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Revolutionizing Patient Surveillance in Assisted Living Facilities: Insights from AUGi Technology Implementation

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Abstract. In the face of escalating non-fatal fall-related expenses and an aging population, innovative solutions in assisted living facilities (ALFs) are imperative. This study evaluates the implementation of a remote-surveillance technology (AUGi) across three diverse ALFs, emphasizing its impact on falls and falls with injury across sites. Utilizing comprehensive data collection, AUGi facilitated an average reduction of 64% in falls ($p < 0.01$) and falls with injury ($p = 0.05$), a statistically and clinically significant difference. The technology's success in enhancing nurse surveillance, providing prompt notifications, and reducing falls underscores its potential to transform ALF care dynamics. This pioneering approach not only fosters better staff-patient interactions but also provides a foundation for future advancements in clinical decision support systems, offering hope for mitigating falls in ALFs.

Keywords. AI, Assisted Living, Falls, Patient Surveillance, Technology

1. Introduction

In the United States, the annual expenditure of $50 billion on non-fatal falls is a critical concern, particularly with an aging population.[1] The prevalence of falls among elderly individuals in nursing homes and assisted living facilities (ALFs) is alarming, with over 1.5 million residing in nursing homes and 1 million in ALFs. This number is expected to increase significantly by 2030, emphasizing the urgency for proactive measures.[2] Nearly half of all nursing home patients fall every year but falls in ALFs are much more difficult to ascertain because of uncertain documentation and overall lack of surveillance.[3] Between 2007 and 2016, the rate of death from falls increased over 30%.[4] Despite this, effective surveillance in ALFs remains challenging due to limited documentation and surveillance capabilities, especially during unmonitored periods such as at night. The purpose of this study was to demonstrate the utility of a technology, "AUGi," to enhance nurse surveillance, timely alerts for patient needs, and remote patient assessment without compromising privacy across three diverse ALFs.

2. Methods

The AUGi device was installed across three ALFs in diverse settings. The device is comprised of mounted hardware in patient rooms, staff-worn Bluetooth Low Energy

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(BLE) beacons, and an integrated mobile app; the hardware employs obfuscated computer vision and artificial intelligence for pose estimation, enabling comprehensive data collection on patient mobility, positioning, and staff interactions. Real-time alerts for immediate patient assistance are sent to staff via the app which also allows remote visual assessments. This technology offers a novel solution to monitor patient-staff interactions in ALFs, an aspect largely unexplored in real-life settings.[5]

3. Results

Data were collected from this technology between 8/21/23-11/19/23 across three sites; a medium sized ALF in suburban Californian (between 25-50 residents), a small suburban facility in New Jersey (10-25 residents), and a large suburban (>50 residents) ALF in Connecticut (Table 1). Staff visited patients an average of 54, 834 times during this 90-day period, averaging 14 in person visits per patient per day, and 7.67 views via the mobile app per patient per day. The technology generated, on average, 12,064 active notifications to staff over 90 days at each site (134 per day, per site). The average response time to alerts was 5.76 minutes, with staff responding within 1.7 minutes for falls. On average, staff spent 1.09 minutes per patient visit, totaling an average of 974.4 staff care hours spent in patient rooms.

Table 1. Results of computer vision assisted surveillance in ALFs.

ALF Facility	1	2	3	Avg
Notifications	12,241	2,549	22,402	12,064
Staff Visits	59,092	32,607	71,804	54,834
Response Time (min)	7.0	3.0	7.3	5.8
Total time staff spent in rooms (hours/day)	10.2	6.9	15.4	10.8
Avg In-Person Response Time (min)	4	3.1	4	3.7
Avg In-Person Fall Response Time (min)	1.5	1.2	2.5	1.7
Timely Interventions (response < 3min)	131	100	700	310.3
Average Duration Per Visit (seconds)	58.4	68.6	70.2	65.7

*Note: ALF Facility Residents: **1.** 45-55 suburban Californian; **2.** 19-20 suburban New Jersey; **3.** 100 suburban Connecticut. Timely interventions were those with a response under 3 minutes. Min = minutes.*

Pre-installation falls data were only available at two of the sites. Using this data, compared to the same period the year before, falls were reduced by 64.7% across these two sites, a statistically significant difference ($t = -4.48$, $p < 0.01$). Falls with injury were reduced by 55.6% across sites, also a statistically significant reduction ($t = -2.83$, $p = 0.05$).

Table 2. Fall data pre-and post- installation of technology.

	Pre-	Post-	Pre-	Post-	Pre-	Post-	Average change
Facility	**1**		**2**		**Combined**		**%**
Falls	31	19	20	13	51	33	↓ 64.7*
Falls with injury	13	9	5	1	18	10	↓ 55.6*

*Note: ALF Facility Residents, pre- and post- implementation of technology. **1.** 45-55 suburban California; **2.** 19- 20 suburban New Jersey; Data were unavailable for Facility 3. *Statistically significant at the p= 0.05 level.*

4. Discussion

These figures depict the technology's efficacy in facilitating prompt responses and enhancing staff-patient interactions, and the ability of prompt notification and response

to reduce falls. The study and technology presented provides unprecedented insights into staff activities within ALFs, laying a foundation for future comparisons and advancements in operation and clinical decision support systems. Although the absence of existing data on staff interaction frequency and duration in ALFs poses challenges for direct comparisons, this represents a pivotal stride towards comprehending care team dynamics, potentially enabling predictive modeling in the future. The heightened accuracy achieved in real-life scenarios also allows for improvement in care planning and documentation. enables refined care planning and documentation. Given the critical concern of falls in ALFs, these findings indicate that patient monitoring through this method could contribute to fall reduction.

References

[1] Florence CS, Bergen G, Atherly A, Burns E, Stevens J, Drake C. Medical costs of fatal and nonfatal falls in older adults. Journal of the American Geriatrics Society. 2018;66(4):693-698.

[2] American Health Care Association. LTC Patient Projections. Accessed March 11, 2020. https://www.ahcancal.org/research_data/Pages/LTC-Patient-Projections.aspx

[3] Agency for Healthcare Research and Quality. Falls. Updated September 7, 2019. Accessed March 21, 2023. https://psnet.ahrq.gov/primer/falls

[4] Burns E, Kakara R. Deaths from falls among persons aged≥ 65 years—United States, 2007–2016. Morbidity Mortality Weekly Report. 2018;67(18):509.

[5] Sapci AH, Sapci HA. Innovative assisted living tools, remote monitoring technologies, artificial intelligence- driven solutions, and robotic systems for aging societies: systematic review. JMIR aging. 2019;2(2):e15429.