

# 日本医療研究開発機構 介護 DX を利用した抜本的現場改善事業 事後評価報告書

公開

## I 基本情報

研究開発課題名：（日本語）マルチモーダル AI を活用したロコモティブシンドローム検出支援システムの開発  
と実証研究

（英 語）Development and Demonstration of a Locomotive Syndrome Detection Support  
System Using Multimodal AI

研究開発実施期間：令和 7 年 8 月 20 日～令和 8 年 3 月 31 日

研究開発代表者 氏名：（日本語）森口 悠

（英 語）Yu Moriguchi MD PhD

研究開発代表者 所属機関・部署・役職：

（日本語）株式会社 ayumo ・研究開発部・取締役・CTO

（英 語）ayumo Inc. ・Research & Development Department ・Director Chief Technical Officer

## II 研究開発の概要

本研究では、介護現場における人材不足、身体機能評価の属人性、ロコモティブシンドロームの見逃しといった課題に対し、マルチモーダル AI を活用した歩行解析システム『Dr Walkie Locomo』を中核とする介護 DX パッケージモデルを構築し、その有効性を介護老人保健施設およびサービス付き高齢者向け住宅において実証した。

### 1. 研究開発の目的

- ・介護現場で実用可能な AI 歩行評価システムを開発する。
- ・ロコモティブシンドロームの早期検出を実現する。
- ・介護職員の業務負担を軽減しケアの質を向上する。
- ・全国へ展開可能な介護 DX パッケージモデルを構築する。

### 2. 研究開発体制

株式会社 ayumo を代表機関とし、313 ソリューションズ株式会社、介護老人保健施設メディコ阿久比、グッドライフホーム今町、大阪大学大学院医学系研究科が連携するコンソーシアムを構築した。研究期間中は 2 施設において AI 歩行解析、アウトカム評価、アンケート調査、AI モデル改良を実施した。

### 3. 研究成果

- ・介護施設データを用いた AI モデル再学習を実施し、重症ロコモ検出性能を向上。
- ・歩行評価時間は老健 54.1%、サ高住 66.1%短縮。
- ・従来ロコモ判定法と比較し判定時間を約 80～92%短縮。
- ・転倒件数は老健 17.7%減少、サ高住 40%減少。
- ・利用者・家族・職員アンケートから高い受容性と説明支援効果を確認。
- ・歩行動画撮影、AI 解析、レポート、情報共有を一体化した介護 DX パッケージモデルを構築。

### 4. 研究開発計画に対する達成状況

#### 1) AI モデルの高度化【達成】

- ・介護施設データによる再学習を実施。
- ・マルチモーダル AI を開発。
- ・重症ロコモ検出性能は向上した一方、軽症例は今後の課題。

#### 2) 業務効率化【目標達成】

- ・老健：目標 30%→54.1%短縮。
- ・サ高住：目標 50%→66.1%短縮。
- ・ロコモ判定時間は非使用時から AI 活用で 80～92%短縮され、当初目標（最大 50%）を上回った。

#### 3) ロコモ新規検出率【達成】

- ・老健：ロコモ度 3 該当者の新規検出率（目標 1.5 倍増）  
→ロコモ検出テストの実施=0%、（実施経験は 8%）であり、AI 導入下での新規検出の感度は 92.9%  
施設データの追加学習モデルで陽性的中率は、初期版：88.1%、改良版：平均 94.5%と 6.4%上昇した。
- ・サ高住：ロコモ 1－2 相当の早期介入対象者の特定率（目標ベースライン比で改善）  
→ロコモ検出テストの実施=0%、（実施経験は 33%）であり、AI による新規検出の感度は 74.0%  
追加学習モデルのロコモ 1 以上陽性的中率は、初期版：100%、改良版：95%であった。

#### 4) 転倒予防【概ね達成】

- ・老健（目標 10%削減）：4 ヶ月でヒヤリハット 29 件（3.3%）増加、転倒は 12 件（17.7）減少
- ・サ高住（目標 15%削減）：転倒のみカウントされており、4 件（40%）減少
- ・ヒヤリハットは報告体制の影響も考えられ継続検証が必要。

#### 5) 利用者・家族への価値【達成】

- ・両施設とも（以下同様）アンケート/聞き取り調査で 80%以上が身体状態を理解しやすいと回答。
- ・90%以上が運動継続意欲を示した。
- ・家族の情報共有ニーズに応える新しい説明手法を提示。

#### 6) 職員受容性【一部未達】

- ・老健（目標 80%以上）：職員 75%が運動機能評価で継続利用を希望。25%は「どちらでもない」と回答  
運動機能の評価や個性のあるリハビリプランの実施、業務負担の軽減が導入インセンティブ
- ・サ高住（目標 70%以上）：職員 60%が運動機能評価で利用を希望。  
リハビリ評価の簡略・客観化、フィードバックやカンファレンスの情報共有が想定利用
- ・満足度は目標未達であったが、原因は撮影環境や運用体制の確保が中心。

- ・客観評価、説明支援、業務効率化については高い評価を得た。

#### 7) 介護 DX パッケージモデル【達成】

- ・導入手順、運用方法、教育、フィードバックまで含めた実装モデルを構築。
- ・施設属性や地域性を超えて、他施設へ横展開可能なモデルを提示した。
- ・現場の要請から TUG (Timed up & Go) test 自動測定機能を追加した。

#### 5. 研究成果の意義

- ・介護現場の人材不足・業務効率化への具体的解決策を提示。
- ・AI による客観的評価を介護現場へ導入可能であることを実証。
- ・利用者・家族・介護職・医療者の情報共有を促進。
- ・介護 DX パッケージモデルとして全国展開可能な基盤を構築。

#### 6. 今後の展望

- ・多施設共同研究による外部検証。
- ・AI アルゴリズムの継続改良。
- ・TUG 等さらなる運動機能評価への展開。
- ・介護業務フローへの適合性（評価自動化機能の向上）
- ・介護記録システムとの連携。
- ・全国介護施設への横展開および社会実装。

#### 総合評価

本研究では研究開発計画で掲げた主要目標を概ね達成した。特に歩行評価時間の短縮、転倒件数の減少、AI 歩行解析の実用化、介護 DX パッケージモデルの構築は当初計画を上回る成果であった。一方、軽症ロコモ検出精度や運用環境については改善点が明確となり、次段階研究への課題整理も達成できた。成果は介護 DX、人材不足対策、ケアの質向上、社会実装の観点から高い意義を有する。

**Japan Agency for Medical Research and Development (AMED)**  
**Post-project Evaluation Report**  
**Comprehensive Long-Term Care Improvement Program Utilizing Digital Transformation (DX)**  
**Technologies**

**I. Basic Information**

**Research and Development Project Title:**

Development and Demonstration of a Locomotive Syndrome Detection Support System Using Multimodal AI

**Research and Development Period**

August 20, 2025 - March 31, 2026

**Principal Investigator**

Yu Moriguchi MD PhD

**Affiliation, Department, and Position of the Principal Investigator**

Director and Chief Technology Officer (CTO)

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**II. Summary of the Research and Development Project**

This project addressed key challenges in long-term care, including workforce shortages, the subjectivity of physical function assessments, and the under-detection of locomotive syndrome. We developed a long-term care digital transformation (DX) package centered on Dr Walkie Locomo, a multimodal AI-based gait analysis system, and demonstrated its effectiveness in both a Long-Term Care Health Facility and Service-Integrated Housing for Older Persons.

**1. Objectives**

- To develop an AI-based gait assessment system suitable for routine use in long-term care settings.
- To enable the early detection of locomotive syndrome.
- To reduce the workload of long-term care staff while improving the quality of care.
- To establish a scalable long-term care DX package for nationwide implementation.

**2. Research Framework**

A consortium was established with ayumo Inc. as the lead organization, in collaboration with 313 Solutions Inc., Medico Agui Long-Term Care Health Facility, Good Life Home Imamachi (Service-Integrated Housing for Older Persons), and the Graduate School of Medicine, Osaka University. During the project period, AI-based gait analysis, clinical outcome assessments, questionnaire surveys, and iterative AI model refinement were conducted at the two participating facilities.

**3. Major Achievements**

- The AI model was retrained using data collected from long-term care facilities, resulting in improved detection performance for severe locomotive syndrome.
- Gait assessment time was reduced by 54.1% in the Long-Term Care Health Facility and by 66.1% in the Service-Integrated Housing for Older Persons.

- Compared with conventional locomotive syndrome assessment methods, AI-assisted assessment reduced evaluation time by approximately 80-92%.
- Falls decreased by 17.7% in the Long-Term Care Health Facility and by 40% in the Service-Integrated Housing for Older Persons.
- Questionnaire surveys demonstrated high acceptance among users, family members, and staff, confirming the effectiveness of the system as a communication and decision-support tool.
- A comprehensive long-term care DX package integrating gait video acquisition, AI analysis, automated reporting, and information sharing was successfully established.

#### **4. Achievement Against the Original Research and Development Plan**

##### **1) AI Model Enhancement (Achieved)**

- The AI model was retrained using data collected from long-term care facilities.
- A multimodal AI model integrating gait videos with demographic and physical information was developed.
- Detection performance for severe locomotive syndrome improved substantially, whereas further improvement in detecting mild cases remains a future challenge.

##### **2) Workflow Efficiency (Target Achieved)**

- Long-Term Care Health Facility: Target: 30% reduction → Achieved 54.1% reduction.
- Service-Integrated Housing for Older Persons: Target: 50% reduction → Achieved 66.1% reduction.
- AI-assisted locomotive syndrome assessment reduced evaluation time by 80-92% compared with conventional assessment, substantially exceeding the original target (maximum 50% reduction).

##### **3) Detection of Previously Undiagnosed Locomotive Syndrome (Achieved)**

###### **Long-Term Care Health Facility**

Target: A 1.5-fold increase in the identification of individuals with Locomotive Syndrome Stage 3.

- Routine locomotive syndrome screening had not been implemented prior to the study (screening rate: 0%; only 8% of staff had previous experience performing the test).
- Following AI implementation, the sensitivity for identifying previously undiagnosed Stage 3 locomotive syndrome reached 92.9%.
- After retraining the model using facility-specific data, the positive predictive value increased from 88.1% (initial model) to an average of 94.5%, representing an improvement of 6.4 percentage points.

###### **Service-Integrated Housing for Older Persons**

Target: Improve identification of residents requiring early intervention (equivalent to Locomotive Syndrome Stages 1-2) compared with baseline.

- Routine locomotive syndrome screening had not been implemented (screening rate: 0%; 33% of staff had previous experience).
- AI achieved a 74.0% sensitivity for identifying previously undetected residents requiring early intervention.
- The positive predictive value for identifying Locomotive Syndrome Stage 1 or higher was 100% with the initial model and 95% with the retrained model.

##### **4) Fall Prevention (Largely Achieved)**

Long-Term Care Health Facility (Target: 10% reduction)

- During the four-month study period, near-miss incidents increased by 29 cases (3.3%).
- Falls decreased by 12 cases (17.7%), exceeding the predefined target.

Service-Integrated Housing for Older Persons (Target: 15% reduction)

- Only falls were recorded, and the number of falls decreased by 4 cases (40%).
- Changes in near-miss incidents may have been influenced by modifications in the reporting system; therefore, continued long-term evaluation is warranted.

#### **5) Value to Users and Their Families (Achieved)**

- In both participating facilities, more than 80% of respondents in questionnaires and interviews reported that the system improved their understanding of their physical condition.
- More than 90% expressed increased motivation to continue exercising.
- The system provided a novel approach for communicating physical function and rehabilitation progress to family members, thereby addressing their need for information sharing.

#### **6) Staff Acceptance (Partially Achieved)**

Long-Term Care Health Facility (Target:  $\geq 80\%$ )

- 75% of staff expressed their intention to continue using the system for physical function assessment, while 25% responded "neutral."
- Major incentives included objective physical function assessment, individualized rehabilitation planning, and reduced workload.

Service-Integrated Housing for Older Persons (Target:  $\geq 70\%$ )

- 60% of staff indicated that they would like to continue using the system for physical function assessment.
- Expected applications included simplified and objective rehabilitation assessment, feedback to residents, and information sharing during multidisciplinary conferences.
- Although overall satisfaction did not reach the predefined target, the primary barriers were related to securing adequate recording space and establishing operational workflows rather than limitations of the AI system itself.
- The system received consistently positive evaluations regarding objective assessment, communication support, and workflow efficiency.

#### **7) Long-Term Care DX Package Model (Achieved)**

- An implementation model was established that encompasses deployment procedures, operational workflows, staff training, and continuous feedback.
- A scalable model applicable to other facilities regardless of institutional characteristics or regional differences was successfully demonstrated.
- In response to requests from participating facilities, an automated Timed Up and Go (TUG) test measurement function was additionally developed and incorporated into the system.

#### **5. Significance of the Research Outcomes**

- Provided a practical solution to workforce shortages and workflow inefficiencies in long-term care.
- Demonstrated the feasibility of implementing AI-based objective physical function assessment in routine long-term care practice.
- Facilitated information sharing among users, family members, caregivers, and healthcare professionals.

- Established a scalable long-term care DX platform suitable for nationwide implementation.

## **6. Future Perspectives**

- Conduct external validation through multicenter collaborative studies.
- Continue improving AI algorithms.
- Expand the system to additional functional assessments, including the Timed Up and Go (TUG) test.
- Improve compatibility with routine long-term care workflows through further automation of assessment functions.
- Integrate the system with electronic long-term care record systems.
- Promote nationwide deployment and social implementation of the long-term care DX package.

## **Overall Evaluation**

The project successfully achieved the major objectives outlined in the original research and development plan. In particular, reductions in gait assessment time, decreases in fall incidence, practical implementation of AI-based gait analysis, and establishment of a comprehensive long-term care DX package exceeded the original targets. Although further improvements are needed in the detection of mild locomotive syndrome and optimization of operational workflows, the project successfully identified these challenges and established clear directions for subsequent research. Overall, the outcomes make a significant contribution to digital transformation in long-term care, workforce optimization, quality improvement, and future societal implementation.