in long-term care, often leading to skin infections, pressure ulcers, and significant physical strain on caregivers due to routine manual inspections. Traditional diaper-based care is labor-intensive and often fails to provide timely cleaning, compromising patient dignity. This study evaluates the clinical utility of a novel Intelligent Gas-Sensing Fecal Collection System, focusing on its efficacy in reducing caregiver workload and improving hygiene standards compared to conventional methods. **Method** A pilot usability study was conducted involving 30 professional caregivers in a clinical setting. The intervention utilized a prototype integrating a reusable ammonia gas sensor with a biodegradable collection bag and Bluetooth Low Energy (BLE) transmission for real-time alerts. Key outcome measures included response time, cleaning duration, dermatological safety, and subjective feedback regarding caregiver workload and patient comfort. **Results and Discussion** The system demonstrated high clinical efficiency, detecting defecation events within 60 seconds and triggering immediate alerts. Significantly, the average cleaning time was reduced by 75%, dropping from 8 minutes with traditional diapers to just 2 minutes using the smart system. In user feedback, 87% of caregivers reported a notable reduction in daily inspection workload, and 83% observed enhancements in patient dignity and comfort due to minimized exposure to soiled conditions. Overall caregiver satisfaction with the system reached 90%, with less than 10% of patients showing mild skin reactions. The integration of real-time gas sensing into excretion care effectively bridges the gap between patient needs and caregiver response. By drastically shortening cleaning times and eliminating unnecessary checks, this technology offers a viable solution for mitigating caregiver burnout while promoting dignified and safer care for bedridden patients.

References

1. Thompson Brewster E, Rounsefell B, Lin F, Clarke W, O'Brien KR. Adult incontinence products are a larger and faster growing waste issue than disposable infant nappies (diapers) in Australia. Waste Manag. 2022;152:30–37.
2. Yu SY, Tung TW, Yang HY, Chen GY, Shih CC, Lee YC, et al. A versatile method to enhance the operational current of air-stable organic gas sensors for monitoring of breath ammonia in hemodialysis patients. ACS Sens. 2019;4(4):1023–1031.
3. Muthu SS, Ng FSF, Li Y, Hui PCL, Guo Y. Carbon and eco-footprints of adult incontinence products. Fibers Polym. 2013;14(10):1776–1781..

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