STUDY 2

Accessible design, hospital discharge and ageing in place: A national survey of occupational therapists

March 2021

The Summer Foundation is a not-for-profit organisation, established in 2006, that aims to change human service policy and practice related to young people in nursing homes. Our mission is to create, lead and demonstrate long-term sustainable changes that stop young people from being forced to live in nursing homes because there is nowhere else for them.

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CITATION GUIDE

D'Cruz, K.,[1,2] Winkler, D.,[1,2] Douglas, J.,[1,2] Wellecke, C.,[1] Goodwin, I.,[1] Davis, E.[1] (2021). *Accessible design, hospital discharge and ageing in place: A national survey of occupational therapists*. Summer Foundation and La Trobe University.

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ACKNOWLEDGEMENTS

We would like to thank the many people who contributed to this report for their time and valuable insights, including occupational therapists who shared their expertise, and Occupational Therapy Australia who kindly supported distribution of the survey. We also appreciate the assistance of Susan Northway, Antony Brown, and Louise Dixon for editorial support and health economist Andrew Dalton and actuaries Simon Guthrie and John Walsh who provided their expertise for the cost calculations.

Cover kitchen image courtesy of Stockland Communities. Pathway image courtesy of Parent to Parent Assoc. QLD - P2P Housing Team

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Foreword

The Summer Foundation is very pleased to present ***Accessible design, hospital discharge and ageing in place: A national survey of occupational therapists***.

This report is the second of 2 studies commissioned in November 2020 and conducted through the Summer Foundation – La Trobe University Research program. These studies provide an evidence base to inform decision-makers on incorporating minimum mandatory accessibility standards in the 2022 National Construction Code (NCC).

Later this year, Australia's Building Ministers will decide what our next NCC will look like. Their decisions will determine how accessible our houses are for decades to come, and in turn affect the housing needs of those with – or likely to have – mobility limitations. Ministers will be choosing between the current voluntary accessible design guidelines, or new accessibility standards. The opt-in approach has been in place for over a decade and has failed to deliver the promised supply of accessible homes.

Within 40 years, the number of Australians with mobility issues is estimated to almost double from 3 million to nearly 6 million.

The recent report from the Royal Commission into aged care revealed that institutional housing for the elderly is not working. When coupled with the challenges experienced by the aged care sector during the COVID-19 pandemic, the importance of enabling our seniors to remain in their own homes for as long as they want to, is clear.

Research shows that up to 80 per cent of Australians aged over 55 want to live at home and "age in place". A recent survey by the University of Melbourne found that over 70 per cent of 1,000 Australians with mobility limitations live in housing that did not meet, or only partly met their accessibility needs. Some of this shortfall in suitable housing can be rectified by incorporating mandatory minimum accessibility standards in the NCC. Only a mandatory approach will future-proof Australia's housing for coming generations and cater to the demands of an ageing population.

This report highlights the most important accessible features to consider as mandatory standards in the NCC. A lack of accessible features in all homes makes hospital discharge slower and makes ageing in place harder.

The Australia we want is one where mobility limitations should not determine where we can live. Making Australia's housing future-proof means pre-empting demand for more accessible housing now. Housing is critical social infrastructure that is with us for decades, so it is vital to get it right.

Di Winkler PhD AM
CEO & Founder, Summer Foundation

Contents

Executive Summary

The aim of this study was to develop a practice-informed evidence-base on the importance of specific housing accessibility features for people with mobility limitations. We sought the professional expertise of occupational therapists (OTs) who conduct home visit assessments either pre-hospital discharge or for older people wanting to age in place. Findings of this study address the current lack of systematic evidence on housing accessibility from the perspective of experts in the health sector and inform the inclusion of specific features for minimum mandatory accessibility in the National Construction Code (NCC).

The study comprised an online survey conducted in February-March 2021. OTs were asked to rate the impact of 22 accessible design features on supporting hospital discharge and ageing in place, as well as to identify and explain the most important housing design changes. The survey also elicited information regarding the frequency of home modification recommendations and the delays to hospital discharge and associated costs due to waiting for home modifications. Survey respondents included 134 OTs, most of whom were employed as senior or Grade 2 clinicians with an average work experience of 11.56 years.

The study findings showed that similar home modifications and accessible design features are needed to support ageing in place and hospital discharge. For both cohorts, quantitative and qualitative results highlighted that the most essential housing features are (a) accessible external access to the home with step-free entrances, and (b) accessible bathrooms including large showers with level access, and where possible, inclusion of a bathroom on the ground floor. The study also found that an average of 42.59% of clients had a delayed hospital discharge due to waiting for the completion of home modifications, resulting, on average, in 22 additional days spent in hospital. The national cost of these delayed discharges was estimated to range between $1.69 billion to $3.17 billion per annum.

These findings suggest that the most important accessible features to support timely hospital discharge and ageing in place are:

- A safe and step-free pathway to a step-free entrance into the dwelling
- A 900 x 900mm shower with a step-free entry on the ground floor
- A toilet and space for a bedroom on the ground floor
- Reinforced walls around the toilet, shower and bath to support the safe installation of grab rails at a later date

The inclusion of these design features as mandatory requirements in the NCC has the potential to decrease costs associated with post-build home modifications and make homes more functional for all Australians.

Introduction

A significant proportion of the Australian population lives with mobility limitations. Approximately 2.9 million Australians had a mobility limitation in 2018, with projections indicating that this number will increase to 4.7 million over the next 40 years (Centre for International Economics, 2020). Consequently, there is a growing need for accessible housing in Australia. However, 73% of people with a mobility limitation are currently living in housing that does not meet their accessibility needs (Wiesel, 2020).

Consequences of inaccessible housing

Previous research examining the lived experience of people with mobility limitations has shown that inaccessible housing is linked to a range of individual and societal costs. Those living in inaccessible homes often express difficulties completing occupational, self-care, and home-based tasks (Aplin et al., 2015; Wiesel, 2020). As a result, inaccessible housing forces the Federal Government to spend large proportions of National Disability Insurance Scheme (NDIS) and aged care funding on support services that would not be required if dwellings were more accessible. Indeed, improving housing accessibility through home modifications has been found to significantly reduce formal and informal support needs by up to 6 hours per week (Carnemolla & Bridge, 2019). In addition, inaccessible housing is linked to reduced mental and social wellbeing; approximately 80% of people with mobility limitations are unable to visit family and friends who live in inaccessible dwellings, leading to social isolation and negative impacts on mental health (Wiesel, 2020). This highlights the importance of building all housing to accessibility standards instead of limiting accessible features to a few selected dwellings. Collectively, these studies suggest that improvements in housing accessibility may achieve a range of beneficial impacts, with Wiesel (2020; pg. 7) concluding that it can lead to “greater independence, dignity, freedom, social inclusion, economic productivity, and improved health and wellbeing for people with mobility restrictions”.

Building Australian homes to accessibility standards will also benefit the wider community. Accessible housing supports our ageing population to safely age in place, such as by decreasing the risk of falls, allowing older Australians to remain in their own homes for longer. Similarly, accessible features like step-free entrances and wide doors can be useful for all residents, such as when moving homes, using prams or suitcases, or recovering from physical injuries. Indeed, a previous audit into recently built Australian houses has shown that volume builders already include many accessible design features in their most popular building plans because they represent good overall housing designs (Winkler et al., 2020). Although the above studies highlight the overall benefits of accessible housing, there is a lack of research systematically investigating specific accessible features. Therefore, it is currently unclear which design features would have the most significant impact for people requiring accessible housing.

Current building regulations

Despite the need for accessible housing and our ageing population, minimum accessibility requirements are currently not mandated in private dwellings in Australia. The building sector instead relies on voluntary construction of accessible homes and post-construction modifications. This voluntary code of practice has failed to achieve the Australian Government’s target that all new housing be accessible by 2020 (Council of Australian Governments, 2010).

As previously stated, almost three-quarters of Australians with mobility limitations are still living in inaccessible housing (Wiesel, 2020). Moreover, although volume builders already include many accessible features, these are often not systematically incorporated to ensure that dwellings are consistently accessible (Winkler et al., 2020). This is problematic, as post-construction modifications are often expensive and only partly meet the accessibility needs of people with mobility limitations, leading to reduced mobility at home and increased concerns about potential injuries (Wiesel, 2020). This highlights the need to mandate accessibility standards in the NCC.

The Australian Building Codes Board (ABCB) is considering the inclusion of mandatory minimum accessibility standards in the NCC. The board recently commissioned the Centre for International Economics (CIE) to develop a consultation Regulation Impact Statement (RIS), which involved an impact analysis on incorporating accessible housing requirements into the NCC. The RIS indicated that the costs of mandatory accessibility standards would outweigh the benefits (CIE, 2020). However, an independent review by health economists Dalton and Carter (2020) highlighted key limitations of the RIS, including overlooked social, health, and economic costs of inaccessible housing. In contrast to the CIE, the authors concluded that the benefits exceed the costs for all available options of accessible housing standards (Dalton & Carter, 2020). Similarly, a recent survey of access consultants and architects indicated that a large proportion of accessibility features would be neither costly nor difficult to implement in new dwellings (Winkler et al., 2021). One significant challenge of completing a comprehensive cost-benefit analysis is the lack of data regarding the potential benefits of minimum accessibility standards to the whole of society. The expertise of occupational therapists could provide critical evidence regarding the negative consequences of relying on home modifications, such as delays to hospital discharges and associated costs, and the potential economic benefit of minimum accessibility standards.

Aims of this study

While past research has highlighted the negative impacts of inaccessible housing, little systematic evidence exists regarding the importance of *specific* accessible design features. Moreover, research on the costs of inaccessible housing has been predominantly conducted by economic and building experts rather than professionals working with people who have mobility limitations. OTs who frequently evaluate housing accessibility for people with mobility limitations can contribute a more rigorous evidence base for what specific accessible design features would be most important to include in mandatory standards. Therefore, this study included a survey of OTs experienced in conducting home visit assessments, either pre-hospital discharge or for older people wanting to age in place. The study aimed to identify which minimum accessible features would have the greatest positive impact on discharging patients from hospital and enabling older Australians to age in place. Further, the study aimed to determine which home modifications are most often needed, as well as to quantify the delays to discharge and associated costs when modifying homes post-build.

Method

Procedure

This study comprised an online survey of OTs conducted through QuestionPro in February-March 2021. Participants were recruited through sharing the study with the Occupational Therapy Australia association as well as individual OTs, universities and health care services. Additionally, a link to the study was advertised on social media platforms (Facebook, LinkedIn, Twitter) and shared with the researchers' social media networks. To be eligible for this study, participants were required to work in Australia and conduct home visit assessments pre-hospital discharge or for older people wanting to age in place. Ethics approval was obtained from the La Trobe University Human Research Ethics Committee (HEC21018).

Survey

The survey collected demographic and occupational information, including participants' age, living area, work experience, and type of work. Depending on their experience in home visit assessments, participants were asked to complete questions for hospital discharge, ageing in place, or both of these cohorts. For both cohorts, participants were asked to rate the frequency of home modification recommendations. OTs experienced in home visit assessments for hospital discharge were also asked to indicate the time taken to complete home modifications and the resulting delay to hospital discharge. Subsequently, participants were asked to rate 22 design features in terms of their impact on enabling older Australians to safely age in place (from *0 = No effect* to *3 = Major effect*) and frequency of delaying hospital discharge (from *0 = Never* to *3 = Nearly always)*. The specific design features evaluated in this study were derived from the 15 features in the Livable Housing Australia Design Guidelines (Livable Housing Australia [LHA], 2017) that are currently under consideration by the ABCB. The survey broke down each of the LHA features into sub-components and selected 22 features identified as being feasible accessibility features in Study 1 of this pair of studies (Winkler et al., 2021). While the provision for a stair-climber is implied in the LHA Design Guidelines regarding internal stairs by specifying a straight flight with a load bearing wall adjacent, this survey referred explicitly to stair-climbers. In addition to asking about all the features in the LHA Design Guidelines, an additional feature in the survey was the provision for a future stair-climber or lift as an option for homes that do not have amenities and living areas on the ground floor or entry level. A description of the accessible features evaluated in this survey can be found in Appendix A.

The survey also included 2 open-ended questions, which asked participants to identify and explain 3 housing design changes that they perceive to be most important to support timely hospital discharge and/or ageing in place. These questions were designed to encourage survey participants to draw on their occupational therapy practice experience to both a) identify 3 most important design features and b) share their reasoning in a free text response. On average, the survey took participants 16.13 minutes (±17.46 *SD*) to complete.

Data analyses

All data was collected anonymously. Preliminary analysis involved calculating response rates and comparing demographic and occupational characteristics to the national OT workforce to estimate the sample's representativeness. Primary analysis involved descriptive quantitative analysis, including calculating frequencies and average responses (i.e. mean, median, mode, and standard deviation) of home modification recommendations, time taken to complete home modifications, and ratings of all 22 design features. All responses were rank-ordered by mean to determine which home modifications are most frequently recommended and most time-intensive, and which design features would have the greatest positive impact on supporting timely hospital discharge and ageing in place.

For home visit assessments pre-hospital discharge, the average percentage of discharges being delayed due to waiting for home modifications and the associated costs were also calculated. Data from the Independent Hospital Pricing Authority (IHPA) from 2014-15 was used to estimate the costs associated with delayed hospital discharge (IHPA, 2016). All cost estimates are presented in ranges, using a national average hospital cost of $1,011 per day for subacute care as the lower bound and $1,901 per day for acute care as the upper bound. The 2 open-ended questions were analysed using descriptive qualitative analysis to identify key themes capturing recommended housing design changes.

Results

Recruitment flow and response rates

In total, 250 OTs attempted the survey. Of these, 35 respondents were ineligible as they were not living in Australia or did not conduct home visit assessments for hospital discharge or ageing in place. Of the eligible respondents, 101 fully completed and submitted the survey and 114 partially completed the survey but did not submit it. Initial ethics conditions required the survey to be submitted for data analyses to be undertaken, however, an ethics modification on 16 February allowed us to analyse partially completed survey responses from this date onwards. Therefore, 33 partially completed surveys could be analysed. The final dataset used for all following analyses comprised a total of 134 survey responses. Currently, there is no available national figure of the total number of OTs conducting home visit assessments in Australia. However, given that in 2019 there were 3,725 OTs working in hospitals, 1,700 working for disability services, and 3,047 working for other community health care services (Department of Health, 2019), we estimate that this survey included around 1.58% of potential respondents.

As participants were asked to complete only those questions that were relevant to their work experience, the number of responses for each question varied. Overall, there were more respondents for survey questions regarding ageing in place than for hospital discharge. Questions regarding the frequency of home modification recommendations were answered by 39-49 participants and 76-85 participants for hospital discharge and ageing in place, respectively. Between 25-40 participants answered questions regarding the time taken to complete home modifications for hospital discharge. Questions regarding the individual design features were answered by 45-55 participants for hospital discharge and 85-92 participants for ageing in place.

Participants

Of the 134 survey respondents, 100 (74.63%) worked with older people requiring additional supports to remain in their own home, 48 (35.82%) worked with hospital patients in rehabilitation, 23 (17.16%) worked with patients in other hospital units, 4 (2.99%) worked with NDIS participants, 4 (2.99%) worked with younger people with disabilities, and 3 (2.24%) worked in rehabilitation post-discharge.[1]

Most participants were working as senior clinicians (n = 58; 43.28%) or in Grade 2 positions (n = 48; 35.82%), followed by Grade 1 positions (n = 19; 14.18%) and new graduate positions (n = 3; 2.24%). On average, participants had been working as an OT for 11.56 years (SD = 8.78), which is largely consistent with the 10.9 years average work experience of the Australian clinical OT workforce (Department of Health, 2019).

Table 1 presents a comparison of occupational and demographic characteristics of OTs in this study to the national OT workforce. Consistent with the national workforce, the majority of participants in this study were working for hospitals, with most participants working in public hospitals (47.01%) rather than private hospitals (5.22%). The relatively large proportion of the hospital sector was expected for this study, given that most OTs who conduct home visit assessments for home modifications are working in hospitals.

[1] Participants could indicate working with more than 1 patient type. Therefore, numbers add to more than 100%.

However, the solo and group practices were over represented in this sample. The sample's age distribution was largely comparable to the national distribution, with most participants being 25-34 years old. Respondents were located in a range of jurisdictions, with OTs from Victoria over represented per capita, and OTs from New South Wales and Queensland under represented per capita. No OTs from the Northern Territory completed the survey. Similar to the national workforce, most participants were from metropolitan/urban/city regions; however, no OT in this study worked in a remote area.

Table 1. Demographic and occupational characteristics of survey respondents (N = 134) compared to the national OT workforce.

	Sample count (n, %)	National count (n, %)
Organisation type*		
Public hospital	63 (47.01%)	3,130 (15.64%)
Private hospital	7 (5.22%)	
Community health care	42 (31.34%)	2,525 (12.61%)
Disability service	10 (7.46%)	1,070 (5.35%)
Outpatient service	8 (5.97%)	1,199 (5.99%)
Residential aged care	2 (1.49%)	495 (2.47%)
Other government department or agency	4 (2.99%)	562 (2.81%)
Solo practice	15 (11.19%)	1,124 (5.62%)
Group practice	15 (11.19%)	1,326 (6.62%)
Age		
18-24 years old	9 (6.72%)	1,700 (7.08%)
25-34 years old	62 (46.27%)	9,995 (41.65%)
35-44 years old	31 (23.13%)	6,458 (26.91%)
45-54 years old	17 (12.69%)	3,623 (15.10%)
55-64 years old	9 (6.72%)	1,843 (7.68%)
65 years or older	0	378 (1.58%)
State of jurisdiction		
New South Wales	16 (11.94%)	5,703 (28.49%)
Victoria	79 (58.96%)	5,241 (26.18%)
Queensland	11 (8.21%)	4,049 (20.23%)
Western Australia	6 (4.48%)	2,663 (13.30%)
South Australia	5 (3.73%)	1,541 (7.70%)
Tasmania	2 (1.49%)	305 (1.52%)
Australian Capital Territory	8 (5.97%)	324 (1.62%)
Northern Territory	0	182 (0.91%)
Working area		
Metropolitan/urban/city region	86 (64.18%)	15,508 (77.48%)
Regional/rural region	42 (31.34%)	4,304 (21.50%)
Remote region	0	196 (0.98%)

Note. National workforce data was derived from the Department of Health (2019) with N = 20,016 for all variables except for age distribution, which was derived from the Australian Health Practitioner Regulation Agency [AHPRA] (2020) with N = 23,997.

* Participants could select more than 1 organisation type.

Home visits for hospital discharge

Home modifications recommended for patients leaving hospital

Table 2 presents the frequency of home modification recommendations made following a home visit assessment for hospital discharge, ranked from the modification that is most commonly recommended to the modification that is least commonly recommended. Overall, bathroom modifications were the most frequently recommended home modifications for hospital discharge, including the installation of a grab rail in the shower (56.63%) and toilet (53.57%), as well as the removal of shower screens (40.10%). More than one-third of people also required the installation of a handrail at the entrance to the home, a ramp for 1-2 steps, and a shower curtain. These modifications represent easier retro-fit of hardware, rather than structural changes to the dwelling. A smaller number of people required structural changes such as an extension with an accessible ensuite (7.60%) and the installation of wider entrance doors (10.18%) and internal doors (10.44%). In addition to the modifications listed in Table 2, 5 OTs also reported that the installation of handheld shower hoses was often required for hospital discharge.

Table 2. Average frequency (in %) of home modification recommendations, ranked from the most to least commonly recommended modification.

Home modification	Mean frequency (%)	SD
Installation of a grab rail in shower	56.63%	28.40
Installation of a grab rail in toilet	53.57%	26.79
Removal of shower screen	40.10%	27.30
Installation of a handrail at entrance to home	39.02%	26.91
Installation of a ramp for 1-2 steps	38.59%	32.09
Installation of a shower curtain	34.67%	28.41
Installation of a step-free shower	27.62%	28.99
Installation of a handrail on external path	16.28%	21.58
Installation of a larger ramp	15.72%	19.64
Installation of wider internal door(s)	10.44%	16.33
Installation of wider door at entrance to home	10.18%	14.62
Extension with accessible ensuite	7.60%	16.44

Table 3 shows the average time taken to complete the above outlined home modifications following a home visit assessment. While some home modifications, such as the installation of grab rails in the shower, grab rails in the toilet, and handrails at the entrance to the home can be completed in approximately 10 days, other modifications can take more than 1 month to complete. These time-intensive modifications included the installation of larger ramps, wider entrance doors, wider internal doors, step-free or “hobless” showers, and extension with an accessible ensuite. Most of these features represent structural changes to the dwelling. Importantly, OTs in this study indicated that they were notified of the need for a home visit, on average, 11.15 days (± 17.38 SD) before a patient is clinically ready for discharge. Therefore, apart from the 3 least time-intensive home modifications, most modifications may not be completed before a client is ready for discharge, leading to potential delays in hospital discharge.

Table 3. Average time (in days) taken to complete home modifications, ranked from the most to least time intensive modification.

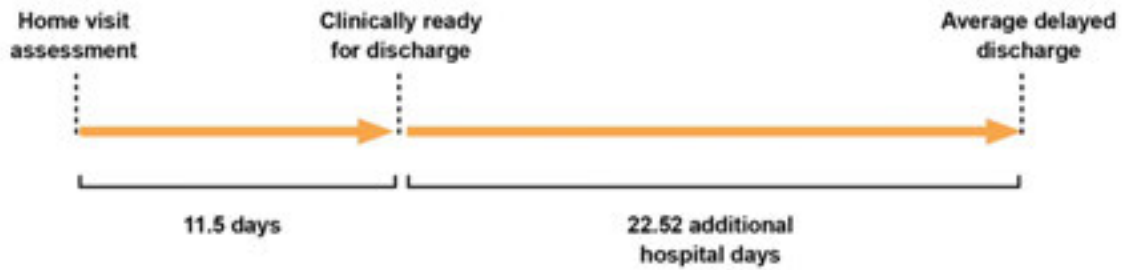
Home modification	Mean (days)	SD
Extension with accessible ensuite	46.60	48.82
Installation of a step-free shower	46.17	35.11
Installation of wider internal door(s)	43.00	47.49
Installation of wider door at entrance to home	40.58	46.19
Installation of a larger ramp	39.24	30.67
Installation of a ramp for 1-2 steps	17.84	15.31
Installation of a shower curtain	13.88	13.39
Removal of shower screen	13.53	12.92
Installation of a handrail on external path	12.03	8.59
Installation of a grab rail in toilet	10.56	8.29
Installation of a grab rail in shower	10.56	8.29
Installation of a handrail at entrance to home	10.35	8.91

Image 1. Step free entrance to home (Courtesy of Taylor'd Distinction)

Delayed discharge

Participants reported that an average of 42.59% (± 31.48 *SD*) of patients had a delayed discharge due to waiting for the completion of home modifications. When there was a delayed discharge, patients remained on average 22.52 (± 27.16 *SD*) additional days in hospital due to waiting for home modifications (including specifying modifications, obtaining quotes, approval for funding and completion of modifications). Considering that home visit assessments are, on average, conducted 11.15 days before a client is ready for discharge, clients with a delayed discharge spend an average of 33.67 days in hospital after the completion of a home visit assessment. This suggests that home modifications that lead to a delay in hospital discharge take, on average, 33.67 days to complete. The timeline of a typical delayed hospital discharge is presented in Figure 1.

Figure 1. Flowchart of an average hospital discharge that is delayed due to waiting for home modifications.



Costs associated with delayed hospital discharge

Calculations and exact figures are outlined in Appendix B. The 22.52 additional hospital days of an average delayed discharge cost between $22,768 to $42,811 per client.

Of the 134 respondents in this study, 70 were conducting home visit assessments for people being discharged from hospital, with an average of 3.89 (±4.31 *SD*) home visits per month. Collectively, the survey respondents therefore completed an estimated 3,268 home visits for hospital discharge in the past 12 months. Considering that 42.59% of patients of these 3,268 home visits had a delayed discharge, the estimated sample cost of delayed discharge due to waiting for home modifications ranged between $31.7 million to $59.6 million per annum.

The 70 OTs in this study represent approximately 1.88% of the 3,725 OTs working in hospitals (Department of Health, 2019). Based on this proportion, we estimate that the total national cost of delayed hospital discharge due to waiting for home modifications ranges between $1.69 billion to $3.17 billion per annum. It is important to note that these estimates are based on hospital bed costs from 2014/15 (IHPA, 2016). The IHPA recommends an indexation rate of 2.7% per annum for the past 5 years to estimate the costs of historical values in terms of the current value of the Australian Dollar (IHPA, 2021). Therefore, the above calculated national costs of delayed hospital discharge likely range between $1.93 billion to $3.62 billion in terms of the current dollar's value.

Impact of accessible design features on hospital discharge

Table 4 presents descriptive statistics regarding the frequency with which the lack of specific accessible design features delays hospital discharge. The list is rank-ordered from the features that on average most frequently delay timely hospital discharge to the features that on average least frequently delay hospital discharge. As can be seen, a lack of at least 1 step-free entrance most frequently delayed hospital discharge, followed by a lack of a step-free shower entry, a lack of a step-free pathway to the entrance, and a lack of a large shower size. Further, lacking bathroom facilities and bedroom space on the ground level was also rated as frequently delaying hospital discharge.

Table 4. Descriptive statistics of the frequency with which the lack of the design feature delays hospital discharge, ranked from 3 = nearly always to 0 = never

Design feature	Mean	SD	Median	Mode
Step-free entrance to residence	1.89	0.95	2	2
Step-free shower entry	1.76	0.92	2	2
Step-free pathway to entrance	1.57	0.90	2	2
Shower size	1.54	0.93	2	2
Shower on ground floor	1.49	0.95	2	2
Toilet on ground floor	1.40	1.00	1.5	2
Ground (or entry level) bedroom space	1.36	0.85	2	2
Transition height for different floor surfaces	1.32	0.94	1	2
Space in front of toilet	1.25	0.80	1	1
Slip-resistant flooring	1.22	0.84	1	1
Removable shower screen	1.20	1.00	1	0, 2
Space adjacent to shower	1.20	0.93	1	1
Internal door widths	1.19	0.79	1	1
Toilet in bathroom located in corner	1.18	0.91	1	1
Reinforcement of bathroom and toilet walls	1.17	0.96	1	1
Closet toilet walls	1.15	0.99	1	1
Entrance door width	1.02	0.77	1	1
Width of pathway to entrance	0.92	0.70	1	1
Internal corridor widths	0.90	0.71	1	1
Internal stairways - no winders	0.89	0.80	1	1
Provision for future stair-climber or lift	0.73	0.71	1	1
Kitchen space	0.66	0.64	1	1

Qualitative analysis of the design changes considered most important to support hospital discharge

In response to this open-ended question, 127 suggested changes were reported. Qualitative analysis of the open-ended responses revealed 3 key themes: 1) External access; 2) Internal access; 3) Preparing for modifications. These themes capture the design changes considered most important to support hospital discharge. A description of the themes and associated codes can be found in Appendix C.

Image 2. Step free pathway and entrance to home (Courtesy of Stockland Communities)

Theme 1: External access

This theme was the most frequently reported recommendation. Participants identified the importance of at least 1 level access to/from the home, recognising the universal applicability to everyone, inclusive of people with mobility limitations, wheelchair users and the elderly population as shared by 1 participant: "*Level accessible entry into home so everyone from a person with a mobility aid to a parent with a pram or carrying children can enter the home easily."* While some noted that 1 step was a minimum requirement, the majority preferred a level, step-free entry. It was also suggested that the entry be a non-slip floor surface, and well lit. The participants emphasised the importance of stepless entry to ensure that people can safely exit their home in an emergency, while also enabling safe access to the community. For example: "*People are often discharged with high risk in case of emergency. They are assisted into their homes but cannot safely exit in case of fire/emergency. They are essentially forced to be housebound as they can't manage the access."*

It was also identified that lack of ability to safely walk up/down stairs with a mobility device, coupled with an external entrance with stairs, is a frequent barrier to discharge from hospital. One participant stated: *"When there are steps it delays discharge because the patient needs to stay an inpatient while working towards this goal. If there are no steps to manage this will reduce length of stay."* Installation of ramps to compensate for inaccessible external access to homes was also recognised as contributing to discharge delays, as well as financial burden. For example: *"Long delays stem from ramp installation. At times, ramp installation is not structurally possible and therefore, for people who are permanent wheelchair users, returning to their home may not be an option and alternative accommodation has to be sourced."*

Image 3. Low transition height of different surfaces (max 5mm) (courtesy of Starliner Access Designs)

Theme 2: Internal access

This theme captures key design features characterised as enabling access within the home. Within this theme, level access shower with circulation space was the most highly reported internal design feature to support hospital discharge. In addition, participants identified the following internal access design features: Wider internal passageways, level access throughout the house, higher toilets with circulation space and upstairs/downstairs bedroom and bathroom options.

Participants described that a step-free shower entry, coupled with a larger circulation space, enabled safe shower use by accommodating equipment such as mobility devices and shower chairs, while also allowing space for support workers/carers. One participant reported: *"Stepless showers can accommodate most mobility levels, various potential future equipment/rail needs and allow sufficient space for potential carer access, which will expedite discharge and maximise patient/carer safety."* Access for equipment was also described as a key reason for the need for more circulation space around toilets, with a preference for toilets to be located within the main bathroom, rather than in a separate toilet room. One participant shared: *"Many patients leaving hospital use a gait aid for walking. Very often, patients are not able to access their toilets with their gait aid because of limited circulation space. Not using their gait aid increases their risk of falls and serious injury."*

In addition to increased safety and timely discharge, survey responses also reflected the importance of accessible showers/toilets from the perspective of personal wellbeing and dignity. This is captured in the following quote: *"Shower recesses that do not facilitate seating or a carer mean that people will either wait in hospital until modifications are completed, or they are discharged home to only sponge wash - this can have a negative impact on their mental health and hygiene."*

Wider internal passageways and level access throughout the house were also identified as important design features. In particular, these features were noted to be essential for wheelchair users to return to their home at discharge. The following quote highlights problems associated with using ramps to facilitate internal home access: *"Poor [internal] access for wheelchair users requires multiple internal ramps and changes to living arrangements e.g. having to move bedrooms which affects sense of self and social relationships, requires provision of multiple aids which 'hospitalises' look of home or can be expensive."*

Theme 3: Preparing for modifications

This final theme recognises that currently, due to lack of accessible home environments, OTs frequently recommend home modifications post-build to enable safe hospital discharge. In this context, survey participants identified barriers to completing home modifications and made the following recommendations to improve the timeliness of modifying homes for safe discharge. Recommendations included: a) improved grab rail installation with pre-installed reinforced walls and metal plumbing pipes; b) pre-installed reinforced ceilings to aid hoist installation. Policy and system changes were also suggested such as consistency of processes/reporting across funding bodies, permission for people to self-fund while waiting for funding approvals, and resumption of government funded archicentre services.

Home visits to support ageing in place

Home modifications recommended to support ageing in place

Table 5 presents a rank-order of the most to least commonly recommended home modifications following home visit assessments for ageing in place. The modifications most frequently recommended were the installation of a grab rail in the shower (67.02%) and toilet (60.98%), followed by the installation of a handrail at the entrance of the home (46.35%). More than one-third of older Australians also required the removal of shower screens and installation of a shower curtain. The least commonly needed modifications to support ageing in place were an extension with an accessible ensuite (6.67%) and the installation of wider entrance doors (8.29%) and internal doors (8.97%).

Table 5. Average frequency (in %) of home modification recommendations, ranked from the most to least commonly recommended modification.

Home modification	Mean frequency (%)	SD
Installation of a grab rail in shower	67.02%	25.73
Installation of a grab rail in toilet	60.98%	26.42
Installation of a handrail at entrance to home	46.35%	28.63
Removal of shower screen	39.35%	25.98
Installation of a shower curtain	33.19%	24.14
Installation of a step-free shower	27.98%	28.10
Installation of a ramp for 1-2 steps	26.50%	21.40
Installation of a handrail on external path	17.32%	20.91
Installation of a larger ramp	12.22%	14.56
Installation of wider internal door(s)	8.97%	19.17
Installation of wider door at entrance to home	8.29%	18.52
Extension with accessible ensuite	6.67%	17.22

In addition to the above-listed home modifications,16 survey respondents reported that changes to the installation of doors were often required to allow an easier opening of doors in everyday life and emergencies. These included magnetic door catchers and safety hinges, such as ross hinges, quick release hinges, and lift-off hinges. Like modifications for hospital discharge, several OTs (*n* = 12) indicated that the installation of handheld shower hoses was often required to support ageing in place. A further 7 respondents indicated a common need to install lifts, such as stair lifts and platform lifts. Lastly, survey respondents reported that changes to the flooring are often needed, including installing platform steps (i.e. steps that are deeper and less steep than normal steps, reported by *n* = 6 survey respondents), reducing flooring thresholds such as through threshold ramps (*n* = 7), and using material that is slip-resistant and more visible (*n* = 7).

Impact of accessible design features on ageing in place

Table 6 presents descriptive statistics regarding the impact of specific design features on supporting older Australians to remain in their own home, presented in rank-order from the feature that on average has the greatest positive impact to the feature that has the least positive impact. Similar to the ratings for hospital discharge, the features with the largest impact on supporting ageing in place included a step-free shower entry, a toilet and shower on the ground floor, step-free entrances, and step-free pathways to the entrance.

Table 6. Descriptive statistics of the effects that the following design features have on supporting older Australians to age in place, ranked from 3 = major effect to 0 = no effect.

Design feature	Mean	SD	Median	Mode
Step-free shower entry	2.61	0.68	3	3
Toilet on ground floor	2.56	0.76	3	3
Shower on ground floor	2.49	0.80	3	3
Step-free entrance to residence	2.41	0.70	3	3
Step-free pathway to entrance	2.36	0.72	2	3
Ground (or entry level) bedroom space	2.31	0.76	2	3
Shower size	2.27	0.68	2	2
Slip-resistant flooring	2.15	0.78	2	2
Reinforcement of bathroom and toilet walls	2.08	0.88	2	3
Internal stairways - no winders	2.02	0.85	2	2
Space in front of toilet	1.97	0.75	2	2
Removable shower screen	1.93	0.81	2	2
Transition height for different floor surfaces	1.86	0.85	2	2
Provision for future stair-climber or lift	1.85	0.85	2	2
Space adjacent to shower	1.75	0.79	2	2
Closet toilet walls	1.74	0.91	2	2
Internal door widths	1.70	0.74	2	2
Toilet in bathroom located in corner	1.58	0.76	2	1
Entrance door width	1.57	0.74	2	2
Internal corridor widths	1.47	0.82	1	1
Kitchen space	1.45	0.74	1	1
Width of pathway to entrance	1.41	0.67	1	1

Qualitative analysis of the design changes considered most important to support ageing in place

In response to this open-ended question, 215 suggested changes were reported. Overall, the suggested changes were very similar to the changes suggested for safe discharge, as outlined earlier in this report. The main difference was more emphasis placed on changing needs over time as people age. Qualitative analysis of the open-ended responses revealed the same key themes as outlined earlier: 1) External access; 2) Internal access; 3) Preparing for modifications. The themes capture the design changes considered most important to support older people to age in place. A description of the themes and associated codes can be found in Appendix C.

Theme 1: External access

Consistent with the qualitative findings to support hospital discharge, this theme was the most highly reported recommendation for ageing in place. Participants identified the importance of at least 1 level access, enabling safe access to/from the home while accommodating for the use of mobility devices. Survey responses highlighted the falls risk associated with steps and the associated cost of installing rails or a ramp at the steps. Emergency access was frequently reported as a key consideration as captured by one participant in this quote: "*It is vital to being able to leave the home in an emergency."*

It was also noted that as people age, their need for mobility devices will increase, reinforcing the importance of step-free entry. One participant shared: *"Most aged care clients require a type of ambulant or seated mobility device at some stage. The only type suitable for standard stairs is a walking stick, but as strength and endurance decreases with age, this is not suitable for long term."*

While home safety was the main reason to support the inclusion of this design feature, participants also recognised the importance of accessible entrances to enable older people to leave their home to access the local community and to visit the homes of friends and family. For example: *"One entry level access between inside (home) and outside (community) - prevent social isolation, encourage community access for mental and physical health, not put off medical appointments, no injuries leaving/returning to the house, improve functional independence (i.e. shopping)."*

Image 4. Bedroom on ground floor (Courtesy of Parent to Parent Assoc. QLD - P2P Housing Team)

Theme 2: Internal access

Again, similar to the qualitative findings to support hospital discharge outlined earlier in this report, a level access shower with circulation space was the most highly reported internal design feature to support people to age in place. In addition, participants identified the following internal access design features: wider internal passageways, level access throughout the house, higher toilets with circulation space and upstairs/downstairs bedroom and bathroom options.

Bathroom safety was identified as a key concern given the risk of falls associated with the wet environment and the need for mobility devices and equipment such as shower chairs. One participant described: *"Showering is an important occupation and it is often a space where people feel the least safe as the floor is often wet and people do not like to have help to shower. This change would enable people to shower safely regardless of their ability."*

Participants also raised concerns about the costs associated with modifying bathrooms post-build, especially the removal of showers over baths. Participants reported limited access to builders to complete works, with some booked out months in advance. For example, 1 participant shared: "*Many clients on pensions cannot afford modifications or equipment."* While another participant stated: *"Level entry showers will allow for people in a wheeled device to be able to choose to live in any home."*

Other suggested design features included wider doorways and hallways to allow use of larger walking frames and wheelchairs and use of external swing doors to minimise entrapment in the case of home falls. Open plan design, step-free and slip-resistant flooring, and improved storage to minimise floor clutter were recommended to minimise risk of falls within the home. In addition, where possible, it was recommended that double storey homes have both upstairs and downstairs bedroom and bathroom options. While toilet access was identified as an issue for both hospital discharge and ageing in place, raised toilet seat height was more frequently recommended for ageing in place, compared to hospital discharge. For example: *"Standard toilet height to be higher - 95% of my clients cannot sit/stand transfer from the 'standard' low toilet seat and require either bilateral grab rails, a toilet seat raiser or over toilet frame to be added."*

Theme 3: Preparing for modifications

Consistent with the qualitative findings to support hospital discharge, this final theme addresses identified barriers to home modifications, with recommendations to improve modifying homes in response to changing needs with ageing. In the context of supporting ageing in place, there was an increased emphasis on supporting safe installation of grab rails in the bathroom and at the entrance to homes, with reinforced walls and more uniform placement of studs. The following quote captures this recommendation: *"Often it is difficult to prescribe suitable rails for people as stud placements do not allow for structurally sound installation in the ideal positions. Having material that rails could be fixed to in a position would allow for individualised and safe prescription to optimise each person's function."*

Survey respondents also recommended pre-installed reinforced ceilings to aid hoist installation. For example: *"Ceiling hoists are much better than mobile hoists, consider this in design e.g. future proof to include load bearing 1 bedroom to ensuite/bathroom."*

Similar to the survey responses to support hospital discharge, a number of policy and system changes were also recommended, with an emphasis on availability of funding schemes, especially for people on pensions or with lower incomes. *"Equitable funding for all people instead of scheme differences."*

Discussion

The results of this survey of OTs indicate that the most important minimum accessibility features are external home access (i.e. step-free entrance and pathways to the entrance) and internal home access (i.e. step-free showers with a large circulation space). These results were remarkably consistent across hospital discharge and ageing in place, supported by both quantitative and qualitative analyses of survey responses.

Regarding external access to the home, the survey respondents overwhelmingly outlined the importance of having at least 1 level access to ensure people can safely exit their home in the event of an emergency. Indeed, safety risks associated with discharging people from hospital to a home in which they cannot safely and independently exit, were emphasised. In addition, survey respondents communicated the importance of level access to/from the home to enable people to access the community and visit family/friends These findings are consistent with previous studies, which have recognised the negative impact of inaccessible housing on social inclusion and wellbeing (Wiesel, 2020), and have highlighted the importance of level access to/from the home from the perspective of people who deliver formal or informal care (Sinclair, 2020). Together with these past findings, the current study emphasises the importance of level access for not only wheelchair users, but also people who use a walking stick, crutches, walking frame or frail elderly with deteriorating mobility and balance difficulties.

Within the home, while a number of design features were recommended, safe shower access was identified as the most important design feature for supporting ageing in place and hospital discharge. This included a non-step level access to the shower, as well as a large circulation space to accommodate a range of mobility devices including walking sticks/walking frames/ wheelchairs, shower equipment and the availability of a support worker/carer. Other suggested design features included incorporating bathroom facilities and bedroom space on the ground level as this may minimise the need for people to sponge bath at the sink, potentially impacting sense of dignity and hygiene. In addition, analysis of the free-text responses indicated support for wider internal passageways/doors and raised toilet seats with larger circulation space within the bathroom. Again, it was suggested that the inclusion of these features accommodated for the use of a range of mobility devices within the home.

More generally, it was also recognised that the introduction of minimum accessibility standards inclusive of the above design features will potentially reduce the need to hire or purchase additional equipment. This can minimise financial burden for individuals, and also avoid an institutionalised look within the home. For example, it may not be necessary to install grab rails in the shower if all homes were built with level-entry showers with large circulation spaces. This highlights the importance of considering the positive flow-on effects of incorporating accessible design features into new builds.

A key feature of this survey is the focus on not only design features, but also home modifications. In addition to identifying design features that have the most impact on hospital discharge and ageing in place, respondents were asked to identify home modifications most frequently recommended following a home visit. Again, similar to the design features, responses were very consistent across both hospital discharge and ageing in place. The most frequently recommended home modifications included installation of grab rails by the shower and toilet, removal of shower screens, installation of step-free showers and installation of handrails/ramp at the entrance to the home. These findings provide an additional strong

rationale for incorporating the most highly ranked accessible design features as minimum accessibility requirements in new homes. Specifically, inclusion of step-free entrances to the residence and step-free shower entries would minimise the need for the most commonly required post-build modifications (i.e. the installation of grab rails by the shower, removal of shower screens, installation of step-free showers and installation of handrails/ramp at the entrance). Post-build modifications are not the most efficient approach to housing accessibility; a study by Wiesel (2020) that examined the lived experience of people with mobility limitations reported that post-build modifications to housing were found to only partially meet the accessibility needs of the survey respondents.

Furthermore, the findings of this study highlight cost inefficiencies of post-build modifications as most modifications appear to delay discharge, contributing to the unnecessary cost of additional bed days. More specifically, survey results show that level-entry showers are required by approximately one-third of hospital patients following a home visit assessment, and they are the second most time-intensive home modification, taking more than 1.5 months to complete. Unsurprisingly, a lack of a step-free shower entry was rated as the feature that second most frequently delays timely hospital discharge (see Table 4).

The importance of avoiding post-build modifications is further stressed by the finding of the substantial costs of delayed hospital discharge at both an individual and societal level. Based on the daily hospital cost between $1,011 to $1,901 in 2014/15 (IHPA, 2016), each client who has a delayed discharge due to the need for home modifications faces an average additional hospital cost between $22,767 to $42,811. The national cost of delayed hospital discharge sums to approximately $1.69 billion to $3.17 billion per annum. Given that the national health expenditure was $171.5 billion in 2014/15 (Australian Institute of Health and Welfare, 2020), delayed hospital discharges due to inaccessible homes account for approximately 1-2% of Australia's health costs. This is a significant proportion that could be reduced with the inclusion of minimum accessibility standards in the NCC.

Limitations

The costs of delayed hospital discharge need to be interpreted as preliminary estimates. Statistically, the variables used for the cost calculation had large standard deviations, potentially reducing the accuracy of the cost estimates. Moreover, the calculations were based on approximate figures due to difficulties finding the national number of OTs conducting home visit assessments and up-to-date, average costs of hospital bed days. Nevertheless, as the sample in this study was highly experienced and largely representative of the national OT workforce, population estimates can be reasonably inferred from the study's findings.

More broadly, it should be noted that the current research focused on the experiences of OTs conducting home visit assessments for hospital discharge and/or ageing in place. Therefore, the study did not capture the views of OTs who conduct home and environmental assessments for other purposes, such as young people with disabilities who need additional support to remain in their own home. These OTs could have provided additional insights into the accessibility needs of different populations. However, considering the consistency of the findings across hospital discharge and older Australians, findings regarding the most essential housing accessibility features would likely be similar across other cohorts.

In addition to focusing on a specific OT cohort, there was a large rate of incomplete responses. It is possible that participants found the survey questions too complex and challenging, as it may have been difficult to provide an average estimate across different clients. For example, the average time taken to complete home modifications may depend on the adaptability of the client's housing. This large variability between clients might also be reflected in the considerable uncertainty (i.e. large standard deviations) for most variables. Future studies may benefit from incorporating more open-ended questions that allow OTs to explain their reasoning, potentially reducing drop-out rates.

Conclusion

The aim of this study was to identify which minimum accessible features would have the greatest impact on discharging patients from hospital and enabling older Australians to age in place. More specifically, this study sought to address a gap in research evidence by systematically investigating specific housing design features from the perspective of health professionals working with people with mobility limitations. The study identified a consistent set of accessible design features that are most important to consider as mandatory requirements for minimum access design in the NCC. The study also highlighted that a lack of these design features feeds into the need for home modifications, often resulting in delayed hospital discharge at a substantial health care cost. These findings point to the inefficiencies of relying on post-construction home modifications instead of incorporating minimum accessibility features as standard to future-proof housing for our ageing population.

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Appendix A

Table A1. Accessible Design Features

Design feature	Requirements
1. Step-free pathway to entrance	A safe, continuous, step-free pathway from the street entrance and/or parking area to a dwelling entrance that is level
2. Width of pathway to entrance	A pathway that is at least 1000mm wide
3. Step-free entrance to residence	At least 1 step-free entrance into the dwelling and the entrance should be connected to the safe and continuous pathway as specified in feature 1
4. Entrance door width	A clear opening width of entry door of at least 850mm
5. Transition height for different floor surfaces	A maximum transition/threshold height of abutting surfaces of 5 mm
6. Internal door widths	Widths of the internal doors enables comfortable and easy movement between spaces. Clear opening width of internal doors is 850mm
7. Internal corridor widths	Internal corridors and passageways provide a minimum clear width of 1000mm
8. Toilet on ground floor	The ground (or entry) level has a toilet to support easy access for home occupants and visitors
9. Space in front of toilet	The circulation space between front edge of the toilet and arc of door is at least 1200mm
10. Closet toilet walls	Walls either side of the toilet are 900mm or 1200mm from the toilet
11. Toilet in bathroom located in corner	The toilet in a combined bathroom is located in the corner
12. Shower on ground floor	There is a shower on the ground (or entry) level
13. Removable shower screen	The shower screen can be removed
14. Step-free shower entry	The shower is step-free or “hobless” entry
15. Shower size	The shower is at least 900mm x 900mm
16. Space adjacent to shower	The size of the space adjacent to showers is at least 900mm x 900mm
17. Reinforcement of bathroom and toilet walls	The toilet and bathroom walls are reinforced to enable future installation of grabrails
18. Internal stairways - no winders	Stairways feature no winders in lieu of landings, adjacent to a wall capable of supporting a handrail
19. Provision for future stair-climber or lift	Where sites have limited floor space at entry level, precluding having amenity on entry level, provision should be made for future fit out. This may be through the option of stairs suitable for fit out with a stair-climber or alternatively, provision for future fit out with a lift. These would need to be demonstrated on drawings to achieve compliance
20. Kitchen space	Clearance in front of fixed benches and appliances (excluding handles) in kitchen are at least 1200mm
21. Ground (or entry) level bedroom space	There is a space on the ground (or entry) level that can be used as a bedroom. (Minimum size of 10m2, excluding wardrobes, linings, etc. There is natural light and ventilation, a bed space of at least 1520mm x 2030mm, plus 1000mm minimum path of travel
22. Slip-resistant flooring	Floor coverings are slip-resistant to reduce the likelihood of slips, trips and falls

Appendix B

Cost range when there is a delayed discharge

The following formula was used to calculate the costs when there is a delayed discharge:

> Daily hospital cost * Average additional days spent in hospital

For the lower bound of the estimated cost range, this equals:

> $1,011 * 22.52 = $22,767.72

For the upper bound of the estimated cost range, this equals:

> $1,901 * 22.52 = $42,810.52

It follows that a delayed discharge due to waiting for home modifications results in an average cost of $22,767.72 to $42,810.52.

Cost range of delayed discharge based on this study's OT sample

To calculate the sample cost of delayed discharge, the number of patients from OTs in our sample who had a delayed discharge needed to be calculated and subsequently multiplied by the average cost of a delayed discharge.

First, the total number of home visits completed by OTs in this sample over the past 12 months was calculated as follows:

> Number of OTs conducting hospital discharge visits * average number of visits per month * 12 months = Total visits over the past 12 months
>
> 70 OTs * 3.89 home visits per month * 12 months = 3,267.6 total visits over the past 12 months

Second, the total number of home visits completed by OTs in our sample was multiplied by the average percentage of delayed discharge related to waiting for home modifications.

> Total visits over the past 12 months * 42.59% have a delayed discharge = Number of patients from OTs in our sample who had a delayed discharge
>
> 3,267.6 * 0.4259 = 1,391.67 patients from OTs in our sample who had a delayed discharge

The number of patients who had a delayed discharge was subsequently multiplied by the average cost of a delayed discharge.

> Number of patients within our sample with a delayed discharge * Cost of a delayed discharge

For the lower bound of the estimated cost range, this equals:

> 1,391.67 patients * $22,767.72 lower bound cost of delayed discharge = $31,685,152.90

For the upper bound of the estimated cost range, this equals:

> 1,391.67 patients * $42,810.52 upper bound cost of delayed discharge = $59,578,116.40

It follows that the cost of delayed discharge based on this study's sample ranged between $31,685,152.90 to $59,578,116.40.

Total national cost range of delayed discharge extrapolated from the sample costs

To calculate the total national cost of delayed discharge, the above calculated sample cost needs to be extended to the national OT population conducting home visit assessments for hospital discharge. In the absence of a national figure of this cohort, the number of OTs working in a hospital (3,725; Department of Health, 2019) was used as an estimate (hereafter referred to as OT population size).

First, it was calculated what percentage of the OT population size was included in our sample:

> (Sample size of OTs conducting home visit assessments for hospital discharge / OT population size) * 100 = Percentage of OT population included in our study
>
> (70 OTs in our sample / 3,725 OT population size) * 100 = 1.88% of the OT population is included in our study

Therefore, the above calculated sample cost represents 1.88% of the total national cost. The following formula was used to estimate 100% of the total national cost:

> (100/1.88) * sample cost = total national cost

For the lower bound of the estimated cost range, this equals:

> (100/1.88) * $31,685,152.90 lower bound sample cost = $1,685,380,473.40

For the upper bound of the estimated cost range, this equals:

> (100/1.88) * $59,578,116.40 upper bound sample cost = $3,169,048,744.68

It follows that the average total national cost of delayed hospital discharge ranges between $1,685,380,473.40 to $3,169,048,744.68.

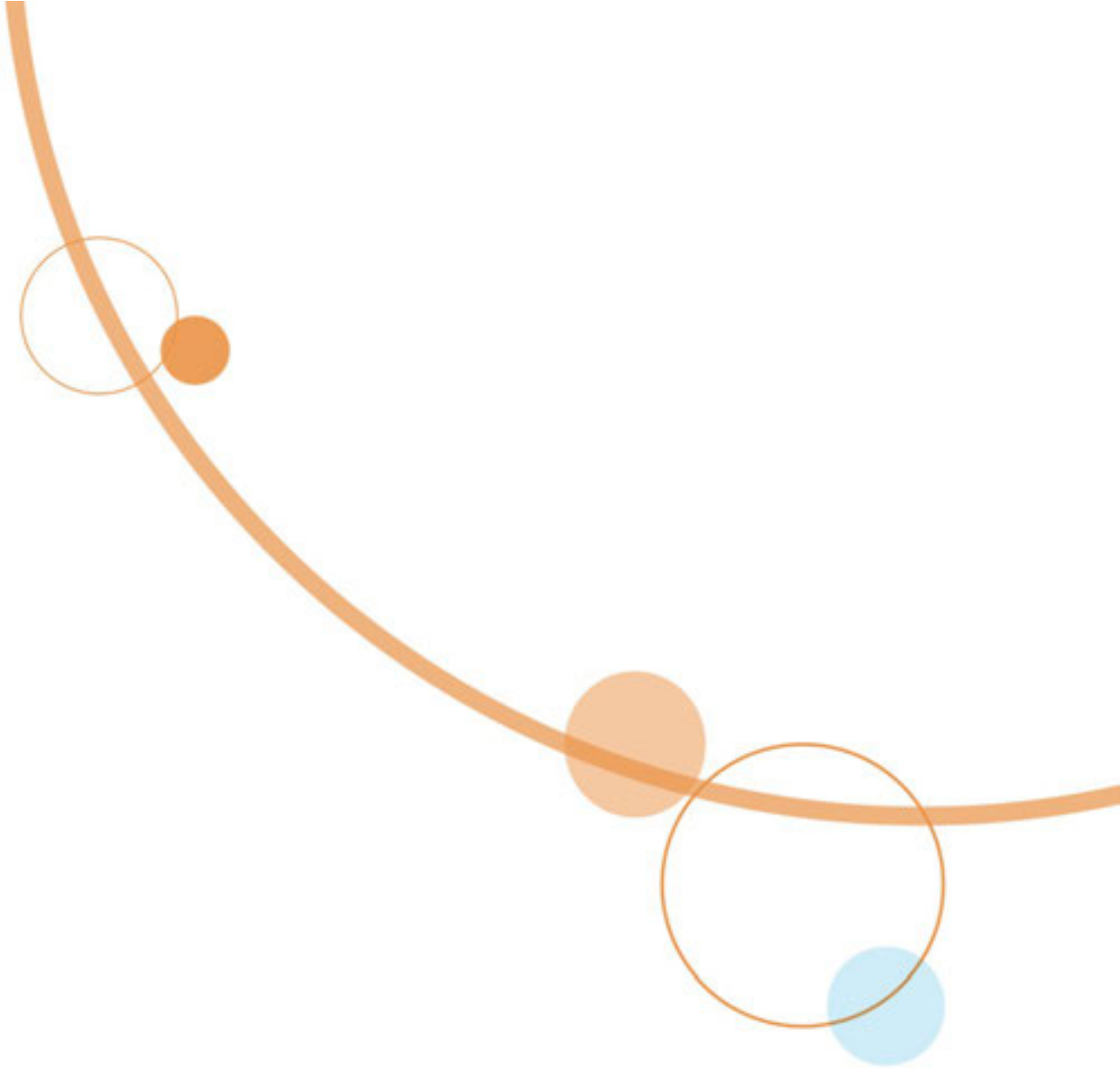
These estimates are based on hospital bed costs from 2014/15. As recommended by IHPA (2021), an indexation rate of 2.7% per year for the last five years was applied to estimate the costs in terms of today's dollar value:

> $(1.027)^5$ * $1,685,380,473.40 = $1,925,529,496.98
>
> $(1.027)^5$ * $3,169,048,744.68 = $3,620,604,920.71

Appendix C

Table C1: Data analysis: Frequency of codes for each design recommendation

Themes and Codes	Hospital discharge	Ageing in place	Combined data
Theme 1: External access (Getting in/out of home)			
Step-free entrance to residence	34	59	93
Theme 2: Internal access (Moving around home)			
Step-free shower entry and circulation space	35	54	89
Wider internal corridors and doors	12	25	37
Higher toilets with circulation space	11	13	24
Level access throughout home	10	12	22
Upstairs/downstairs bathroom and bedroom options	7	12	19
Theme 3: Preparing for modifications			
Reinforced walls/ceilings for rail installation	7	16	23
Policies and systems	5	3	8



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