Symposium: Student Paper Contest

ISG Student Paper Contest 2026 – First Edition N. El Hajj (Convener) & Y.L. Hsu (Convener).
Gerontechnology 25(s)

PARTICIPANTS: D. Zhang (Hong Kong), W. Lam (Hong Kong), Y.H. Chiu (Taiwan), L. Li (Singapore), N. El Hajj (Canada), A. Panahi (Canada). **ISSUE:** Early career researchers (ECRs), including students, are future leaders in the research community and should be supported to help shape research culture and practice (1). Scientific societies and journals can contribute through practical strategies, notably by increasing the visibility of ECR-led efforts and creating opportunities for ECRs to share their research-improvement activities with others (1). In this spirit, the ISG Student Chapter, in collaboration with the Gerontechnology Journal, launched the ISG Student Paper Contest to support students in developing publishable manuscripts from master's or doctoral thesis research and to increase the visibility of their work within the field (2). The contest aims to strengthen scientific writing, provide formative feedback as part of training, and offer early exposure for student-led research in gerontechnology. **CONTENT:** Following a two-round selection process, six students have been selected as finalists. 1. Zhang (Hong Kong) will present a standardized deep-learning framework for automated multi-site muscle segmentation in ultrasound to support accessible sarcopenia assessment. 2. Lam (Hong Kong) will present MUNICAS, a multimodal non-invasive instrumental swallowing assessment using simultaneous point-of-care ultrasound and swallowing accelerometry, including exploratory factor analysis of multimodal features. 3. Chiu (Taiwan) will present an intelligent gas-sensing fecal collection bag integrating real-time ammonia sensing with a biodegradable bag to reduce caregiver burden and environmental impact. 4. Li (Singapore) will present a systematic review on how social support through social media influences older adults' acceptance of AI technologies. 5. El Hajj (Canada) will present a realist review identifying context–mechanism–outcome configurations that explain when and why digital technologies are usable for home-based neurorehabilitation. 6. Panahi (Canada) will present an assessment of commercially available and AGE-WELL-affiliated sensors mapped to interRAI Home Care items to inform the development of a Digital Comprehensive Geriatric Assessment system. **CONCLUSION:** This first edition will spotlight student-led research from multiple regions of the world and provide finalists with a constructive forum for learning through feedback and discussion. By pairing recognition with visibility, the contest helps amplify emerging voices and supports participants as the next generation of leaders in gerontechnology. The jury's final decision will consider both the submitted papers and the quality of each finalist's oral presentation during the symposium.

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Automating Multisite-Muscle Segmentation in Ultrasound via Deep Learning through a Standardized Framework for Sarcopenia Assessment D. Zhang, C. Wu, Y. Na, W. Li, K.S. Lee, Y. Sun, Y. Zheng. *Gerontechnology* 25(s)

Purpose Sarcopenia is receiving more and more emphasis nowadays. More than 29% of the elderly population suffers from sarcopenia (1). Ultrasound (US) has been attracting more and more attention to muscle quality and quantity assessment (2). While US is portable and radiation-free, its widespread use for sarcopenia assessment is affected by operator-dependent variability and time-consuming manual analysis. To address a critical unmet need in geriatric care for an accessible tool for quantifying muscle health, this study aimed to unlock the full clinical potential of US by developing a deep learning framework that automates muscle analysis, thereby creating a practical tool for routine clinical use in screening, diagnosis, and follow-up assessment of sarcopenia, while linking to physical performance tested as recommended by Asian Working Group of Sarcopenia (3). **Method** The ground truth of the images was annotated using the Software LabelMe (Version 5.5.0) under supervision of a ten-year experienced US medical doctor. We trained and validated deep learning models (U-Net and nnU-Net) on 2D US images from 94 adults (young: n=22; middle-aged: n=22; elderly: n=50). The training, validation and testing dataset was set into 70%, 10%, and 20%. The models automated the segmentation of five clinically relevant muscle groups (biceps, triceps, rectus abdominis (RA), rectus femoris (RF), and the peroneus longus and brevis muscles (PLPB)). The clinical utility of the AI-derived metrics (Muscle Thickness (MT), Cross-Sectional Area (CSA)) was established by correlating them with commonly used bioimpedance analysis (BIA) body composition data and key functional performance tests (Figure 1). **Results and Discussion** The primary finding of this study is the profound clinical utility of the automated framework. Our system successfully fills the gap between a simple US image and a comprehensive assessment of a patient's muscle health. This is evidenced by the moderate to strong correlations between deep learning-derived metrics and systemic biomarkers of sarcopenia. For example, a rapid scan of the thigh (RF) MT provided a reliable estimate of a patient's total Fat-Free Mass ($r = 0.4223$, $p < 0.001$), while an arm scan (triceps and biceps) robustly predicted total Muscle Mass ($r = 0.7849$ and 0.8212, $p < 0.001$). Crucially, the system moves beyond mere quantification to provide functional insight; PLPB were significantly associated with mobility and frailty indicators like the 5-time Sit-to-Stand test ($r = 0.7480$, $p < 0.001$). This robust clinical performance is built upon the model's high technical fidelity, confirmed by excellent Dice scores (0.826-0.920) against expert analysis. **Conclusion** This work demonstrates US as an accurate modality for sarcopenia management, and strong agreement was observed between US- and BIA-measured parameters. By automating and standardizing the analysis, our framework transforms a user-dependent US imaging technique into an objective, quantitative biomarker for muscle health. The clinical implications of the system enables feasible large-scale community screening for early detection, provides objective data to track patient progress and the efficacy of interventions and offers point-of-care decision support for clinicians. This technology has the potential to fundamentally change how we approach muscle health in aging populations, making proactive and personalized sarcopenia care a reality.
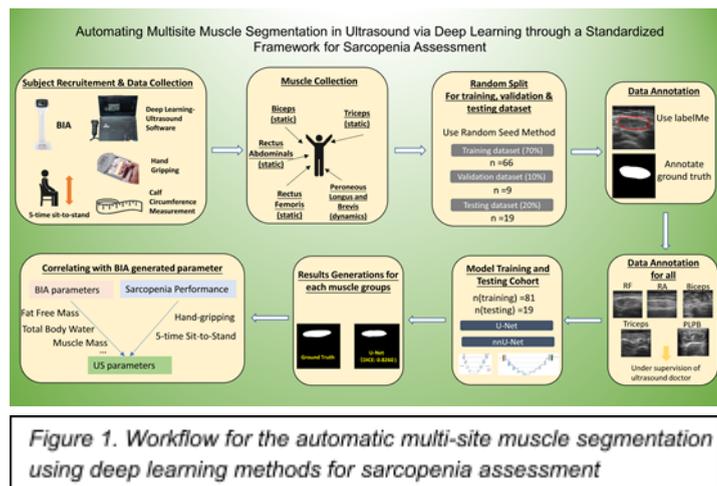
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Figure 1. Workflow for the automatic multi-site muscle segmentation using deep learning methods for sarcopenia assessment

Implementing Multimodal Non-invasive Instrumental Clinical Assessment of Swallowing (MUNICAS): an exploratory study W.Y.S. Lam, E. Kwong, R.C.K. Leung, S. Rai, L.K. Lui, M.S.W. Chan, S.Y.S. Poon, P.T.C. Shek, L.C.Y. Yip, C.H. Lee, W.F. Tsui, T.Y. Cheng. *Gerontechnology* 25(s)

Purpose Multimodal instrumental swallowing assessment is an emerging paradigm in evaluating and studying swallowing physiology. Nonetheless, this paradigm often involves invasive imaging techniques, despite being the 'gold standards'. This is the first non-invasive instrumental study to date that draws on simultaneous utilization of point-of-care ultrasound (POCUS) and conformal swallowing accelerometry (CSA). There are two objectives in the current study: [1] examine the correlations among variables extracted from POCUS and CSA, and [2] explore possible combinations of these variables using exploratory factor analysis (EFA). These objectives will inform future hardware and software development and design for multimodal non-invasive instrumental clinical assessment of swallowing (MUNICAS), particularly as precursors of multimodal deep learning. **Method** Thirty-four healthy adults, including 18 young adults (mean age: 34.72±12.54) and 16 older adults (mean age: 67.62±.88), were recruited from the local community in Hong Kong. A combination of POCUS and CSA instruments were used to simultaneously examine swallowing movements as they performed various swallowing tasks. Temporal, spatial, and spatio-temporal variables were extracted from POCUS, and time-domain and frequency-domain features from CSA. Intra-modal and inter-modal correlations were first examined and subsequently an EFA was conducted with iterative steps to identify the possible combinations of multimodal factors that characterize swallowing movements. **Results and Discussion** Intra-modal correlations were shown to be stronger than those of inter-modal variables. Five factors were identified by two iterations of EFA, Factor 1 included solely mechano-acoustic variables in CSA, Factor 2 was a collection of variables associated with the airway protection mechanism, Factors 3 and 4 were essentially the kinematic variables of swallowing efficiency with Factor 3 more temporal-focused and Factor 4 spatial-focused, and Factor 5 was virtually a factor of movement coordination between the tongue and other structures. The oropharyngeal swallow is a complex process that gives rise to multiple physical phenomena that could only be captured by multimodal sensing techniques. The current evidence seemed to suggest that the development of MUNICAS might take an ensemble approach in clinical protocols and instrumentation as well as a late fusion approach in multimodal learning (1).

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Development of an intelligent gas-sensing fecal collection bag for bedridden and incontinent people
F.J. Chuang, Y.H. Chiu, C.H. Chen. *Gerontechnology* 25(s)

Purpose In current home and care facilities, bedridden individuals with bowel incontinence are unable to actively report defecation, which often leads to delayed cleaning, higher infection risk, skin ulcers, and a substantial caregiver burden. Existing diaper-based systems mainly detect urine and are often delayed, costly, or non-specific for feces. This study presents an Intelligent Gas-Sensing Fecal Collection Bag that integrates real-time ammonia sensing and a biodegradable collection bag to realize instant alarms along with a reduced environmental impact (1). **Method** The system consists of a biodegradable bag made from Green Cycle Materials™ (a pineapple-leaf-fiber/ PLA composite), a reusable ammonia gas sensor based on nanostructured organic semiconductors, and a Bluetooth Low Energy (BLE) module for wireless notification (2). Laboratory validation included ammonia exposure tests to determine detection limit and response time, material decomposition assessment and life-cycle carbon estimates, and a pilot user study with 30 participants to evaluate feasibility and user-reported outcomes regarding caregiver workload, dignity and comfort, and overall satisfaction. **Results and Discussion** The gas sensor showed consistent detection of 1 ppm of ammonia in 60 seconds and provided immediate alerts, enabling prompt replacement and cleaning. The biodegradable bag showed an estimated carbon footprint of about 515 grams CO_2-equivalent per unit, representing a 48.5% reduction versus polyethylene (PE) and 35.6% versus polypropylene (PP), consistent with Taiwan's 2032 carbon-reduction target of 32% ± 2%. In pilot use, 87% of caregivers reported reduced workload, 83% observed improved personal dignity and comfort, and 90% indicated high satisfaction with instructions and rapid clean-up time. Together, these findings indicate that combining real-time gas sensing with a sustainable collection bag can shorten feces–skin contact time, potentially reduce infection and pressure-ulcer risks, and support eco-friendly practices in long-term care.

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Systematic Review: The Role of Social Support Through Social Media in AI Technology Acceptance among Older Adults L. Li, C.J. Smith. *Gerontechnology* 25(s)

Purpose Artificial intelligence technologies increasingly shape daily life, yet older adults often lack familiarity and confidence with them, and some may even feel intimidated. This disparity has created a phenomenon known as "the grey digital divide". While earlier research has focused on digital literacy and access, social and emotional factors, particularly the role of social support, are equally critical in enabling digital inclusion. Social media provides new channels for emotional reassurance, knowledge exchange, and intergenerational learning, offering a potential bridge to AI adoption. **Method** This systematic review examines how social support via social media enhances older adults' AI technology acceptance. Using the PCC framework and applying the Technology Acceptance Model and Social Support Theory, we analyzed 21 peer-reviewed studies (2012–2025) from Web of Science, PubMed, IEEE Explore, and EBSCOhost via PRISMA 2020 processes. **Results and Discussion** The finding reveals that informational and emotional support are the most influential factors in lowering older adults' anxiety and promoting perceived usefulness and ease of use. Similarly, Facebook, WhatsApp, and WeChat were popular platforms for peer learning, family engagement, and community reassurance. In the context of cultural perspective, the finding was significantly moderated by outcomes. Culturally, collectivist societies emphasize emotional and familial support, individualistic societies more value on autonomy and informational learning. The review provided an opportunity to transform social media support for older adults to reduce anxiety, build confidence, and promote digital equity. For the practical implications, these include integrating social learning models into an AI literacy program, designing socially adaptive AI interfaces, and promoting intergenerational sustainable digital inclusion.

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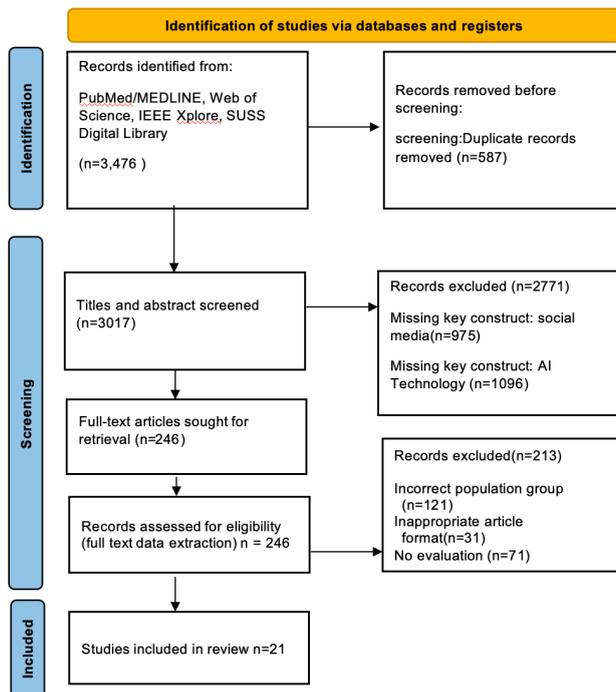**Email**: lsli001@suss.edu.sg

Figure 1. The PRISMA Strategy View for Data Extraction

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Understanding the usability of digital technologies in home-based neurorehabilitation: a realist review N. El Hajj, D. Kairy, Q.N. Hong, F. Zeyour, C. Vincent, A. Thomas, S. Ahmed, N. Bier, C. Auger. *Gerontechnology* 25(s)

Purpose Digital technologies have the potential to transform home-based neurorehabilitation by improving access to care and enabling intensive therapy (1). However, the noticeable decrease in adherence to technologies when comparing clinical to home settings suggests critical usability challenges in terms of effectiveness, efficiency, and satisfaction that are not yet fully understood (2,3). The purpose of this study is to understand how, why, and under what circumstances digital technologies are usable for home-based neurorehabilitation. **Method** Following Pawson et al's methodology (4) and RAMESES standards (5), a five stage realist review was conducted: [1] developing an initial theory from existing theoretical frameworks; [2] systematically searching the literature from 2015 to 2023; [3] selecting the studies; [4] extracting Context-Mechanism-Outcome (CMO) configurations; and [5] conducting theory-driven analysis to revise, validate, or eliminate elements from the initial theory leading to a refined middle-range theory. **Results and Discussion** Of 4,708 records, 134 articles were retained. A total of 379 extracted CMOs were analyzed to refine the initial theory into 9 key mechanisms that can be activated or inhibited by 33 contextual factors, influencing home usability for people with neurological conditions, their caregivers, and health professionals. The proposed middle-range theory enhances our understanding of digital technology usability and translates theory into practice to guide home neurorehabilitation solutions.

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Applicability of Sensor Technologies Data to Enhance Accuracy of Comprehensive Geriatric Assessment System A. Panahi, S. Freeman, S. Jia, P. Jackson, W. Haque, R. Richard, S. Ebihara, H. Sato, S. Amirkhani Ardeh, H. Fournier. *Gerontechnology* 25(s)

Purpose Global demographic shifts, particularly the rapid growth of the older adult population, are creating significant strain on healthcare systems and driving demand for new approaches that support health, independence, and quality of life in later years. One response to this challenge is the emphasis on enabling older individuals to remain in their own homes and communities for as long as possible, often referred to as "aging in place" (1). In Canada, the interRAI Home Care (RAI-HC) assessment is widely used to guide care planning for individuals receiving home-based services (2). However, barriers such as limited staffing, administrative demands, and variability in data collection can hinder frequent reassessment, delaying necessary care adjustments. Incorporating sensor technologies and artificial intelligence (AI) into the assessment process offers a promising solution to enhance accuracy, reduce burden on clinical staff, and enable real-time updates between formal interRAI assessment intervals (3). The employment of technologies can potentially assist in reaching the full capacity of CGAs and overcome the constraints of data transfer between settings and stakeholders. Digital Comprehensive Geriatric Assessment system (D-CGA) could fill this gap by offering a coordinated, sensor-informed platform to support proactive, person-centered care planning. The aim of this study is to evaluate the usability and applicability of data generated by commercially available and AGE-WELL-affiliated sensor technologies in supporting digitizing the RAI-HC assessment instrument. We investigated how sensor-based data can inform RAI-HC assessment items and described the potential for the identified sensor-based data to contribute to a D-CGA system. **Method** A five-stage methodology was applied which included: 1. Identifying relevant technologies through market scans and AGE-WELL databases; 2. Developing a classification matrix to document functionality of each product, data characteristics they record, and interoperability capability; 3. Mapping technologies to RAI-HC sections based on relevant gathered data (4). We used the current RAI-HC Version 10.0 Standard Edition which includes 20 sections and 104 subsections; 4. Validating the mapping through a literature review (5); and 5. Consulting a clinical expert experienced in RAI-HC to assess applicability. **Results and Discussion** Eighty-three sensor technologies (49 commercial and 34 from AGE-WELL) were identified based on the data they collected and their integration capabilities. These devices captured diverse data, including medication adherence (e.g., pill dispenser alarms, missed dose alerts), activity and mobility patterns (e.g., motion, posture, steps, fall events), cognitive and social engagement (e.g., session attendance, voice call logs, app interactions), and environmental interactions (e.g., door sensors, location triggers). Literature-based mapping showed that sensor data could potentially support fifteen RAI-HC questions. Expert validation indicated that five sections can be directly assessed with sensor data; five can be partially supported, and five still require clinical judgment. These findings highlight both the promise and the current limitations of sensor-based data assessments. While sensors cannot replace clinician's expertise, they can play an important role in supporting the assessment process and improving the accuracy and timeliness of data useful to inform care planning. Findings serve as an early step to inform the development of a D-CGA system.

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