

**RAE2026**

# **Reframing Unpleasurable Toilet Experience Design for Nursing Homes**

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PolyU UoA38

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# Reframing Unpleasant Toilet Experience Design for Nursing Homes

## Descriptor

**Safety first or does dignity matter more?** This research initially examines how nursing home residents can **retain autonomy and dignity in self-managed toileting and bathing**, particularly outside staffed hours, while maintaining safety from falls. Conventional monitoring systems often compromise privacy and impose a sense of surveillance. The project explores how assistive technology can enable real-time, non-invasive fall detection that supports both resident independence and ethical care practices. Positioned at the intersection of gerontechnology, inclusive design, and design for ethics, the HKPolyU (UGC)-funded programme (HK\$800K) adopts a **privacy-by-design** approach and emphasizes **co-creation** among residents, caregivers, families, and professionals with differing values.

An interdisciplinary team of academic, NGO, and industry collaborators conducted ethnographic research in twelve nursing homes, followed by iterative prototyping in two facilities. The developed prototype—**a non-invasive, AI-augmented skeletal-tracking system**—records only joint movements, eliminating bodily or facial imaging and wearable devices. Two pilot studies (2022–2023; 2024–2025) validated its ability to detect falls in real time through posture analysis while preserving residents' anonymity. Feedback from staff and residents informed design refinement and workflow integration, demonstrating that **privacy-preserving safety systems** are feasible in practice. Beyond technology, the study exposed structural tensions between safety protocols, autonomy, and dignity, contributing new frameworks and insights for **ethical eldercare design and fall-prevention innovation**.

**Does design matter to both care recipients and care providers?** Reflecting on the carer's investigation, the team conducted a second study to reveal the **conflicting interactions between care receivers and carers**. This study focused on incorporating the care providers' perspective into the design process, which is usually ignored. This resulted in a paradigm shift in the development of **inclusive design principles**. The discussions were disseminated at peer-reviewed international conferences and local seminars. The team recommends that a holistic understanding of ethically sensitive eldercare products and environmental design will be needed in the future.

## Personal Profile: Prof. Brian Lee, Associate Professor

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Brian Lee is a researcher and designer focused on promoting well-being through socio-materiality and collaborative prototyping. He employs design research to empower stakeholders and drive transformation across various sectors.

His research interests include artefact creation, service system innovation, creative citizenship and sustainable living. From 2019 to 2025, he conducted research in two main areas.

In MCO1, he partnered with non-governmental organisations in Hong Kong to improve bathing and toileting services in nursing homes, approaching the issue from a humanistic design perspective.

In MCO2, he worked with stakeholders in Hong Kong's recycling ecosystem to develop sustainable supply chains using local resources.

A trained product designer, he has experience in medical product development, furniture design and lifestyle consumables. He holds a PhD in Design and Technologies and leads the BA (Hons) in Product Design programme at The Hong Kong Polytechnic University's School of Design.

## Research Questions

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1. From the perspective of enhancing autonomy for care receivers and considering the needs of carers, what **design considerations** should be made for **real-time fall-detection assistive technology** to enable unsupervised toileting and bathing experiences for elderly people in Hong Kong nursing homes without the need for invasive monitoring or loss of dignity?
2. Reflecting on the application of an AI-augmented body-skeleton tracking system prototype, what **design limitations** does technology-driven, self-managed toileting have in terms of supporting safety and autonomy while also raising **privacy and ethical** concerns, based on ethnographic observations and interviews?
3. From both the perspective of the care receiver and provider, what are the **limitations of current inclusive design** imposed on nursing home design, fall-prevention technology for unsupervised settings and design frameworks for balancing autonomy, safety and dignity?

## Research Outputs

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1. A series of **working prototype AI-enabled monitoring systems** for the toilet environment in nursing homes in Hong Kong are designed, produced through an iterative process, and installed at two real sites for **user engagement and observations** to facilitate in-depth dialogue with care receivers, frontline staff (e.g., care providers), and the management of the nursing homes. Our team realised that the prototype can function not only as a tool for evaluating technology-driven design against the expected users' needs, but also as a bridge and engagement tool for the researcher to build constructive, in-depth dialogue with stakeholders. The in-depth qualitative study enabled us to carry out a second initiative to explore the **conflicting design issues** influencing the bathing experience context.
2. The project established the **first design case study** in Hong Kong, implementing a fall-detection system in the toilet and bathing area of an elderly nursing home that uses neither wearable sensors nor surveillance cameras that capture face and body images.
3. Academic discussions on **quality of life** and **quality of care** through a critical review of the conflicts between elderly experience and product and environmental design for elderly nursing homes, viewed through the lens of heterotopia of crisis and heterotopia of deviation, considering not only the **needs of the care receiver** but also the **mindset of care providers**.

# Research Field & Key References

## Background

The project was funded by a collaborative research fund\* from the School of Design at The Hong Kong Polytechnic University. It comprises a collection of research works by multidisciplinary teams investigating ways to enhance nursing home services through inclusive product and environmental design. The project has been ongoing since 2019.

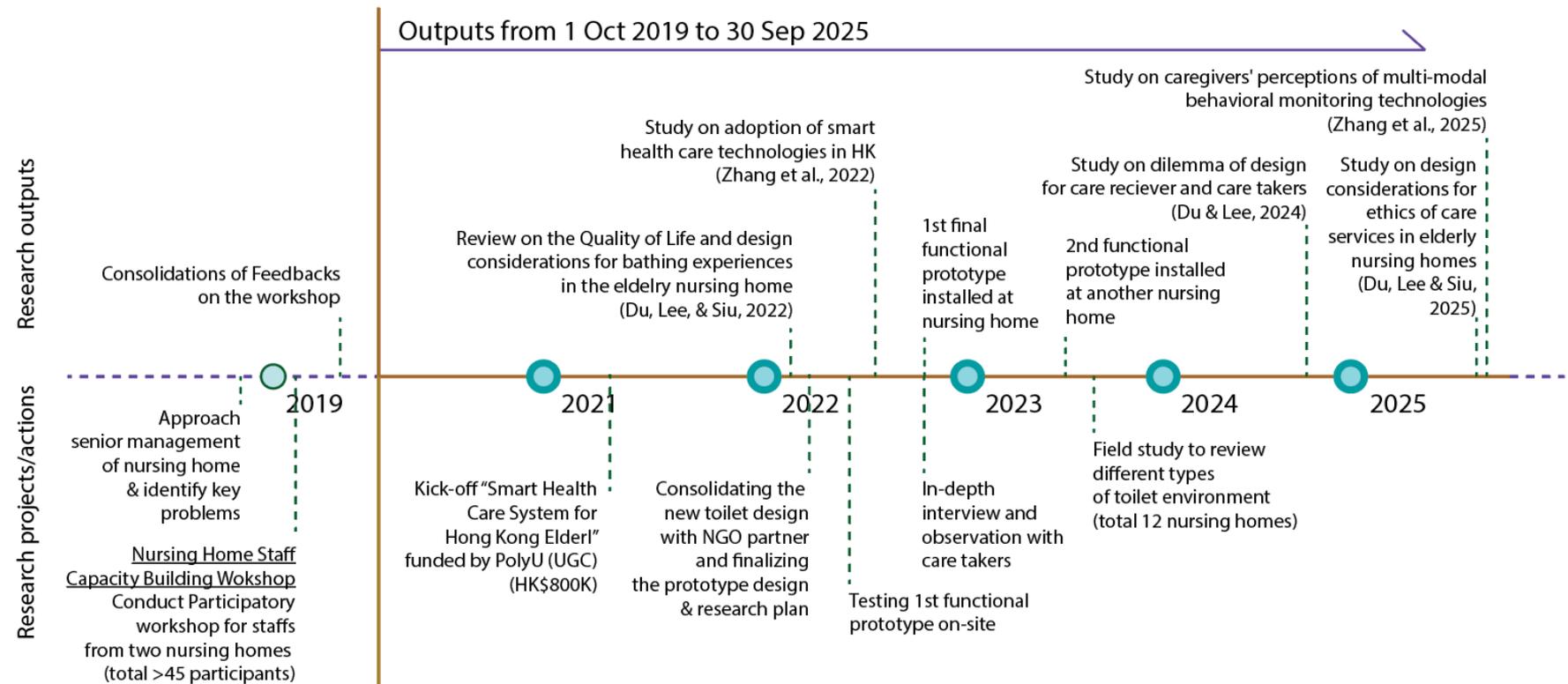


Figure 1. Project timeline illustrates key research actions\* and outputs.

\*Funding sources: **Smart Health Care System for Hong Kong Elderly, PolyU (UGC), HK\$800,000**; Mar 2021–Feb 2023 (co-PIs: Tina Luximon, **Brian Y.H. Lee** and H.Y. Park).

## Research Field & Key References

### Team members and project partners

Team members	Name and organisation	Major roles in the project
Principal Leader	<b>Prof. Brian Y.H. LEE</b> , School of Design, The Hong Kong Polytechnic University (HKPolyU)	Takes the lead in devising and conducting research and prototyping activities, facilitating collaboration, meeting key stakeholders, carrying out iterations and evaluations and promoting outcomes
Research partners	Prof. Hailiang WANG* Prof. Tina LUXIMON* Prof. Kin CHEUNG** *From the School of Design, HKPolyU **From the School of Nursing, HKPolyU	*Conduct a knowledge in ergonomics study; **Advises on service support for an elderly nursing home in Hong Kong
Research assistant	Mr Luke YUNG, School of Design, HKPolyU	Coordinates and supports prototyping design and production
PhD student	Miss Caroline Yunhe DU (chief supervisor: Prof. Brian Y.H. LEE, co-supervisor: Prof. Michael K.W. SIU)	Support user studies and observations at the nursing home; assist with data collection and analysis

## Research Field & Key References

### Team members and project partners

Project partners	Major roles in the project
(1) Hong Kong Society for the Blind (Nursing Home Service)	Provides expert insights into nursing home service and management, facilitates ethical approval and provides a venue for implementation
(2) Jockey Club Design Institute for Social Innovation, The Hong Kong Polytechnic University	Coordinates and supports the pilot study in collaboration with key care providers and managers of a local nursing home
(3) SenainAI	Develops AI-assisted technology for prototyping

## Research Field & Key References

### Why explore the toilet experience in a nursing home environment?

According to studies on elderly residents, ageing life in a nursing home may negatively affect quality of life (QoL). Care services include dressing, toileting, bathing and assistance with eating. Bathing is one of the most challenging tasks for careworkers due to the complexity of bathing activities as well as the design of products, services and the environment. The cognitive condition and agitated behaviour of elderly residents are primary causes of stress for caregivers. Due to a shortage of careworkers, the workload for nursing staff in nursing homes has increased, which may also negatively affect elderly residents' QoL through its impact on quality of care (Anderson et al., 2020; Vaarama et al., 2007). Therefore, this study discusses possible factors that may influence elderly residents' bathing experiences and careworkers' experiences in assisting with bathing under the QoL model, justifies the importance of addressing elderly people's unmet needs in their bathing activities and proposes potential research directions for defining design considerations in future studies (Du et al., 2022).

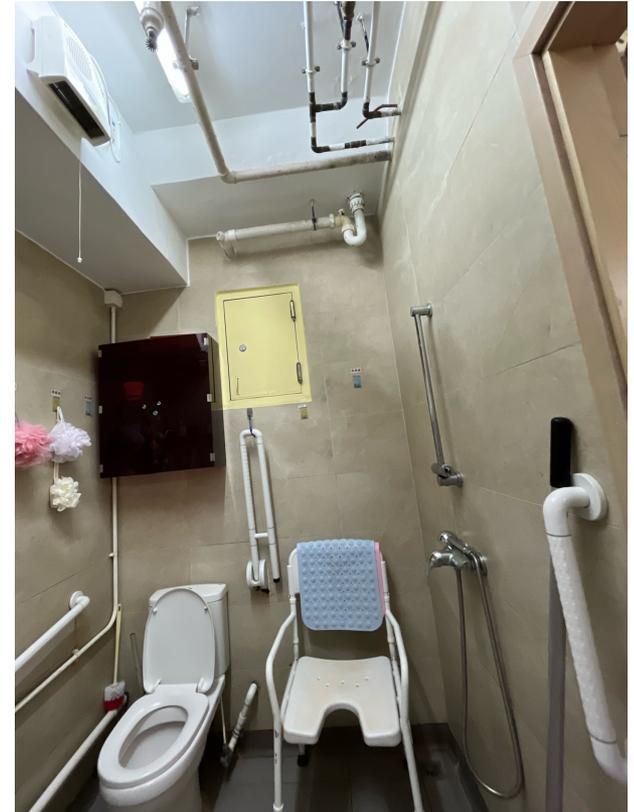


Figure 2. A typical bathing environment at an elderly nursing home in Hong Kong. The toilet and bathing spaces overlap, and there is very limited space for two people (Photo taken by the PI).

## Research Field & Key References

### Why explore the toilet experience in a nursing home environment?

It is difficult to determine whether the complex needs of elderly residents are fulfilled, especially for those with dementia. Few studies have shown how nursing homes identify and address the unmet needs of elderly residents. The research team proposed a framework (see Figure 3) including Maslow's five levels of physiological needs, the theory of human motivation, Alderfer's ERG motivation theory and Raphael's 3B QoL model, in which the being, belonging and becoming domains partly correspond to existence needs, relatedness needs and growth needs, respectively. This framework will guide researchers in conducting exploratory studies to understand and fulfil elderly residents' unmet needs, including opportunities for design interventions to enhance their bathing experiences. The team also proposed four directions for design considerations to review existing design services in nursing homes (see Figure 4).

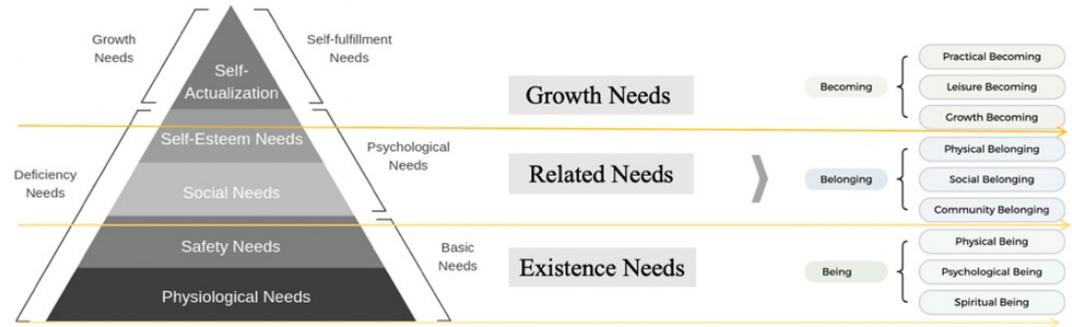


Figure 3. Mapping Maslow's pyramid and Alderfer's ERG theory with Raphael's 3B QoL model (Du et al., 2022) (illustrated by the research team).

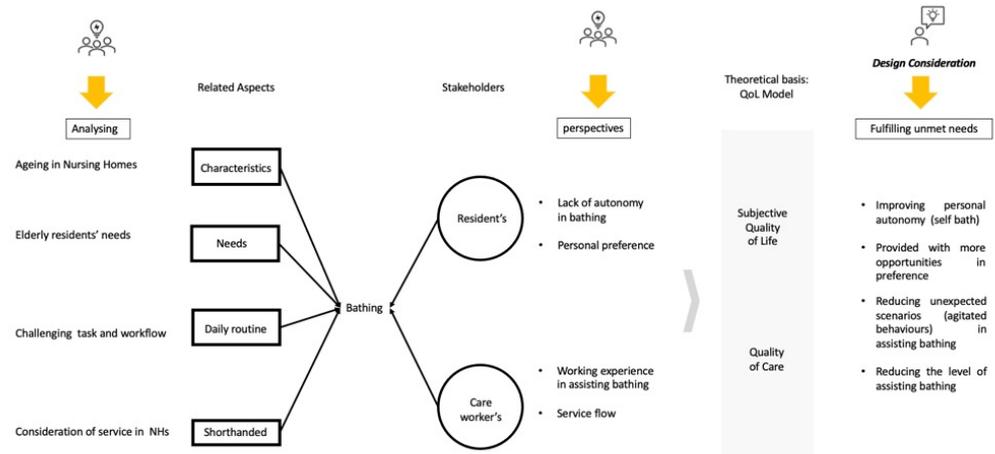


Figure 4. Research framework for "Promoting Elderly Residents' Quality of Life: Design Consideration for Bathing Experiences in the Nursing Home" (Du et al., 2022). (Illustrated by the research team.)

## Research Field & Key References

### Why explore the toilet experience in a nursing home environment?

In 2019, the PI conducted a co-creation workshop with approximately 40–50 staff members (five teams) from two nursing homes. In collaboration with the Jockey Club Design Institute for Social Innovation, Grace Nursing Home Group (two hostels) was engaged to conduct workshops to understand their daily routine tasks, including reviewing their existing workflows over a 24-hour period. All participants described their 'pleasant' and 'challenging' routine work tasks at different times and in different areas. All five teams reported similar challenges, particularly those related to bathing and the design of toilet and bathing facilities. This preliminary study forms the core of this research.



Figure 5. Workshop participants from Grace Nursing Home in February 2019, including frontline caregivers, nurses, student interns, physiotherapists, a chef and managers.



Figure 6. The participants co-created a 24 hour working experience map on the tool shown on the left. The tool was developed by the PI.

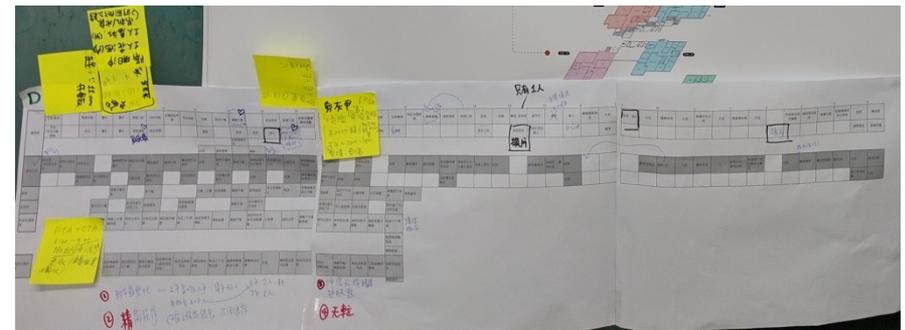


Figure 7. A 24-hour working schedule incorporating the six major roles of nursing home staff and mapping the specific problems they encounter in particular tasks.

## Research Field & Key References

### Assuming that autonomy enhancement can improve quality of care service by introducing monitoring technology

The issue of mobility during toileting is of concern to nursing home management, who seek to ensure zero accidents. Few design studies have examined bathing experiences in nursing home settings (Du et al. 2022). Most older people who are capable of toileting prefer to do so unsupervised and outside designated bathing hours. The limited number of staff on duty in nursing homes overnight and after dinner presents a risk and suggests that current management systems do not meet the real needs of residents.

This raises a discussion about the definition of individual quality of care and the conflicts that arise in the service design process, such as privacy, comfort and freedom of service choice. This research proposes the adaptation of available technologies and to inform design strategies. The research methodology includes interviews with staff and residents, as well as on-site observations.



*On-site observation*

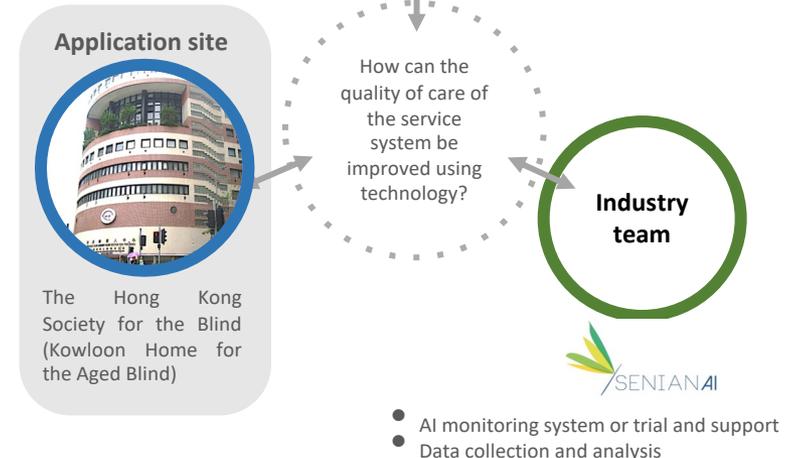
2021–2023



*Interview with service providers and receivers*

Home manager, registered nurse, careworkers, support team, residents and family members

#### University- NGO-Industry collaborative research team



## Research Field & Key References

### Critical reflection on the nursing home as heterotopia

During discussions with the nursing home's managers and staff, we realised that there was a design dilemma in balancing conflicting criteria. For example, there was tension between a sense of security and a sense of autonomy as well as between the limited space in Hong Kong and range of activities or the restricted schedules in nursing homes. Our team identified a deeper design-related problem: how to focus on the positive value change in the quality of life in a nursing home environment, which current technology alone cannot address. We broadened our focus to question these conflicting values and design issues through the lens of Michel Foucault's concept of dual heterotopias (Du & Lee, 2024), thereby deepening our understanding of design for care.

- (i) From the perspective of *heterotopia of crisis*: How can design acknowledge vulnerable life stages, providing compassionate spaces and appropriate products and services to enable care and dignity?
- (ii) From the perspective of *heterotopia of deviation*: How can design reduce structured separation and regulated spaces or services for ageing people so that they are perceived as part of normal society, thereby enhancing inclusiveness and creating a life-affirming environment?



Figure 8. During site observations and in-depth interviews, evidence emerged showing that many conflicting design scenarios had been compromised due to misconceptions, limited resources and a lack of clear design principles.

# Research Methods, Prototypes & Materials

## First approach

This research study was conducted in collaboration with a nursing home for visually impaired older people. We installed a monitoring system in a toilet for female residents that was also used for bathing and conducted a one-year pilot study. There were two types of bathing users: (i) capable elders who could bathe themselves and (ii) elderly with disabilities who were supported by carers when bathing.

Recognising that installing cameras in toilets could create uncomfortable experiences for users, even though they did not capture facial data or send data to a closed online system, we sought support and consent from the nursing home team, residents and their families.

Installing this system in a setting with low-vision residents helped refine the focus and scope of our research analysis on issues of service design and accessibility.

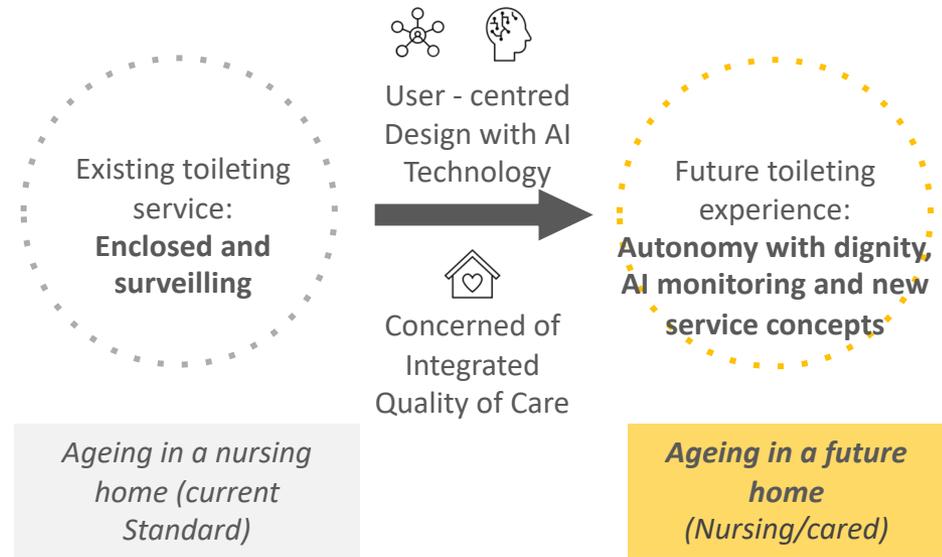


Figure 9. The research discussion builds upon the exploration of the move from a traditional 'enclosed and surveilling' toileting and bathing service model to an 'autonomous and dignified' model and argues that the technology-driven approach has limitations from a human-centred design perspective.

## Research Methods, Prototypes & Materials

### (I) Prototype development: AI-enabled monitoring system design

- The key challenge of the prototype design process was to eliminate individual identification and the perception of the design as a 'surveillance camera' or an invasive privacy monitoring system, focusing instead on enabling freedom of mobility through just-in-time adaptive interventions and long-term health-monitoring management.
- The research team developed different physical forms to gather user feedback. The design of the monitor needed to address both the physical and psychological requirements.
- As the product needed to house an entire AI computer module, along with a specific camera and LED lighting, the original forms (versions 1 and 2) proposed by the industry partner (an AI company) comprised a table stand design. This proved bulky and inflexible for high-level mounting.
- The new forms developed and produced by the design research team (versions 3, 4 and 5) featured waterproof construction and ease of production and maintenance. The formal language of the object also aimed to reduce any association with standard surveillance cameras and to be less visually invasive.



Figure 10. The PI is the chief designer to define the form factor and interface of the main monitoring module. The design went through an iterative process, and the 3D-printed models, integration of electronic components, and installation methods were explored.

## Research Methods, Prototypes & Materials

### (I) Prototype development: AI-enabled monitoring system design

#### 1<sup>st</sup> on-site test through the installation of the first version of working prototype

The first functional prototype – a human-skeleton tracking and alert system – was installed in 2022, and a second was evaluated at another nursing home in 2024. The prototype development and design were led by the PI.



Figure 11. Real-life site photograph showing the location of the customised AI augmented fall-prevention monitoring system (top right) installed at the first pilot study site. The research team designed the monitor, with the internal hardware and AI motion-capture solution provided by the research partner (AI company). The selected toilet was a newly constructed facility in the nursing home, designed to promote inclusivity and facilitate greater user autonomy while toileting.



Figure 12. The technology incorporated in the toilet involves AI-augmented 3D human-skeleton tracking, capturing only data of bodily movements by identifying the location of joints represented as a set of points in 2D or 3D space. The system sends alerts to the manager via a sonic alarm, along with real-time skeleton images, if a predefined posture is identified.

## Research Methods, Prototypes & Materials

### (I) Prototype development: AI-enabled monitoring system design

#### 2<sup>nd</sup> on-site test through the installation of the final prototype (updated version)

The second set of prototypes was installed at another nursing home for the elderly with intellectual disabilities.



Figure 13. The 2<sup>nd</sup> version of the working prototype (updated waterproof and optical features) was installed at the second target environment. As advised by the nursing home staff, installation of a camera or any alternative products at a higher position is a must to avoid being touched by other residents.



Figure 14. The team was testing the camera's visual monitoring feature, including adjusting the shooting angle. The green shading in the image illustrates the coverage of the camera lens.



Figure 15. The photo showed the actual usage scenario happening in the living room of the nursing home. The residents were sitting on the chairs, and one of the care providers was standing on the right-hand side to monitor the residents during a break time.

# Research Methods, Prototypes & Materials

## (II) Interface development: Three visual design criteria for monitoring via the user interface

During the iterative development of the nursing home monitoring system, clear communication and transparency with all users were important. In particular, the toilet environment represented both private and public space. For example, bathing was provided to all nursing home residents at specific times. This study summarises three visual design criteria from a user experience perspective (excluding consideration of AI algorithms). These were developed separately from the surveillance system.

- 1. Visual without personal marking:** No visual indication of individual users being captured in the system.
- 2. Realistic enough without unnecessary association:** Avoidance of any realistic association that might cause embarrassment while remaining accurate enough to effectively map users' locations within the surveillance area for real-time assessment and later review.
- 3. Proper visual contrast:** The luminance contrast in the toilet environment and the background image of the main interface should provide sufficient visual contrast to allow for the effective and efficient capture of information by the machine and viewer, respectively.

1st version of monitoring interface design



Our first functional user interface was displayed on a television in a lobby where staff members could monitor the situation. This initial design showed skeleton images of toilet users with a text message only.

2nd version of monitoring interface design



After reviewing the first interface design with other stakeholders, we generated a range of toilet images in both realistic and line-art formats to obtain further user feedback.

3rd version of monitoring interface design



A semi-realistic toilet image was selected and implemented. This approach illustrated the correct proportion of the spatial arrangements and the object's location. It was used for the final implementation.

## Research Methods, Prototypes & Materials

### Second approach

The team redirected and extended the research, delving deeper into constructing another layer of understanding. Rather than focusing solely on investigating autonomy needs through technology, they examined the living and working experiences in nursing homes through the lens of heterotopia (crisis and deviation) (Du & Lee, 2024).

The results will help researchers gain a better understanding of users' real needs, including conflicting issues. They may also help formulate new design strategies that complement existing inclusive design principles, thereby enhancing care delivery through a deeper understanding of quality of care.

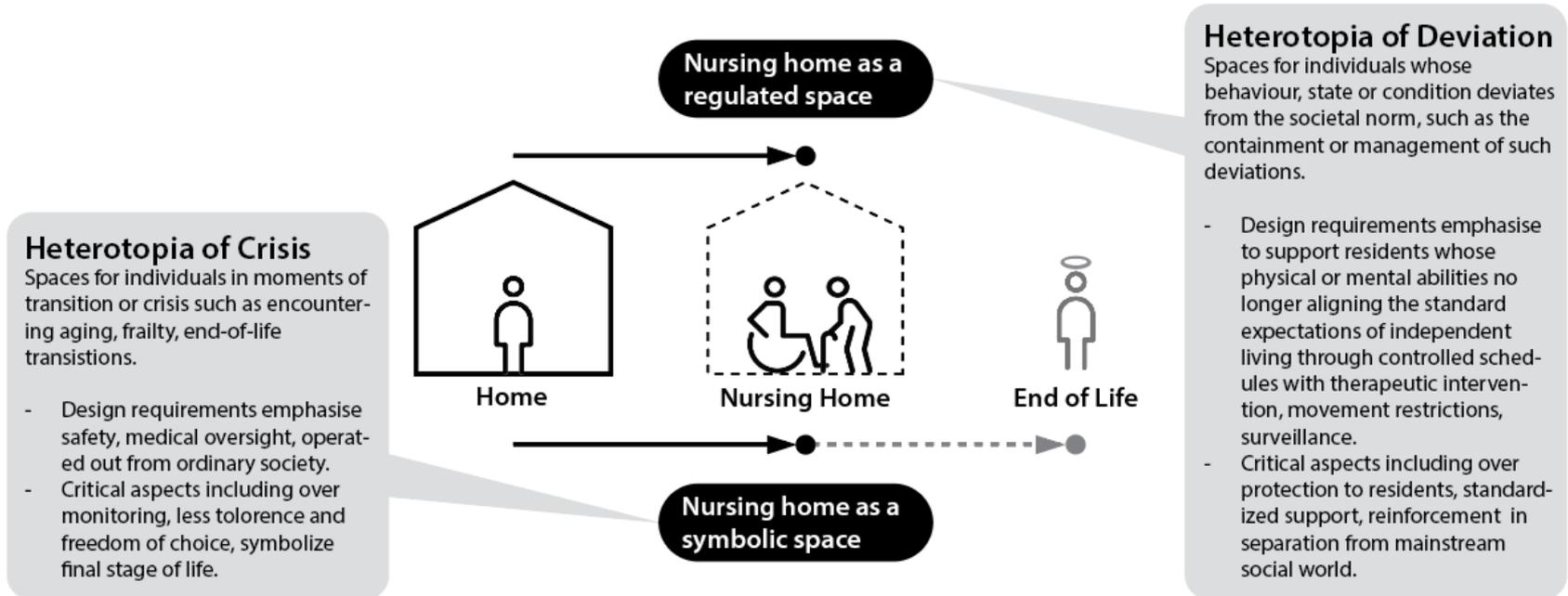


Figure 16. Transitional perceived experience of elderly activities of daily living through the lens of dual heterotopias (crisis and deviation) (illustration by the project leader).

## Research Outcomes, Findings & Further Research

### Site study with interview

The project team visited six local common nursing homes (small scale: fewer than ~50 residents per group) and discussed toilet/bathing support services with managers and residents in the context of daily operations and experience.



Figure 17. Selected collection of photos taken from six local nursing homes (with consent).

# Research Outcomes, Findings & Further Research

## Field visits to twelve local nursing homes



Figure 18. The PI and his team reviewed the routine service with the managers (upper group of images) and visited 12 nursing homes representing the typical small-to-medium-sized nursing homes, which usually lack manpower and other resources (lower group of images).

# Research Outcomes, Findings & Further Research

## Site observation

Reviewing toilet and bathing products and service design aspects across the twelve sites, we clustered the design objects (e.g. environmental element, artefacts/tools, service notices) and identified key challenges in the toilet-based scenarios.



Figure 19. Analytical study of the bathing's spatial, product and service design.

# Research Outcomes, Findings & Further Research

## Field notes

To obtain real user feedback and avoid ethical conflicts, we conducted informal interviews and observations and used field notes as the data collection record. Those field notes help the research team in identifying the challenges of toilet-based scenarios from different stakeholders.

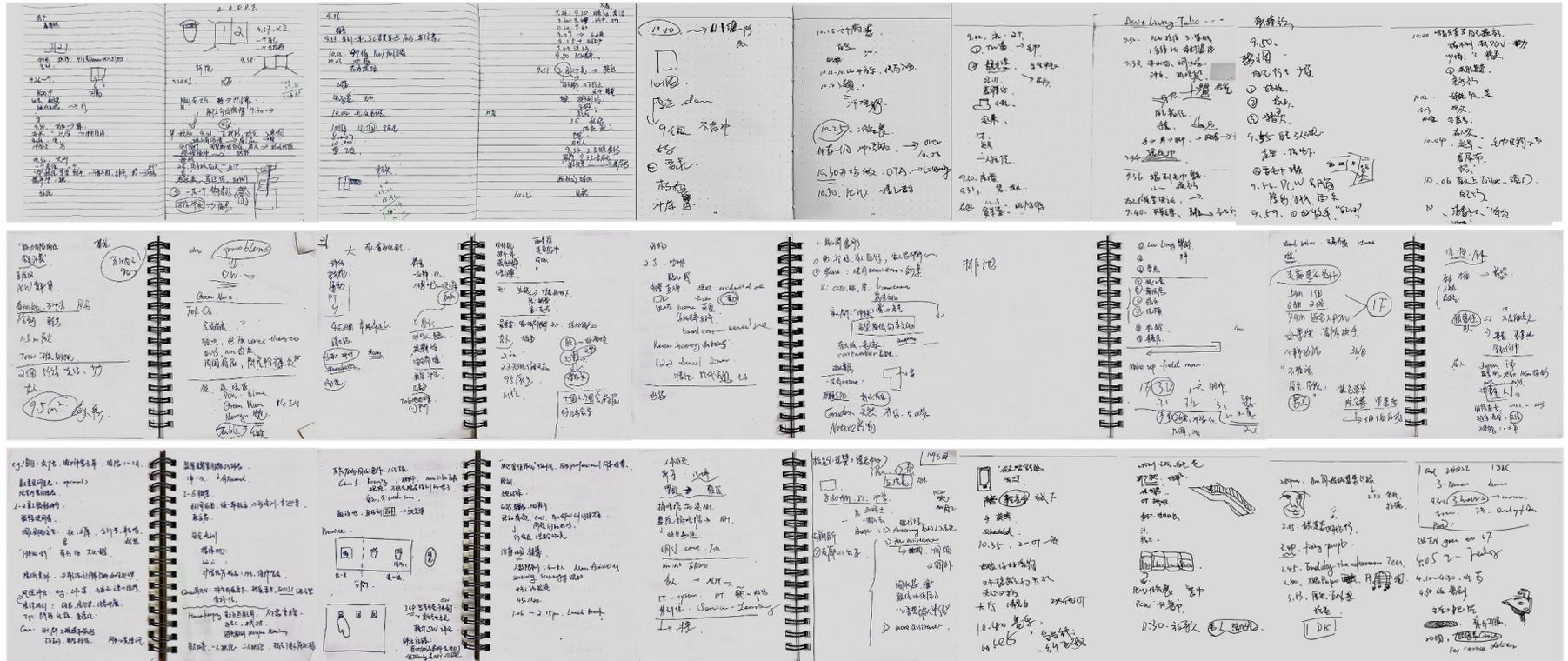
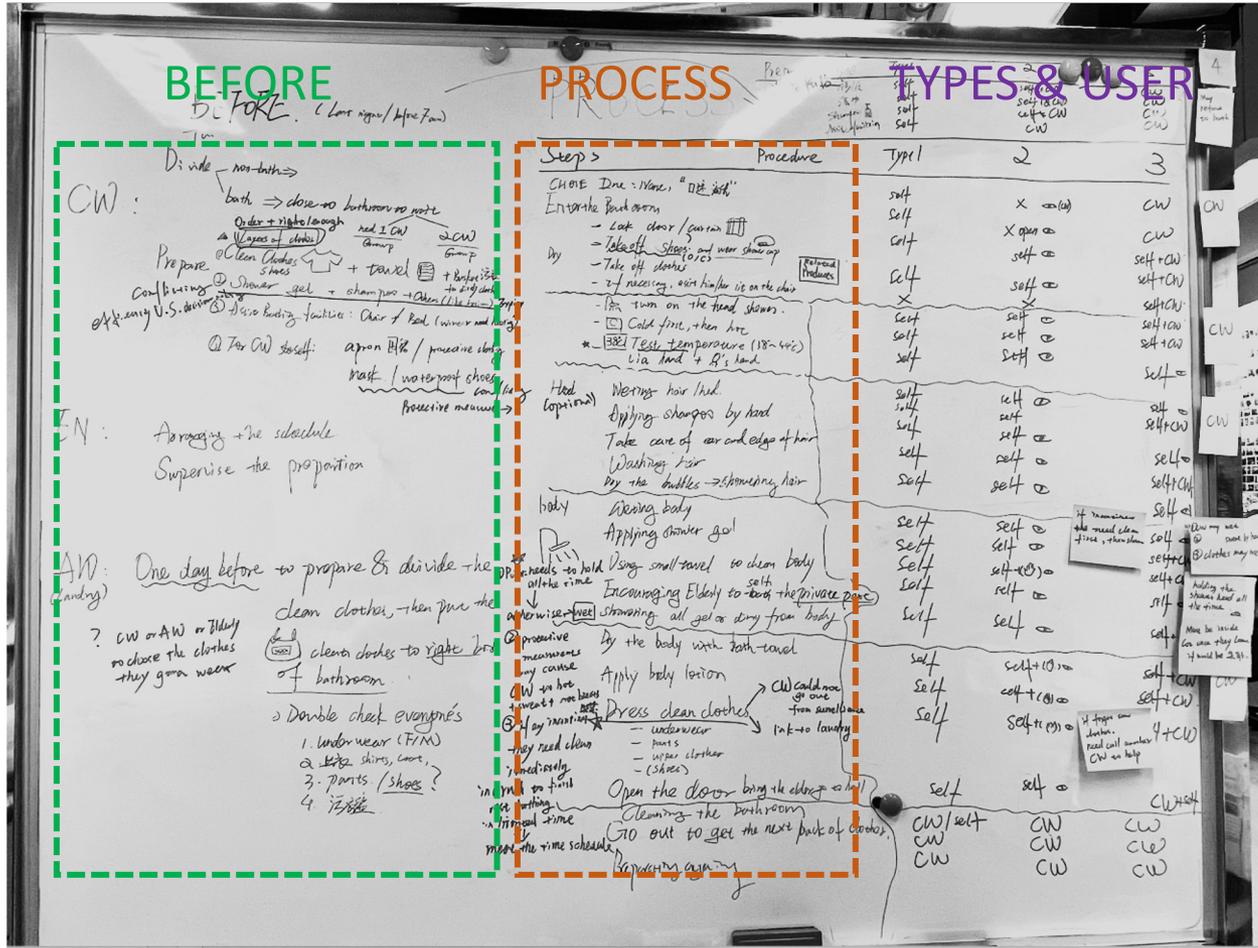


Figure 20. Selected field notes taken from twelve local nursing homes through informal interviews and observations.

# Research Outcomes, Findings & Further Research

## Study process of bathing service for elderly residents in nursing home



**Steps:**

**[1] Enter the bathroom:**

- Lock the door / curtain
- Take for shoes, clothes,
- Transfer to the bathchair (if needed)

**[2] Starting/ preparing:**

- Turn on the shower head,
- Test and adjust water temperature

**[3] Head and hair cleaning:**

- Wet the hair,
- Applying shampoo by hand,
- Take care of the edge of hair
- Wash hair

**[4] Body washing:**

- Wetting the skin of full body,
- applying shower gel,
- Using smell towel/sponge to clean body
- Encouraging elderly to self bath the private parts,
- Showering the gel and dirt from body

**[5] Drying:**

- Dry the body with clean bath towel
- From head to toe
- Apply lotion
- Help to dress the clean clothes with underwear,
- pants, upper clothes, socks and clothes

**[6] Finish**

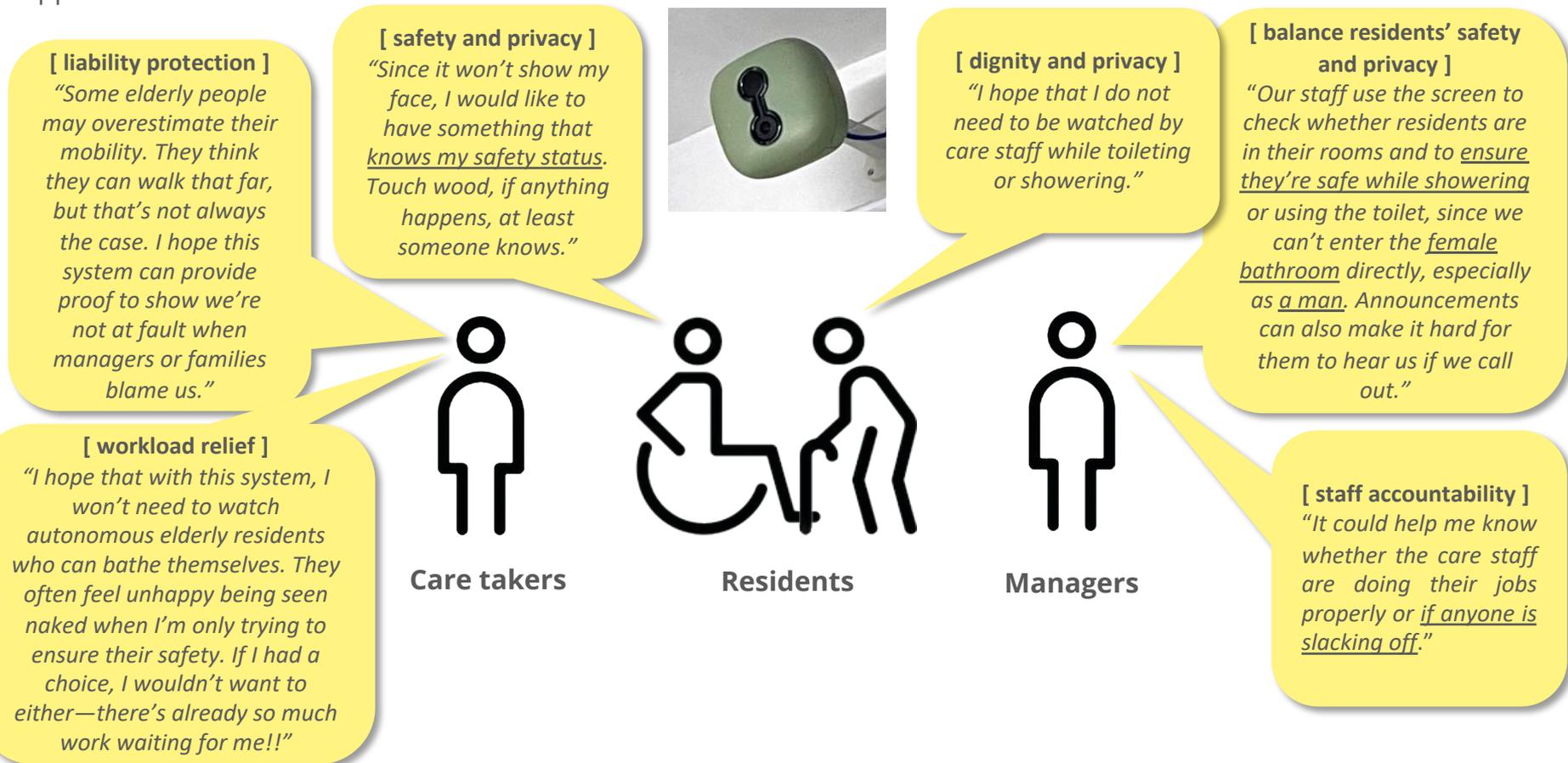
- Open the door and escort the elderly to bedroom or lobby.
- Clean the water of the bathroom floor
- Go to find the next resident

Figure 21. Analytical study of the bathing service processes.

## Research Outcomes, Findings & Further Research

### Users' feedback on the monitoring system

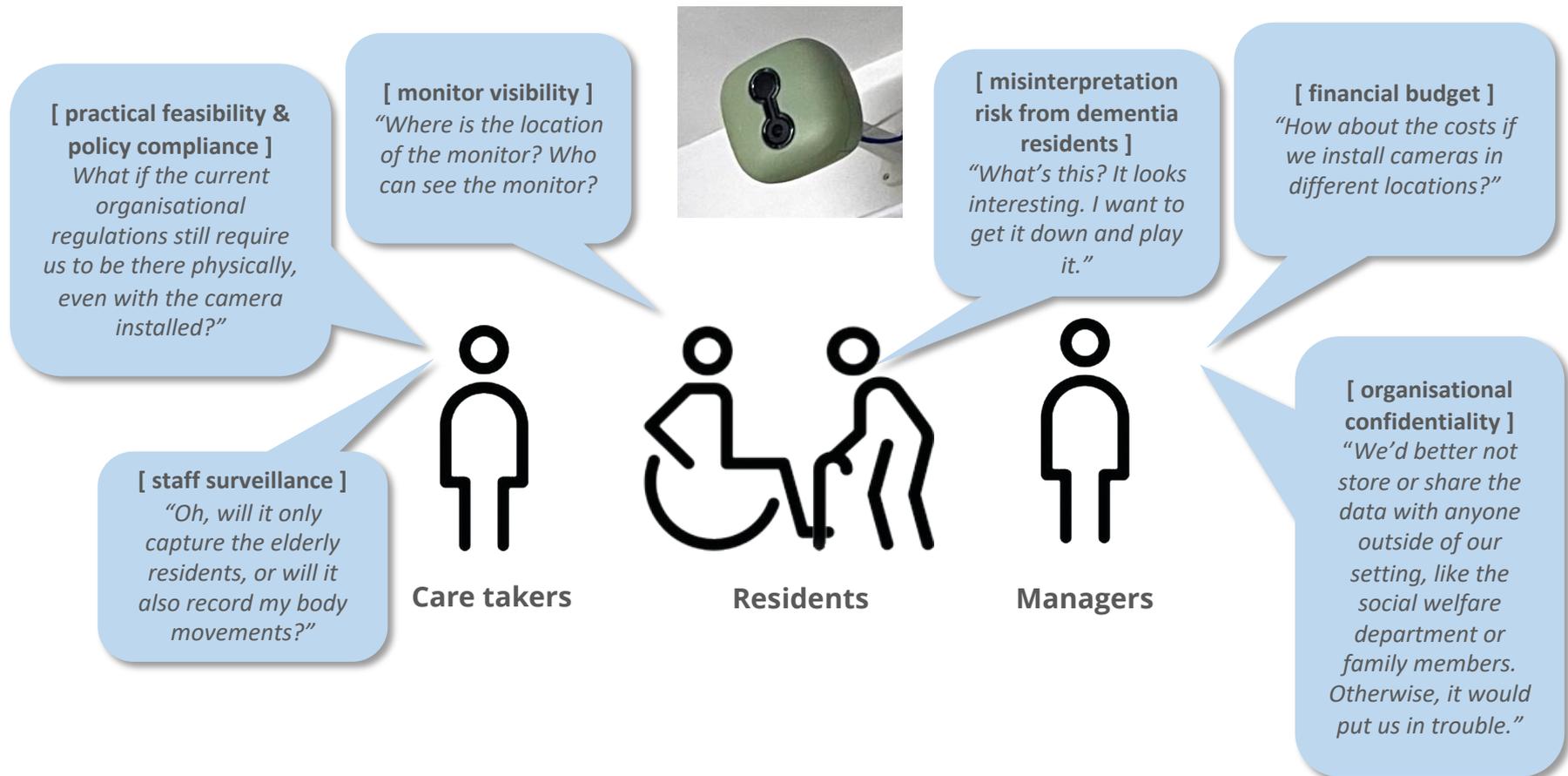
Users, including residents, caretakers and managers of nursing homes, were asked to provide feedback on the AI fall-detection monitoring system. Selected feedback shown below sheds light on the real needs of users and new design opportunities.



## Research Outcomes, Findings & Further Research

### Users' concerns on the monitoring system

Users also raised concerns about the new design solution (the working prototype as the design hypothesis) that we installed in their work environment. Selected concepts are shown below.



# Research Outcomes, Findings & Further Research

## Identified users with complex needs

The project successfully implemented the system (the prototype) in a nursing home for over a year, during which user feedback on a hypothetical concept was collected.

Scenario studies helped the team recognise the design needs related to autonomy in bathing and toileting. Selected qualitative insights that informed **new design criteria** are summarised below.

### Scenario One

### Scenario Two

Care receivers' dependence on assistance

- One resident always takes a shower outside the service support period (without a dedicated carer), in the **early morning** at around 6.30 a.m. She prefers bathing alone without being monitored by staff.
- Three residents do not dare to bathe alone due to safety concerns.

Care providers' workload, experiences

- Careworkers who assist with bath activities during the day shift are not at work at that time.
- Careworkers' workloads increase with the surveillance of elderly residents showering, which can be both embarrassing and energy-consuming.

Management balancing

- It is challenging for managers to know the situations of elderly residents in the early morning.
- There is a need to address labour shortages and careworkers' tight schedules, as they have many duties.

AI monitoring system can...

- Provide 24-hour surveillance care every day.
- Assist careworkers in performing surveillance tasks while considering privacy.

AI monitoring system cannot...

- Satisfy other user needs, such as emotional support (e.g. trust and a sense of home).
- Safeguard dignity and improve bathing conditions for both care recipients and providers.

# Research Outcomes, Findings & Further Research

## Identified users with complex needs

Other insights supporting the design of a technology-assisted toilet :

- 1) Nursing home stakeholders demonstrated a willingness to adopt technology-based monitoring systems to support their work.
- 2) Privacy remains a major concern; however, providing evidence that limits personal information (e.g. omitting facial and body images) can help reduce conflict among users, managers and frontline workers. For example, when an incident occurs, the organisation must produce an investigation report detailing when, where and how the incident happened, who was involved and how long it took to respond.
- 3) The three identified design criteria can be used to construct a useful acceptance measurement tool for evaluating the effectiveness and efficiency of technology-enabled toilet experience design. The criteria include:
  1. Visuals without personal marking.
  2. Being realistic enough without unnecessary association.
  3. Proper visual contrast.

## Limitations

A key challenge was that no reported falls occurred during the implementation period. While this was positive news for users, it meant that the AI fall-detection algorithm could not be validated.



Figure 22. A screen showing the three cameras installed in the toilet, with each capturing the real-time skeletal movements of toilet users. After more than a year of monitoring, the system had not recorded any unusual user activity.

# Research Outcomes, Findings & Further Research

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## Identified users with complex needs

### Limitations

In the literature, studies on bathing design for the elderly have primarily focused on developing assistive machines or robots from an engineering perspective, often lacking service integration. Some innovations have emerged from collaborations between academia and industry. Few studies have addressed ergonomic design or human factors in bathing robots. Research on bathing issues among elderly people has emphasised bathroom modifications in community centres, while neglecting the interactions among residents, caregivers and services. Overall, there remains a lack of systematic design consideration and concern for elderly people's quality of life (Du et al., 2022).

### Proposed design framework

- 1) Reduce unexpected scenarios in assisted bathing by minimising residents' agitated behaviour.
- 2) Reduce the level of careworkers' assistance required during bathing.
- 3) Promote elderly residents' autonomy in self-bathing.
- 4) Provide residents with more options for their bathing preferences.

## Research Outcomes, Findings & Further Research

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### Further research

This project is ongoing and, in the context of nursing homes in Hong Kong, the concept of heterotopia provides designers with a valuable lens for exploring the complex, multifaceted nature of these institutions. Through this lens, designers see the nursing home not only as a heterotopia of deviation and a heterotopia of crisis but also as a system in which care services operate under a hierarchy of discipline and control. Registered nurses, professional healthcare staff, personal careworkers and the elderly residents themselves all participate in this hierarchical surveillance system, which reinforces the power dynamics and disciplinary mechanisms inherent in the nursing home setting. This approach can lead to more responsive, resident-centred and socially integrated design solutions for nursing home environments in Hong Kong, with the aim of improving residents' quality of life and enhancing overall social integration within these facilities.

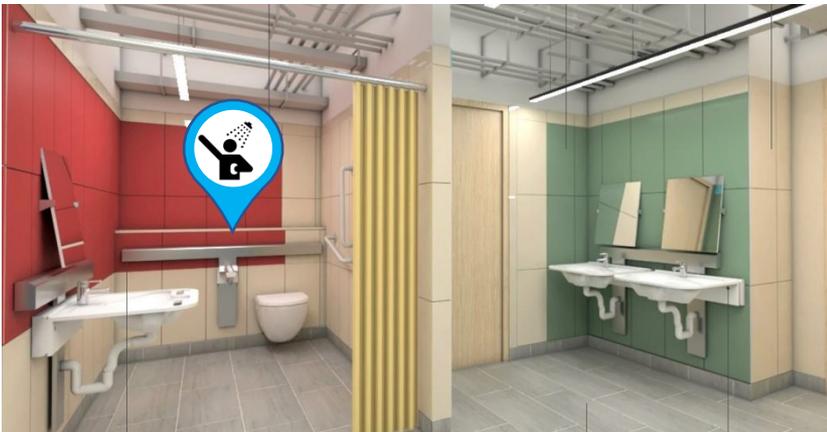
Ultimately, a heterotopian perspective encourages designers to view nursing homes as sites where broader societal attitudes, values and power structures are manifested and contested, not merely as spaces of care. Future research could explore a more holistic, contextually grounded and in-depth design framework, providing guidelines for designing care and ethics in nursing homes conceived as heterotopias.

## Research Dissemination

### (I) First case in Hong Kong implementing a fall-detection system without wearable sensors or a surveillance camera capturing face and body images

This is the first study in Hong Kong to apply AI cameras (i.e. AI-augmented 3D human-skeleton tracking) in a nursing home environment to improve the efficiency of human resources while maintaining the speed and quality of responses to fall incidents. This enables the more targeted use of resources to provide appropriate services to older people by observing their physical activity data and to understand their ageing needs and trends.

The nursing home also engaged a professional interior design firm to create a new toilet facility suitable for elderly users, including smart toilets and bathrooms with non-slip surfaces and handrails, as well as expanded spatial tones and colour palettes, allowing elderly and visually impaired residents to navigate the facilities in a more comfortable manner.



24-HOUR  
ACTIVE  
MONITORING



FALL  
DETECTION



MESSAGE  
ALERTS

Above: The overall case includes the installation of an AI monitoring system (24-hour monitoring, fall alarm, alerts to mobile and desktop devices), dashboard and data management for future fall prediction as well as a new elderly- and worker-friendly toilet.

## Research Dissemination

### (II) Conference sharing

Du, Y., **Lee, Y.H.B.**, & Siu, K.W.M. (Accepted in September 2025). Design Considerations for Ethics of Care of Intimate Care Services in Elderly Nursing Homes: Transparency, Boundaries and Discipline. *Proceedings of the International Association of Societies of Design Research 2025*, Taiwan Design Research Institute. Taipei, Taiwan. <https://iasdr2025.org/>

Zhao Z., Mao Q., Du Y., **Lee, Y.H.B.**, Sit, W.M.R., & Wang, H. (Accepted in September 2025). An Empathic Design Approach to Understanding Caregivers' Perceptions on Multi-modal Behavioral Information of Adults with Intellectual Disabilities. *Proceedings of the International Association of Societies of Design Research 2025*, Taiwan Design Research Institute. Taipei, Taiwan. <https://iasdr2025.org/>

Du, Y., & **Lee, Y.H.B.** (2025, September). Doing Ethnography with Designerly Ways of Thinking: Drawing the Complexity of Elderly Care for Possibilities of Change, The 50th Annual Meeting of the Society for Social Studies of Science (4S): Reverberations, Seattle, WA, United States. [https://www.4sonline.org/final\\_program\\_seattle.php](https://www.4sonline.org/final_program_seattle.php)

Du, Y., & **Lee, Y.H.B.** (2024, October). Heterotopia of Nursing Home: Constructing Care and Discipline for Care Workers and Elderly Care Receivers in the Context of Hong Kong. *Proceedings of the 5th International Congress on Ambiances Sensory Explorations: Ambiances in a changing world*. Lisbon, Portugal. Réseau International Ambiances. <https://iris.polito.it/retrieve/handle/11583/2997536/d6d19af4-3617-4c1c-91c5-01bd3c7d4f01/lisboa-2025.pdf>

Zhang, J., Wang, H., **Lee, B.Y. H.**, Pang, M. Y. C., & Luximon, Y. (2022, June). Older Adults' Actual Use and Adoption Intention of Smart Health Care Technologies in Hong Kong. In Q. Gao & J. Zhou (Eds), *Human Aspects of IT for the Aged Population. Design, Interaction and Technology Acceptance* (pp. 658–669). Springer International Publishing. [https://doi.org/10.1007/978-3-031-05581-2\\_45](https://doi.org/10.1007/978-3-031-05581-2_45)

Du, Y., **Lee, Y. H. B.**, & Siu, K. W. M. (2022, January). Promoting elderly residents' quality of life: Design consideration for bathing experiences in the nursing home. In *AHFE International: Human Factors in Communication of Design* (pp. 86-92). <http://doi.org/10.54941/ahfe1002040>

# Research Dissemination

## (III) Public seminar

- Speaker on the topic '**A Case Study: Bathing Experience Design in Nursing Home**' at the public seminar '**Forum on Elderly Centred Care: Holistic Body, Soul and Spirit with Gerontechnology**', hosted by Hong Kong Productivity Council (Smart City Division) on 15 March 2024; *Link:* [https://campaigns.hkpc.org/hubfs/%5BSCD%5D%2011722622499%20Forum%20on%20Elderly-Centered%20Care/Pamphlet%20for%20Forum%20about%20Elderly%20Care\\_v6.pdf](https://campaigns.hkpc.org/hubfs/%5BSCD%5D%2011722622499%20Forum%20on%20Elderly-Centered%20Care/Pamphlet%20for%20Forum%20about%20Elderly%20Care_v6.pdf)

