Models of supported accommodation for people with traumatic brain injury: A systematic review

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for :
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Accompanying documents to this report

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Models of supported accommodation for people with traumatic brain injury: A systematic review. ***3 page summary***	***0513-022.024-R1B***

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KEY MESSAGES

This systematic review aimed to describe the characteristics of different models of supported accommodation provided to people with traumatic brain injury (TBI) and to assess the effects of these models on outcomes. Models of supported accommodation were included in this review if they were available to people with TBI over 18 years of age; included both housing and support provided by a service system; and offered permanent, long term accommodation in a community-based setting. Accommodation based in institutional settings, such as residential aged care or secure neuropsychiatric facilities, was excluded. The search identified 4,127 records and 376 articles were retrieved in full text. Sixty-eight articles described models of supported accommodation, including six articles that assessed the effects of supported accommodation on client outcomes.

There were three key findings of this review:

1. Most of the existing TBI literature describes a similar range of disability-specific supported accommodation options and, of the models described, there is limited detail regarding the type of housing or support provided to people with TBI;
2. There is limited evidence available regarding the impact supported accommodation has on outcomes for people with TBI;
3. Of the evidence that is available, participant numbers are small, studies vary in design (survey, cohort, case series), the measures used were varied, and the supported accommodation models studied were restricted to traditional group home or cluster settings.

Implications of these findings within the review include:

1. Exploration, documentation and the provision of information for people with TBI and their families regarding the range of models of housing and support that may be available and are likely to improve outcomes following TBI is necessary.
2. Broadening the range and type of housing and support available to people with TBI may provide greater flexibility to meet individual goals and needs, and may include options that separate the provider of housing from the provider of support, improving tenancy rights for the person with disability.
3. There is a pressing need for evaluation of impact of housing and support models on outcomes following TBI.
4. Supported accommodation should be viewed as part of a rehabilitation continuum within a lifetime care model for people with TBI.

EXECUTIVE SUMMARY

Many individuals who experience severe traumatic brain injury (TBI) require ongoing support and specialised accommodation, often for their lifetime. Traditionally, the range of supported housing options for this group has been limited to living with family or paid carers, group homes, or institutional settings such as residential aged care.

Objectives

This project aimed to undertake a systematic review of the existing international literature to: (1) describe the available body of evidence and the characteristics of models of supported accommodation for people with TBI; and (2) assess the effects of supported accommodation models on outcomes of people with TBI.

Data sources

Five electronic databases were used: Cochrane Central Register of Controlled Trials, MEDLINE, EMBASE, CINHAL and PsycINFO. Reference lists of relevant articles were searched to further identify any potential studies for inclusion. Grey literature, including national and international government reports and peak body positioning papers, was included where it described the characteristics of models. A Google Advanced search was undertaken. In addition, websites of Australian and international government and peak bodies representing people with TBI were searched. Recommended references from experts in the field of community TBI practice were also sought.

Study eligibility criteria

'Supported accommodation' was defined as the provision of both long-term housing and support services by a government or non-government organisation. Transitional or post-acute rehabilitation settings were excluded. In order to describe the characteristics of existing models (objective one), articles and information sources were not limited by study design or publication type. When assessing the effects of models (objective two), both controlled and uncontrolled study designs, including observational cohort studies with a comparison group, were included; however, individual case studies were not.

Participants

This literature review included studies of adults (aged over 18 years) with acquired brain injury (ABI), where it was evident there were people with TBI in the cohort.

Study appraisal and synthesis methods

Titles and abstracts were examined independently by two reviewers. Full text articles were obtained for those that met selection criteria, or those unable to be excluded based on the initial information available. Studies with outcome data that met the inclusion criteria for objective two were categorized based on levels of evidence (National Health and Medical Research Council, 2009).

Results

Reporting of this review followed Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Liberati et al., 2009). The total number of records screened was 4,127. Full texts were retrieved for 376 publications that met inclusion criteria, and two people reviewed each of these texts. Sixty-eight articles met objective one criteria. Of these, only six publications, using data from five separate studies, met the criteria for objective two and were included in synthesis.

Limitations

This review was limited to studies published in English from 1990 onwards, describing participants aged over 18 years, and to only long-term supported accommodation.

Conclusion

This review identified there is a limited range of options for supported accommodation currently available, and there is a lack of detailed information available for people with TBI and their families to plan the type of supported accommodation they will need for lifelong community living. The review highlights the need for further research in the area of housing and support, and contextualised slow stream rehabilitation for people with TBI. Some of this research has already been initiated through the Institute of Safety, Compensation and Recovery Research's Neurotrauma Research Strategy, and associated programs. Finally, this review provides evidence of models of housing and support where both resources are viewed within a continuum of rehabilitation for people with TBI as they strive to achieve a level of autonomy, participation and quality of life that is of personal meaning and value to them.

1. BACKGROUND

Acquired brain injury and traumatic brain injury

Over 432,700 Australians have an acquired brain injury (ABI) (Australian Bureau of Statistics, 2011), with ABI referring to any damage to the brain that occurred after birth. Common causes of ABI include accidents, stroke, lack of oxygen and degenerative neurological disease (AIHW, 2007). Where the mechanism of the brain injury is traumatic (e.g. motor vehicle accident, an external force to the head such as falls, assaults) the individual is classed as having sustained a traumatic brain injury (AIHW, 2007). In the United States between 100-250 per 100,000 are admitted to hospital each year with a traumatic brain injury and 20-30% die (Ponsford, Sloan & Snow, 2012). In Australia there is a reported rate of 107 TBI per 100,000 population (AIHW, 2007). Traumatic brain injury severity is strongly predictive of outcome and can be classified on the basis of length of post-traumatic amnesia and varies from mild to extremely severe (Jennett & Teasdale, 1981).

Recovery following traumatic brain injury

Recovery following traumatic brain injury (TBI) is a complex process, characterised by significant individual variability and a long-term course (Ponsford, Sloan & Snow, 2012). Following relatively rapid improvements in the early weeks and months post-injury, individuals with extremely severe brain injuries typically exhibit complex, multiple impairments and their rate of recovery is slow. Such individuals are more appropriately managed under a model of slow stream rehabilitation where therapy inputs are tailored to shape small, but meaningful changes in function over an extended time frame (Sloan, Callaway, Winkler, McKinley, & Zino, 2012). The nature and extent of functional adaptation achieved is heavily dependent on the range of experiences and types of environments to which a brain injured person is exposed (Gould & Gross, 2002). Evidence points to a number of critical factors in the social and physical environment including the need for meaningful environmental stimulation, opportunities for goal-directed learning, and minimisation of the experience of pain and stress (Tierney, 2004). Irrespective of time post-injury, intervention which is personally meaningful to an individual and contextualized within their living environment has been shown to result in significant changes in functional

independence, community integration and participation in meaningful life roles (Sloan et al., 2009b).

Outcomes following TBI

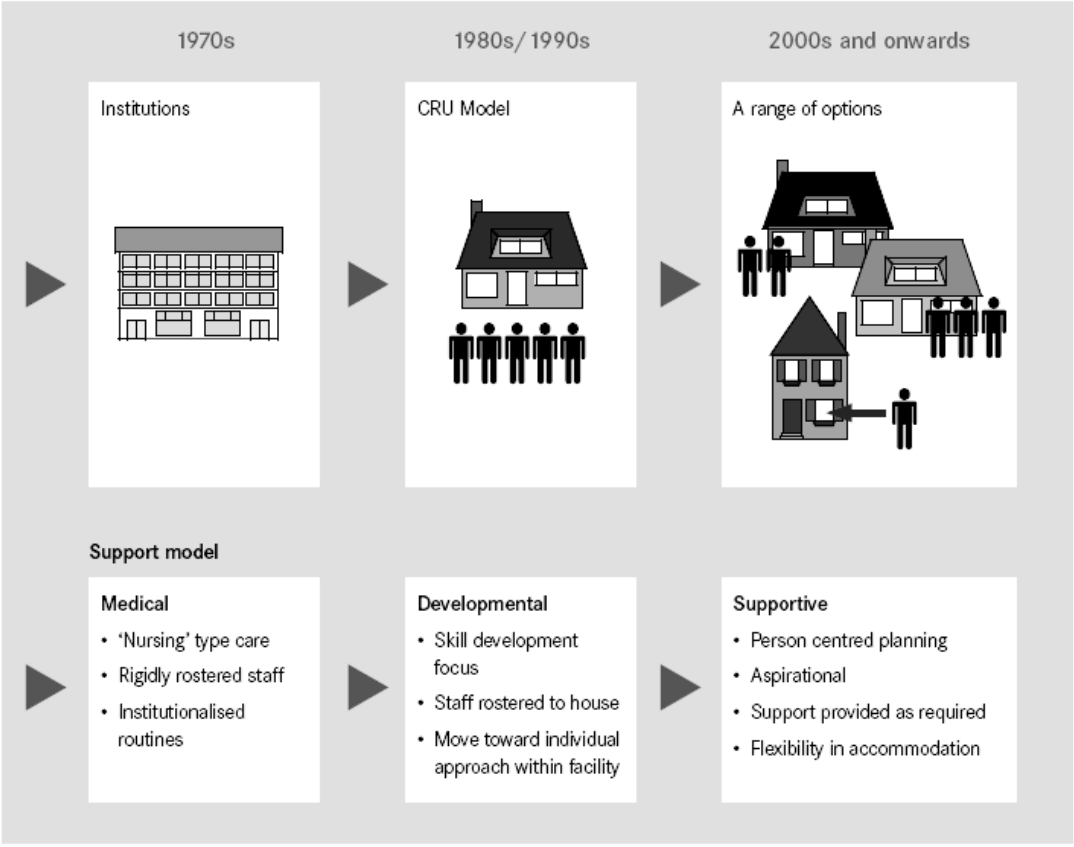
Outcomes following severe TBI vary but, despite the recovery processes discussed above, individuals typically experience lifelong cognitive and behavioural impairments that adversely affect community integration, independence and life role participation. Such impairments necessitate high levels of support delivered within home and community settings – for many, this may be up to 24-hour care and indicate a need for long term supported accommodation. In addition to the impact on those injured and their families, there are significant lifetime costs associated with ongoing disability and attendant care needs (Gruen, Bragge, Sedgman, Pitt, & Chau, 2011, p. 4). The fact that a high percentage of these survivors are young (< 30 years of age) means that they, and their families, will require access to support for many years to complete everyday activities and participate in the life of their community (Ponsford, 2003; Strettles, Bush, Simpson, & Gillet, 2005; Tate, 2003). Meeting the specific and varied accommodation and support needs of people with brain injury is complex and costly, but the option chosen for, or by, the individual will have a substantial impact on the level of independence they achieve (Sloan et al., 2012). Ideally a range of accommodation options is desirable, so that a continuum of support can be provided – as a person regains skills and abilities a move to more appropriate accommodation and support can follow (Brain Injury Association of Queensland, 2010). Yet currently there are limited models available and the best models of long term care still need to be determined (Institute for Safety Compensation and Recovery Research, 2012).

Supported accommodation

Individuals able to return to a home-like setting often do so with the addition of a structured support model, typically comprising unpaid support of family and other community members, as well as paid care (Sloan et al., 2012). Those with high care and support needs may be unable to return to their pre-injury living situation or access home-like settings due to the level of support required. For those unable to live in home-like settings, a small range of disability-specific accommodation and support options are typically available, in the form of cluster units, group homes, and residential aged care facilities (Winkler, Sloan, & Callaway, 2007a).

Over the last three decades, state governments in Australia have identified a need for change in the delivery of housing and support to people with lifetime care needs, with de-institutionalisation being the first step in this change process. More recently, there has been a shift in focus to developing models of long term housing and support that take an individualised approach to the promotion of independence, community inclusion and meaningful participation for people with severe disabilities (Ponsford et al., 2012; Whiteneck, Gerhart, & Cusick, 2004; Ylvisaker, 2003) as well as offering a continuum of both housing and support to maximize outcomes over time. The changes in community based accommodation for people with disability over recent decades are detailed in Figure 1 below.

Figure 1: Changes in community based accommodation



(Pearson, 2008)

Sustainable and appropriate supported accommodation is a combination of housing, tenancy and day-to-day support with activities of daily living. Until recently these services have varied only in relation to the number of people who share the house with little consideration of individual preferences, whether sharing is the best option for the person, or their decisions about with whom they may wish to live (DHCS, 2010, p.11).

In Australia, there has been a range of key issues identified in relation to supported accommodation for people with up to 24-hour care needs, including:

- Greater demand for supported accommodation in the community due to aging caregivers, devolution of large residential centres and increasing numbers of people with lifetime care needs seeking support;
- A need for flexibility in the range of accommodation supports available for people, and the capacity of these to change over time as a person's needs change;
- Identification of models aligned with achieving community participation and quality of life for residents (DADHC, 2004; DHCS, 2010).

The accommodation choice of people with complex needs is often driven by the cost and available resources; the availability of paid and unpaid support, and the families/guardians' need for a safe, secure and sustainable environment for their family member (DHCS, 2010). Limited supply of supported accommodation can impact the available choice in terms of where the accommodation might be located, or with whom the individual lives. As a consequence, this can result in people with TBI continuing to stay in the family home, which can place significant strain on relationships, and may act as a barrier to independence (Beer & Faulkner, 2008).

Compensation for people with TBI in Victoria

In Victoria, Australia, those people who sustain a TBI in a road accident receive compensation through the Transport Accident Commission (TAC). The TAC is a Victorian Government-owned organisation which provides no-fault compensation to all persons injured in road accidents (Huggett & McDonald, 2011, p. 13)

From May 2004 to May 2005, there were 213 new TAC major injury claimants. Of this group, 163 had a severe TBI and over 70% were aged less than 65 years, with over 50% aged less than 50 years (DHS, 2005). As a result of improved medical technology and rehabilitation the number of people with TBI, and the complexity of their needs, has dramatically increased over the past two decades (DHS, 2001; Papastrat, 1992). People who sustain a very severe brain injury, who once would have died at the scene of the accident or in hospital are now surviving (Lippert-Grüner, Maegele, Haverkamp, Klug, &

Wedekind, 2007). Many of these people require long term and high levels of support to live in the community.

Supported accommodation for people with TBI who receive compensation

Access to higher levels of financial resources through compensation provides greater choice and opportunity for individualised accommodation and support solutions. Many people choose to receive funded support to enable them to return to their own, or the family, home (Winkler, Farnworth, Sloan, Brown, Callaway, 2010). However, for those people unable to return to their own or the family home, the shortage of disability housing and support options also has a significant impact on compensable clients (TAC, 2011). For example, the number of TAC clients in supported accommodation has risen from 100 in 2004, to over 200 in 2011 with the numbers estimated to increase to over 300 by 2019 (TAC, 2011). This current situation provides TAC with a number of key challenges to not only continue to increase the overall capacity (i.e. “depth”) and quality of accessible supported accommodation in the community, but offer a greater range of choice (i.e. “breadth”) to meet clients wants and needs (TAC, 2011, p. 7). The TAC has recognised the current limitations in models of supported accommodation for their client group and has developed an Accommodation Strategy to work to address the restrictions experienced (TAC, 2011).

Why it is important to do this review

Given the level of need and current activity in the area of housing and support, a key piece of evidence to inform practice is currently missing. To date, there has not been a systematic review of supported accommodation for people with TBI. Within this context, the lead author of this project proposed the current review to ISCRR and the TAC. Hence this current project was incepted. This systematic review is being conducted to comprehensively identify all models of supported accommodation that are part of current international practice and the effect these models have on outcomes for people with TBI. It is timely that policy makers are aware of the types and range of models in current practice, as well as the evidence of their impact on people with TBI, in order to make evidence-informed decisions on what works, what can be improved upon, and how we might ultimately achieve meaningful community-based living for people with TBI.

2. METHODS

Review Objectives

This review had two key objectives:

1) To identify and describe the characteristics of models of supported accommodation for people with TBI and;

2) To assess the effects of models for supported accommodation on outcomes for people with TBI.

Search strategy

Five electronic databases were searched: Cochrane Central Register of Controlled Trials (September 25, 2012), MEDLINE (OvidSP; 1946 to September 6, 2012), EMBASE (1974 to September 5, 2012), PsycINFO (OvidSP; 1987 to August week 4), and CINAHL (EBSCOhost September 6, 2012). We searched for grey literature, including national and international government reports and peak body positioning papers. A Google Advanced search was undertaken to identify resources directly related to supported accommodation as well as websites of government departments and peak organisations associated with housing and support for people with TBI. Experts in the field of TBI community practice were also contacted and asked to recommend key references.

Search terms

Refer to Appendix A for a list of the search terms used.

Criteria for considering studies for this review

Types of studies

Articles and information sources that described any model of supported accommodation were included in this review, regardless of study design or publication type (objective 1). Grey literature was included in this review when describing characteristics of models of supported accommodation for two main reasons: 1) due to the range of past state and federal government initiatives in Australia leading to the development of supported accommodation models for people with disability; and 2) the authors were aware that internationally there has been supported accommodation developed for people with TBI

which has not necessarily been published in academic literature, but is available via organisations and government bodies. However, when assessing the effects of models of supported accommodation on outcomes (objective 2), only randomised and non-randomised studies that include a comparison group that did not have supported accommodation (e.g., groups that received support only, accommodation only, or institutionalised care) were included. Study designs that provided a comparison at baseline were also considered, such as controlled before and after studies, and interrupted time series. Single case series and individual case reports were excluded when examining effects of models on outcomes, as these study designs do not provide group comparisons of the effects of supported accommodation compared with other living environments. Unless this comparison is present, it is difficult to determine if the accommodation model has in fact influenced outcomes.

Types of participants

Studies involving people with TBI at any age over 18 years, who required assistance with accommodation and tasks associated with daily living were including in this review. Studies involving mixed populations (e.g., people with acquired brain injuries) were included where it is clear people with TBI were a sub-group of the sample, and where possible attempts were made to obtain separate data for those individuals.

Studies of populations with neurodegenerative conditions such as multiple sclerosis or Huntington's disease were excluded. Studies of populations with a primary diagnosis of mental illness, disabilities, or substance abuse were also excluded. Populations described with these conditions were only included in the review in the case that TBI was the primary diagnosis.

Types of interventions

The intervention examined in this review was referred to as 'supported accommodation' and involved two dimensions; 1) provision of accommodation, and 2) support services required for the person to live in the community.

For the purpose of this review, interventions were considered as 'supported accommodation' if they meet the criteria described in both A and B below.

A. Accommodation

Public or private accommodation provided to people with TBI in a community-based setting. Accommodation provided in institutional settings such as locked facilities, neuropsychiatric facilities, or residential aged care facilities were excluded. Temporary accommodation options such as respite facilities or transitional living arrangements were excluded. Accommodation could be provided at no expense to the individual or as part of a subsidised financial arrangement. Studies of individuals living in a home they had secured using their own financial means (rather than being provided by the service system), or which had been provided in a private arrangement by family (in a full time capacity) were excluded (i.e., individuals that do not require accommodation to be provided to them beyond what the family is willing to provide). We also excluded studies describing accommodation provided by housing services without a formal link to support for daily living activities.

B. Support

Support was defined as any assistance with activities that are part of daily living. For the purposes of this review, support could be provided by any individual including family, carers, disability support workers, health professionals or service providers (e.g., cleaner, gardener, personal assistant) and could be either paid or unpaid. Support could be provided in person or remotely (via phone or computer) and could be delivered at any time (such as 24-hour care, weekly or occasional support) as needed. We only included studies that described formal arrangements for providing support to individuals as part of their living arrangement.

Types of outcome measures

Primary outcomes

Individuals opting out of supported accommodation (moving to full time family support or independent living or full-time residential or institutional living, such as an aged care facility).

Secondary outcomes

Patient-reported outcomes

Goal attainment scale

Quality of life

Activities of daily living

Function

Disability

Self-efficacy

Mental health

Continence

Eating / mealtime assistance

Choice

Communication

Indicators of social inclusion (e.g., visitors/social contacts/interpersonal relationships with friends and family)

Employment

Community participation (e.g., volunteerism, work, study)

Access to the community (e.g. going to the shops, participating in leisure activities)

Quality assessment undertaken

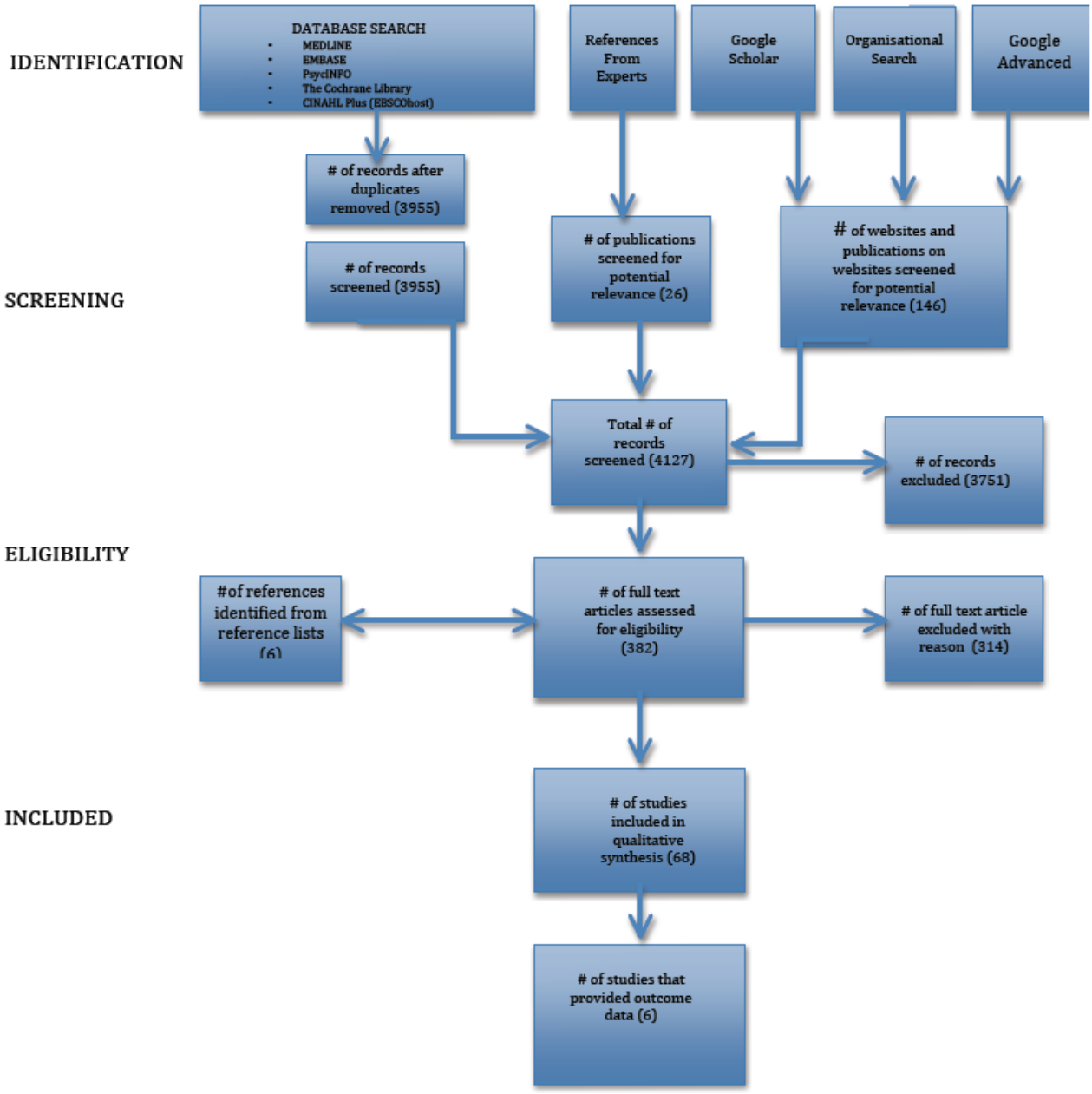
This review utilised the Newcastle-Ottowa Scale (Wells et al., n.d.). The Newcastle-Ottowa Scale was developed to assess the quality of non-randomised studies when undertaking a systematic review.

3. RESULTS

Search results

Our search identified 3,955 articles, 146 web-based records, and 26 references from experts that were independently screened by two reviewers. Of these, 3,751 records were excluded, as they did not meet our eligibility criteria. Full texts were retrieved for the remaining 376 publications, and two people independently reviewed each of these. Reference lists of relevant articles were also searched to further identify any potential studies for inclusion. A flow diagram of the selection of studies is provided in Figure 2.

Figure 2: Flow diagram of the selection of studies



(Liberati et al., 2009)

Characteristics of models of supported accommodation for people with TBI

Nineteen peer-reviewed journal articles and two chapters in edited text books that described models of supported accommodation were identified that met inclusion criteria. In addition, 15 Australian federal or state government reports were identified via database searching as well as 17 web-based citations. Consultation with experts in Victoria and with national brain injury peak bodies resulted in 15 additional reports or journal articles that were located and included in this review. Thus a total of 68 publications were

identified that met the inclusion criteria for objective one, describing the characteristics of models of supported accommodation for people with TBI.

Characteristics of accommodation

Thirteen different types of accommodation were identified (Table 1).

Table 1. Characteristics of accommodation

Model	Description
Cluster housing	Cluster housing is defined as the provision of multiple dwellings for people with disability on a single site, with communal facilities and shared resources or services (Victorian Coalition of ABI Service Providers, 2007). The type of dwelling may include small houses, units (Fisher et al., 2008; Huggett & McDonald, 2011; MS Australia, 2007), or apartments (Martin & Beamish, 2008a).
Unit housing hub	A series of small units under multiple rooflines surrounding an office or sleep over building (DHCS, 2010).
Co-located models	The provision of domestic accommodation with five to ten bedrooms under one or two rooflines with 24-hour support. This model could include a duplex, apartment or house plus granny flat (DADHC, 2009).
Residential group home	A community based residential home where typically four to six people with disability live together with 24-hour shared support (DADHC, 2009; Pearson, 2008).
Adult foster home Adult family home Alternative family placement	These models provide a payment to an alternative family carer for the support provided to a person with disability through placement in the family's private home (Accessible Space Inc., n.d; Brain Injury Association of North Carolina, n.d; DADHC, 2009; Wisconsin Health Care, n.d.).

Model	Description
Co-residency or co-tenancy (home-share) model	People with a disability co-tenant with people without a disability, mainly using private rental options. Under negotiated Occupancy Agreements, the co-tenants without disability lives either rent-free or on a reduced rental in exchange for the provision of some discrete day-to-day personal and / or tenancy support (e.g. shopping, being home certain hours, some household tasks) (DHCS, 2010).
Assisted living facility	This model offers semi-institutional hostel living. Residences provide semi-private accommodations where people share a room, or where there will be two bedrooms, with a shared kitchen and living area and each person having access to their own bathroom (Bowe, 1993).
Duplex, dual occupancies and triple occupancies	Re-development of a residential block, originally designed for a single dwelling to accommodate two houses with the potential for shared support (DHCS, 2010). The two dwellings may be joined by a shared staffing space. A triple occupancy is based on the same principle as dual occupancy, but with three dwellings on one block.
Unit housing under a single roof	A series of independent or semi-independent units surrounding a communal living and kitchen area (DHCS, 2010).
Village model	Designed to accommodation 80–100 residents in five to ten bed units with 24-hour support. This model is based on existing models in residential aged care and modified for people with disability (DADHC, 2009).

Model	Description
Linked / networked / keyring / close housing support housing model	A model whereby a community organisation provides homes located over a specific geographical region. This support model intentionally sets a number of properties within close proximity for the purpose of creating opportunities for people to share support while enabling people to live without full-time formal support in their home. Tenancy is managed by the organisation and support for day-today living can be provided by a range of agencies but coordinated by one organisation. People are encouraged to become familiar with, and connected to, their local community and thereby build and maintain a range of natural supports from within their neighbourhood and community that augment their formal supports (DHCS, 2010).
Responsive landlord model Supportive tenancy management Concierge model	This model provides a higher level of tenancy support via a landlord or concierge model. Additional tenancy support may include budget management, organising utilities, negotiating with flatmates, paying utilities and property maintenance. The responsive tenancy manager does not provide in home accommodation support (DHCS, 2010).
Integrated apartment living	In contrast to a cluster apartment model, integrated apartment living provides individual apartments for a number of sole occupants, dispersed throughout a larger residential apartment development and with access to a single apartment or quarters for location of shared staffing support (DHCS, 2010; Vander Schaaf, 1990).

Of the 68 articles identified that included information on supported accommodation, only 18 articles provided a detailed description of the supported housing design. The other fifty articles offered limited or no detail of the accommodation, other than the category of housing provided (e.g., group home; cluster unit). Appendix B lists those references describing each of the models of housing identified.

Characteristics of support

Five different types of support were identified (Table 2).

Table 2. Characteristics of support

Model	Description
Disability support / attendant care worker	A person who is appropriately trained and employed by an attendant care agency to provide direct support services, with an independence approach (TAC, 2013).
Living skills trainers (LSTs)	LSTs are paraprofessionals, typically college graduates with additional training in the behavioural sciences. LSTs undergo a 40-hour orientation training curriculum that consists of lectures, tapes, resident observation, and participation in care activities under direct professional supervision. Areas of training include but are not limited to: brain injury overview□, behaviour management, medications□, seizure management□, sexuality□, psychosocial issues□, psychiatric emergency management, infection control, body mechanics, family issues, and stress management. LSTs are responsible for the hands-on daily care and supervision of the residents. These duties include assistance with self-care, therapeutic activity, productive activity, home management skills, transportation, and the like. The primary objective of a LST's intervention is to facilitate and enhance the injured individual's cognitive skills by supplying consistent orientation information, redirection, assistance with problem solving, encouragement of targeted behaviours, and cueing for safety awareness (Alexander & Roughan, 1997, pp. 61-62)
Foster support	Support provided by an individual or couple, in their private home, with the return of payment or subsidy.

Model	Description
Para-professional staff trained in brain injury	These staff members typically possess some background in the human service field (e.g., bachelor's degree in psychology) or special training (e.g., nurse's aides). Many are trained in first aid, CPR, protective intervention techniques, secure management, behavioural intervention, and management of brain injury sequel. Some programs additionally require staff members to have special training in recreation, counselling, or vocational interventions (Eicher, Murphy, Murphy & Malec, 2012; Jackson, 1994)
Family / informal support	Unpaid support provided by a direct family member, friend or partner, with no formal agreement regarding, or payment for, the support delivered.

Of the 68 articles identified that described models of supported accommodation, 30 provided a detailed description of the type of support provided within the model. Thirty-eight articles only offered limited, or no, detail of the support provided. Refer to Appendix B for details the references associated with each of the models of support identified for people with TBI in this review. Further details regarding the characteristics of accommodation; paid support; direct support staff qualifications; any other form of support provided in the model besides paid support; the location and community within which the accommodation was located; and cost of the supported accommodation model are provided in Appendix C.

Effects of supported accommodation on outcomes for people with TBI

Five peer-reviewed journal articles assessed the effectiveness of supported accommodation for people with TBI (Eicher et al, 2012; Sloan et al, 2012; Sloan et al, 2009a; Winkler et al, 2010; Burleigh et al, 1998). In addition, one Australian report was identified (Winkler et al, 2012). Of these articles, four were published by the same author group in Australia (Sloan et al, 2012; Sloan et al, 2009a; Winkler et al, 2012; Winkler et al, 2010). Two of these publications involved the same group of participants (Sloan et al,

2012; Sloan et al, 2009a). Thus, overall, the six publications identified that examined the effects of supported accommodation on outcomes for people with TBI represented five separate studies.

Four studies described the need for contextualised slow stream or post-acute rehabilitation provided to the person within their home and community settings (Eicher et al, 2012; Sloan et al, 2012; Sloan et al, 2009a; Burleigh et al, 1998) and the impact this rehabilitation had on long term outcomes for people with TBI. Eicher et al (2012) described four different models: intensive residential rehabilitation; long-term residential supported living; long-term community based supported living; and intensive outpatient and community-based rehabilitation. Only the long-term residential supported living in the Eicher et al (2012) study met the inclusion criteria for this review. The authors found "evidence of the effectiveness of residential and community-based intensive post-hospital rehabilitation programs in contrast to supported living programs" in addition to evidence that "supported living programs accomplish their stated goal of stabilising functional status" (Eicher et al, 2012, p. 106). A study by Sloan and colleagues utilised the Community Approach to Participation (CAP) (Sloan, Winkler & Callaway, 2004), a recognised evidence-based rehabilitation model in the field of TBI (Volpe, 2011; O'Brien et al, 2010). The authors assessed the impact of CAP intervention on individual outcomes, including the capacity to improve independence (Sloan et al, 2009a), increase life role participation, and allow the person to transition to more home-like living arrangements (Sloan et al, 2012). The type of accommodation setting was related to the amount of support provided, with statistically higher levels of support provided to those in disability-specific settings. In addition, there was no significant change in paid care or gratuitous care hours across the intervention period for the disability-specific group. There was a significant decline in total care hours for the home-like group over the three years of intervention, with an average decrease of 20.49 hours per week. For those people who transitioned across accommodation during the intervention period, the aim of an accommodation transition was to move to a more independent, or less restrictive, living environment. Burleigh et al (1998) offered limited detail regarding the model of supported accommodation, reported as either supported apartment services (24-hr supervision available with home-based or community-based intervention) or group residential services (24-hr supervision provided on site with home-based or community-based intervention) (Burleigh et al, 1998, p.47). Findings of the Burleigh et al (1998) study indicated that participants living in supported apartment

settings reported significantly more home integration than did participants living in residential or shared homes.

There were no randomised controlled trials identified assessing the effects of supported accommodation for people with TBI. Of the six publications, two were surveys (Burleigh et al, 1998; Winkler et al, 2010), two were case series (Sloan et al, 2012; Winkler et al, 2012), and two were retrospective cohort design (Eicher et al, 2012; Sloan et al, 2009a). The number of participants in each study ranged from 30 (Burleigh et al, 1998) to 604 (Eicher et al, 2012); however, those participants living in supported accommodation which met the inclusion criteria for this review ranged from 9 (Sloan et al, 2012) to 246 (Eicher et al, 2012). The studies identified used a range of measures to examine effects of living situation on outcomes, limiting the ability to compare outcomes across studies, even where supported accommodation settings were comparative.

Table 3 on page 25 provides an overview of the publication type, study design, sample size and outcomes measures used in the five studies (within a total of six publications) assessing the effects of supported accommodation for people with TBI. Table 4, page 26, provides a summary of the accommodation models studied, and key findings, within each of the six publications.

Table 3. Overview of design of studies assessing the effects of supported accommodation for people with TBI

Authors	Publication Type	Study Design	Sample Size	Measures used
Eicher et al, 2012	Journal	Retrospective cohort	246 met inclusion criteria for review, out of total 604 participants (41% of sample)	Mayo-Portland Adaptability Inventory
Sloan et al, 2012	Journal	Case series	9 met inclusion criteria for review, out of total 43 participants (21% of sample)	FIM CANS Role Checklist CIQ Hours of paid / gratuitous care Customized accommodation transition factors checklist
Sloan et al, 2009	Journal	Retrospective cohort	16 met inclusion criteria for review, out of total 85 participants (19% of sample)	FIM CANS Role Checklist CIQ Hours of paid / gratuitous care
Winkler et al, 2010	Journal	Survey	128 met inclusion criteria for review, out of total 189 participants (68% of sample)	Customized questionnaire regarding activities and participation CANS
Burleigh et al, 1998	Journal	Survey	22 met inclusion criteria for review, out of total 30 participants (73% of sample)	CIQ Life Satisfaction Index-A
Winkler et al, 2012	Victorian government report	Case series	34 met inclusion criteria for review, out of total 68 participants (50% of sample)	CANS Role Checklist CIQ Personal Wellbeing Index Overt Behaviour Scale Resident Choice Scale

Table 4. Overview of models and key findings of studies assessing the effects of supported accommodation for people with TBI

Authors	Supported accommodation model/s	Other Models of Accommodation or Support	Key Findings
Eicher et al, 2012	Long-term residential supported living, provided within an assisted, supervised residential setting	Living with spouses or alone in their own home or apartment; intensive residential rehabilitation; long-term community-based supported living in the person's own home	This article compared the effect of four types of intensive rehabilitation programs in Pennsylvania, USA: intensive outpatient and community-based rehabilitation (n=235), intensive residential rehabilitation (n=78), long-term residential supported living (n=246) and long-term community-based supported living (n=45). The third program, long-term residential supported living, satisfied the supported accommodation inclusion criteria for this literature review. The residential supported living program was "designed to preserve optimal level of health and assist participants in their ability to care for themselves, participate in a stable activity plan, and preserve medical, physical, neurocognitive, mood, and behavioural stability in an assisted, supervised residential setting. Most of the participants' programming and care is provided by residential paraprofessional staff trained in brain injury rehabilitation, with licensed therapists available to provide reassessments and intermittent therapy as needed" (Eicher, Murphy, Murphy, & Malec, 2012, p. 100). This study showed evidence of the effectiveness of residential and community-based intensive post–hospital rehabilitation programs in contrast to supported living programs in improving outcomes for people with TBI. Results also provided evidence that supported living programs accomplish their stated goal of stabilizing functional status for participants (Eicher et al., 2012, p. 106).
Sloan et al, 2012	Cluster units; shared supported accommodation	Living with spouse, family, friend or alone in own home or	This Australian case series study of 43 people aimed to document and compare living situation outcomes of a group of individuals with severe ABI who received Community Approach

	(group home)	apartment; living with others in a separate area of the home; Australian Defence Force; residential aged care; locked neuropsychiatric unit	to Participation (CAP) occupational therapy input (Sloan, Winkler & Callaway, 2004) over a 3-year period. In addition it explored the range of disability-specific and home-like housing and support models accessed by the group and sought to examine whether there is a relationship between these models and levels of independence, community integration and participation. Finally, the study aimed to investigate transitions in accommodation that occurred within the 3-year intervention period (Sloan et al., 2012). The 43 participants in this study, who had previously been reported on (Sloan et al, 2009a; Sloan et al, 2009b), lived across a range of home-like environments (home alone with or without support, home with friends, family or a partner, or living with others but in a separate area of the house, such as a moveable bungalow) and disability-specific settings (group home, cluster unit, residential aged care, secure neuropsychiatric facility). Ten participants experienced a total of 12 accommodation transitions over the 3-year intervention period, whilst 33 remained living in the same setting. The study found that individuals with high care and support needs may be unable to return to their pre-injury living situation or access home-like settings. Those able to return to a home-like setting did so with the addition of a structured support model, typically comprising gratuitous support of family and other community members, as well as paid care. For those unable to live in home-like settings, a small range of disability-specific accommodation and support options were available (Sloan et al, 2012, p. 37). Findings highlighted that the type of accommodation setting was related to the amount of support provided; however, the authors also pointed to the limited flexibility within disability-specific accommodation to tailor and grade supports over time to meet the range of individual needs within community living, when compared with home-like settings

			(Sloan et al, 2012, p. 37). Consistent with these observations, the study found that support hours for the disability-specific group did not reduce over the 3 years of intervention. In contrast, for those in home-like settings, there was a statistically significant mean reduction of 20.48 hours support hours per week by the end of the 3-year study (Sloan et al, 2012, p. 38).
Sloan et al, 2009	Shared supported accommodation (group home)	Living with spouse, family, friend or alone in own home or apartment; living with others in a separate area of the home; Australian Defence Force; residential aged care; locked neuropsychiatric unit; rehabilitation centre	This article details a case series of 85 Victorians with severe ABI who received up to 12 months of Community Approach to Participation (CAP) intervention (Sloan, Winkler & Callaway, 2004). The aim of this study was to investigate the participation outcomes of the group. As part of this, living situation was examined at baseline and at 12 months post intervention. Sixteen of the 85 participants resided in supported accommodation, thus meeting the inclusion criteria for this review. Statistically significant increases in level of independence in basic daily activities and community integration were found for all participants from baseline to T1 (a 12-month time period). The number of roles in which participants engaged increased on average by almost one role per participant following intervention, with increased participation in volunteer, home maintainer, participant in organisations and hobbyist roles most common; however, this was not statistically significant. This study demonstrated the potential for improved participation outcomes for people with complex needs following ABI, even many years post injury (Sloan et al., 2009a, p. 282). The authors went on to provide details of three years of outcome data for a sub group of this participant population (Sloan et al, 2009b), as well as accommodation outcomes and transitions for this subgroup (Sloan et al, 2012).
Winkler et al, 2010	Shared supported accommodation (group home)	Residential aged care	This Australian study involved a postal survey to describe the characteristics, support needs and level of community inclusion of 128 people with ABI living in shared supported

			accommodation service (SSA) and compared these characteristics with 61 people with ABI aged under 50 years living in a residential aged care facility (RAC) from a previous study by the authors (Winkler et al, 2007). The study found that people with ABI living in shared supported accommodation required a similar level of support to the comparison group of people with ABI living in RAC, but went outside, participated in community based leisure activities, and visited friends, more often. There was no significant difference between the two groups in the frequency of visits to the facility from relatives or friends. This study suggested that the type of accommodation and support had a significant impact on the frequency of community participation experienced by people with ABI and high care needs (Winkler et al., 2010, p. 323), with improved outcomes for the group living in shared supported accommodation versus that group living in aged care.
Burleigh et al, 1998	Supported apartment services (24-hr supervision available with home-based or community-based intervention), and group residential services (24-hr supervision provided on site with home-based or community-based intervention)	Living with spouses or alone in homes or apartments	Examining the relationship between the degree of community integration to life satisfaction of the person with TBI living in America, this article included a total of 30 participants living across three community settings: 12 lived in supported apartment services (24-hour supervision available in home or community settings), 10 in group residential services (24-hour supervision provided on site), and eight in home-like settings with family. The first two settings met inclusion criteria for this review. Data was collected face-to-face by the researcher. A key finding of this study was that “participants who lived in supported apartments scored significantly higher on home integration scores than those who lived in group residences or shared homes” (p.50). The authors went onto point to a range of possible reasons for these findings, including higher levels of functioning of those people in the apartments compared to the other two settings or the structure of each of the living situation

			(Burleigh et al, 1998). The authors pointed to the need for rehabilitation program planning which focuses “on maximising clients abilities for social integration with others in the community” (Burleigh et al, 1998, p.49).
Winkler et al, 2012	Shared supported accommodation (group home)	Residential aged care	This study evaluated quality of life outcomes for a cohort of participants involved in the Victorian Younger People in Residential Aged Care (YPIRAC) Initiative. The study aims were: 1) to measure changes in the health, independence, and community inclusion of Victorians aged under 50 years who received funding through the Victorian YPIRAC initiative and 2) to provide comparison of the quality of life outcomes of the people assisted through the initiative with the quality of life of young people with disabilities living, or previously living, in RAC without YPIRAC support. There were three sub-groups of participants: people who moved out of aged care (group 1 – RAC Exit Group); people who diverted from living in aged care (group 2); and people who received funded supports to remain living in aged care (group 3). Group 1 met the inclusion criteria for supported accommodation in this review. There were 34 participants in group 1, thirteen of whom had both pre-move (living in RAC) and post-move (living in traditional shared supported accommodation) data. For those people who moved out of aged care, findings “demonstrated that not only can people with high disability support needs be successfully supported to live in community settings, but that also their lives are enriched when placed in more normalised, age-appropriate environments with person-centred supports. The RAC Exit Group had more frequent community access and was provided with more opportunities to make everyday choices. There was also an increase in its frequency of social contact. Group members spent fewer hours in bed, and went outside more often. A more home-like

			environment and additional supports enabled some people who moved to demonstrate their potential for increasing their independence in a range of personal and domestic tasks" (Winkler et al, 2012, p. 2). For the group of 13 participants with pre- and post-move data, there was evidence that participants spent fewer hours in bed, were able to be left alone for longer periods of time, went outside more often, received visits from friends more often, had greater involvement in home integration tasks such as shopping and cooking, and had the greater opportunity for choice (e.g., regarding meals or the time they went to bed) after they moved out of RAC. These participants also were involved in a greater number of life roles after they moved (Winkler et al, 2012).

Quality assessment findings

This review utilised the Newcastle-Ottowa Scale to assess the quality of the included observational studies (Wells et al., n.d.). The participants of the included studies were representative of the general TBI population living in the community in most studies. The exceptions were Eicher et al, 2010 and Winkler et al, 2010, in which surveys were conducted among managers of shared supported accommodation (SSA) services in Victoria to get information on people with TBI. In all studies, both exposed and non-exposed participants were recruited from the same TBI community. One study used interviews to ascertain the dwelling situation of the participants (Sloan et al, 2009a) whilst the others used secure records (e.g. institutional records). In surveys that were conducted among shared supported accommodation managers, the authors used institutional records to gather information about the TBI participants and therefore these two studies (Eicher et al, 2010 and Winkler et al, 2010) are categorized as studies those obtained data from secure records. None of the studies adjusted for injury severity. Outcomes were mostly obtained through questionnaires and medical records and one study did not report how this was obtained (Winkler et al., 2012). Four studies reported for how long the patients received intervention (Eicher 2012; Sloan et al, 2009 and 2012; and Winkler et al., 2012). Because most studies relied on available medical records to gather information and the response rate was high in surveys, loss to follow up was not a major issue. Only one study (Winkler et al., 2012) did not report on how many patients were initially received the intervention and how many were lost to follow up.

Refer to Appendix D for details of the quality assessment findings.

4. DISCUSSION

Key review findings

There were three key findings of this review:

1. Most of the existing TBI literature describes a restricted range of disability-specific supported accommodation options and, of the models described, there was limited detail reported on the type of housing or support provided to people with TBI for the reader to be fully able to understand, compare and consider models;
2. Within the international TBI literature, there is limited evidence available regarding the impact supported accommodation has on outcomes of people with TBI;
3. Of the evidence that is available, participant numbers were small, studies varied in design (survey, cohort, case series), a range of measures were used, and the supported accommodation models studied were restricted to traditional group home or cluster settings.

Strength and limitations of the evidence

The restricted number of publications identified through this review, which were provided by a small group of authors from two countries (the United States of America and Australia), points to the urgent need for further research to assess the effects of models of supported accommodation on outcomes for people with TBI.

Of the five studies (total six publications) identified that met the inclusion criteria for objective two in this review (examining the effects of models on outcomes for people with TBI), only a low level of evidence was available (National Health & Medical Research Council, 2009). The level of evidence provided in the studies was significantly impacted by:

- Predominantly small sample sizes
- Mixed cohorts (ABI and TBI)
- Study design
- Study location (USA or Australia)
- Varied models of supported accommodation provided (and limited detail regarding the specific characteristics of the models)
- An inability to examine the results of the sub-group of participants living in supported accommodation specifically.

Study findings should therefore be interpreted with caution.

Limitations of this review

It should be noted that models of supported accommodation that are described in the academic literature do not always translate into clinical practice and, following on from this, practice-based evidence is not always documented in formats accessible to the broader community. Significant findings for this review came from grey literature and references provided by experts in the field. When assessing the effects of models, both controlled and uncontrolled study designs, including observational cohort studies with a comparison group, were included; however, individual case studies were not. As such, qualitative studies that offered individual case examples, aiming to assess the effects of models of supported accommodation on outcomes via subjective experience, were not included in this review (e.g. Huggett & McDonald, 2011; Martin & Beamish, 2008b). Following on from this, we also are aware of individual cases in practice in Victoria where people with TBI and their families have forged innovative and flexible models of long term housing and support (Winkler, Sloan, Seabrook, Anderson, & Callaway, 2013; Winker, Sloan & Callaway, 2007a) – such cases are not captured using an evidence review methodology.

Existing evidence shows that people with TBI are more likely to return to home-like settings when there is availability of natural or informal supports to facilitate this transition (Sloan et al, 2009a; Sloan et al, 2009b; Strettles et al., 2005). The inclusion criteria of this review stated that both the model of housing and the model of support had to be provided by a service system – however, it is important to note that for many people with TBI they may receive a model of 'supported' accommodation within home-like settings, via the assistance provided by paid support staff, or family members. A review of literature on models of care delivered in a person's home, rather than disability-like settings, may provide interesting insights and further evidence regarding the design and impact of community-based models on outcomes for people with TBI, to expand the findings of the current review.

Finally, the inclusion criteria of the current literature review allowed only permanent or long term accommodation and so precluded the reporting of the significant international body of literature on post-acute or transitional rehabilitation facilities, some of which were residential and offered slow stream rehabilitation. The blurring line between post-acute

rehabilitation and long term supported accommodation settings was identified through the current literature review, and this is further discussed on page 42 below.

Implications for research and practice

Implications of the findings within the review include:

- There is a need for documentation and expansion of the range of models of supported accommodation for people with TBI and their families.
- Broadening the range and type of housing and support available to people with TBI may provide greater flexibility to meet individual goals and needs, and may include options that include separation of housing from support provided to the person.
- There is a pressing need for evaluation of impact of housing and support models on outcomes following TBI.
- Supported accommodation should be viewed as part of a rehabilitation continuum within a lifetime care model for people with TBI. An individual's needs are likely to change over time, so the housing model chosen should be seen "as a step in the pathway to a life of choice, rather than an institution of final destination" (Brain Injury Association of Queensland, 2010a).

Each of these implications will be discussed further below. The relevance of these implications to the Transport Accident Commission, the recipients of this review, will be highlighted.

There is a need for documentation and expansion of the range of models of housing and support for people with TBI

The type of accommodation and support provided has a significant impact on the frequency of community participation experienced people with brain injury and high care needs (Winkler et al., 2010). For people with TBI, two main settings are possible: home-like settings or disability-specific accommodation settings. Home-like settings are defined as accommodation accessed through the private or public housing market (via either rental or purchase) and may include living alone, with parents, friends, or a partner or living with others in a separate area of the house (e.g., a detached residence on the property) (Sloan et al., 2012). In these settings, disability support is not linked to the accommodation and thus, if support is required, it is sourced and structured separately from the housing. Disability-specific settings include cluster units, group homes, and residential aged care facilities (Winkler et al., 2007a). Most often in disability-specific supported accommodation

one provider delivers both the housing and support. Refer to Figure 3 below for an overview of the range of long term housing and support options for people with TBI currently available.

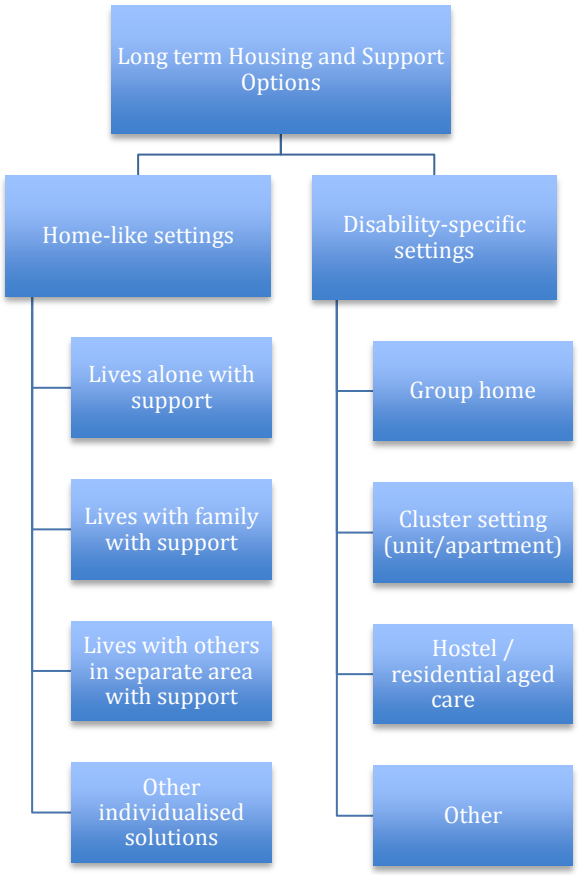


Figure 3: Long term housing and support options for people with TBI

In supported living, there is a challenge in balancing the right to privacy and dignity of risk with the need for supervision to ensure safety. Finding a supported accommodation model that provides the individual with the greatest amount of personal control that he or she can responsibly exercise becomes more complex as the person's need for supervision or support increases (Jacobs, Blatnick, & Sandhorts, 1990). Higher levels of support are generally provided in disability-specific models and the support hours are fixed to the needs of the group of residents, rather than the individual. There is typically less scope to modify supports in accordance with an individual's changing needs (e.g., improved independence, increased behaviours of concern). In contrast, individuals in home-like settings may live in a range of housing types within community settings. Typically, support may comprise both paid and informal supports and can be tailored and adjusted to individual needs.

Participation, behaviour and function may be improved by matching the individual with the most appropriate accommodation and support model and ensuring this model can be flexible and responsive to changing needs over time. However, the variety or scale of supported accommodation options required to meet the range of individual needs and lifestyles of people with TBI is currently limited, and most often provided within a block-funding model where housing and support is delivered by the one provider. This is a current limitation in the service sector, as disability-specific housing models tend to be quite homogenous, with the choice being largely between community-based group homes, cluster units, or more institutional facilities such as residential aged care. "The standard group home model in Victoria … will always have a role for individuals with very high support needs, but it is reasonable to conclude that as the National Disability Insurance Scheme advances, [group homes] are an accommodation model that may not necessarily fit well with the key principles of individualisation, choice and control" (Willingham, 2012). The current restricted range of options and block-funding of services demonstrates the disconnection between the disability policy aspirations and the lived experience of people with ABI and other disabilities (Disability Service Commission of Western Australia, 2008; Pearson, 2008) and adversely affects capacity for, and choice of, accommodation and support transitions over a person's lifetime (Sloan et al., 2012), pointing to the need for an expanded range of flexible housing and support options.

Through this literature review, internationally, thirteen models of housing and support for people with TBI were identified, only three of which aren't already being, or about to be, trialled by the TAC – the linked or networked community model; co-residency or co-tenancy (home-share) model; and the responsive landlord or concierge model. These three point primarily to new models of support being provided, rather than built design. The limited, existing literature on innovation within models of supported accommodation for people with TBI points to the need for greenfield practices and tenacity to forge partnerships between the policy makers, government, commercial, housing trusts and not-for-profit sectors (TAC, 2011; Vander Schaaf, 1990). Accessible, subsidized housing is crucial if new and innovative models of housing and support are to be developed. "Using donated homes, mounting capital campaigns, or leasing large residential settings are approaches that are difficult to fund for the long term because of operating costs that cannot be recovered through ethical resident rent charges … [we] must accept the reality

of subsidized housing and be prepared to forge cooperative arrangements with local public housing agencies" (Vander Schaaf, 1990, p. 42). It is these partnerships that will provide opportunities for home ownership or affordable rental for people with TBI.

The type of support that can be provided to people with TBI needs to be broadened

Existing disability-specific supported accommodation relies on paid support, and international literature, as well as current TAC practice, indicates little deviation from a traditional attendant care model (Jackson, 1994; Martin & Beamish, 2008a; Pearson, 2008; Worthington & Merriman, 2008). In order to achieve innovation in models of housing and support, the TAC will need to examine opportunities to be able to fund a broader range and type of support for their clients. This broadening may in part be assisted via individualised funding models versus the current restricted range of approved services for TAC clients (e.g., attendant care; domestic services).

Support workers in disability accommodation can fulfil a vital role in facilitating independence, shaping coping behaviours and maximising functional outcomes for people with TBI living in the community. However, the effectiveness of these supports is determined by the skills, aptitude and approach of the support team (DHCS, 2010, p.6) and may be compromised by low levels of training, burnout and high turnover. Evidence suggests that, to date, residents generally have little input into the choice of the support workers in their home (DHS, 2011; Huggett & McDonald, 2011). The service provider most often makes these decisions. Generally, in disability-specific settings the needs of the organisation or its support workers often override the preferences of the individual. Consequently, there may be less flexibility, and residents may have low levels of personal choice and autonomy regarding day-to-day routines and activities. Expansion of the range of specialist support services available to people with a disability which reflect contemporary living arrangements, and the opportunity for the person with TBI and their family to be involved in choice regarding these services, is necessary (DHCS, 2010).

A mix of service approaches is required, "that incorporates improving the skills of existing generic disability service staff, increasing the level of support to home-based models of care and the introduction of dedicated, specialized community living options" (Strettles et al., 2005). Optimising functional outcomes necessitates training and ongoing mentoring of the support person in order to retain a more skilled support network for the person with

TBI. Foundation principles to appropriately and effectively support people with high and complex needs include:

- Social role valorisation, defined as "the application of what science can tell us about the enablement, establishment, enhancement, maintenance and/or defence of valued social roles for people" (DHCS, 2010, p.6)
- Person-centred planning
- Treating each person with a high level of dignity and respect
- Active support, which is "a model of service delivery that focuses on the engagement of people in an activity and the delegation of support workers to achieve this. It values participation and involvement in activities. An important contribution of active support comes from the fact that those who are providing the support are asked to think about individual people as more than receivers of care. (DHCS, 2010, p.7)
- A commitment to supporting the person to be as involved in the life of their community as possible
- Positive behaviour support.

(DHCS, 2010; McMorrow et al., 1998, p.24).

Workforce capacity and retention has been identified as a key issue (National Disability Services Victoria, 2010) and the international literature calls for a more skilled and specialised workforce (Eicher et al, 2012; Alexander & Roughlan, 1997; Jackson, 1994). Disability support workers who have the skills to support the individual's reintegration into a program of activities that underpin valued social roles can positively influence independence and quality of life outcomes (Sloan et al., 2009a; Sloan et al, 2009b). Such specialised support enables successful participation in paid or unpaid work, as well as social, independent living and recreational activities that can create a sense of empowerment, reduce social isolation and assist psychosocial adjustment to disability (McMorrow et al., 1998).

There are many elements of a support structure that can be shaped in delivery of individualised support to people with brain injury (Sloan et al., 2009b). For the TAC, this restructuring of, and innovation within, support models can only be harnessed via an increased flexibility in the services that can be provided to clients, and which may be delivered via individualised funding models. In addition to considering hours of support, the following elements of support can be tailored to the individual increase in participation and to promote skill development: the nature of the support (e.g., manual handling support

in transfers or prompting to provide cues for memory); the intensity of support (e.g., 1:1 hands on assistance or on-call support); the focus of support (e.g., domestic or recreational activity); the provider of the support (e.g., parent, paid worker or taxi driver); as well as the frequency of support (e.g., daily or weekly) (Sloan et al., 2009b, p. 304). These elements can be individualised to assist to normalise support structures and to transition people from disability to mainstream services, a key principle of the NDIS.

Finally, specifically to variation in the intensity and provider of support, assistive and mainstream technology (e.g., an environmental control unit or smart phone or tablet) offers a real and, as yet, untapped potential element of a support model. This literature review identified only limited information regarding the use of technology in the delivery of support to people with TBI in long term accommodation settings (Martin & Beamish, 2008a; Vander Schaaf, 1990). There is no doubt that a significant opportunity exists to pilot and evaluate the use of technology as an addition, or at times, replacement for paid or informal care (e.g. to facilitate a transition from face-to-face support to a model of on-call assistance delivered via Skype or Facetime or via monitoring where staff are alerted, for example, if a person has an epileptic seizure). Research and innovation in this area is necessary, and currently being pursued in research design by ISCRR and in practice by TAC and Residential Independence Pty Ltd.

There is a pressing need for evaluation of impact of housing and support models on outcomes of people with TBI

Expansion of housing and support models should be coupled with research into the impact of these models on independence, participation and family outcomes (Sloan et al., 2012). Given the range of supported accommodation options being accessed by people with TBI who are in receipt of TAC funding, and the identified need for a greater range and breadth of these models, a significant evidence gap exists. Currently, the TAC has no formal measures in place to evaluate the appropriateness or effectiveness of accommodation and support services in delivering client outcomes relating to independence and community participation (TAC, 2011, p. 8). It is important to determine the characteristics of supported accommodation models responsible for the effectiveness of programs and those which have little or no effect on outcomes (Glenn, Rotman, Goldstein, & Selleck, 2005). Following on from this, there is no existing service development program for supported accommodation (Strettles et al., 2005). Indeed, past TAC research has indicated some

clients and families perceived that the supported accommodation industry was essentially self governed and lacked competition, finding that there appears to be no consistent quality or standard of care for service provision (TAC, 2011, p. 9). All providers of residential services should have in place procedures for effective clinical governance (Worthington & Merriman, 2008, p. 106).

The success of a supported accommodation strategy must be tested against expected outcomes (Department for Families and Communities, 2006; DHCS, 2010). These outcomes may include individual goal attainment; psychological status; cognitive functioning; improved access to specialist support services which are consistent with the person's life stage and assessed functional needs; functional abilities; choice within the supported accommodation environment; opportunity to move to more independent housing as skills progress; community integration; vocational status; subjective feelings of well-being; burden of care/resource needs; and items from the World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF) activity and participation domains, which include health condition, bodily functions and structure, participation, activities, environment, and personal factors and their interactions (Trudel, Nidiffer, & Barth, 2007).

As identified in the current literature review, there is limited research to date that has examined the outcomes or cost benefits of supported accommodation services for people with brain injury. A proposed evaluation framework for housing and support will assist to:

- Gather information regarding the characteristics of the accommodation and support model, including support model, ratios, built design, location and neighbourhood, and resident characteristics.
- Determine the effectiveness of a range of models in meeting complex support needs and enhancing outcomes, including the identification of those models most effective in shaping positive outcomes.
- Identify the support needs profiles of individuals that are most appropriate for the characteristics of each model. This knowledge can assist clinical decision making when identifying the most appropriate model to match to the support needs of the person. It can also assist in ensuring that placements are not inappropriate (i.e., in either providing too much or too little of the supports the individual requires).

- Document a long-term view of the person with TBI, the transitions they make over time and assessment of cost effectiveness.
- Record the requirement for access to additional support services (e.g., allied health; specialist behavioural support) and associated costs.

A longitudinal evaluation framework for models of housing and support provided to TAC clients is necessary, provides leadership in this important area of research, and has commenced through ISCRR research projects (Callaway, Winkler, Sloan, Tate, & Hopwood, 2012) and interdisciplinary programs (e.g., ISCRR accommodation and service innovation programs). Methodologies that will allow for evaluation across models are necessary, given the small numbers in each accommodation setting and the heterogeneity of individuals with TBI. This points to the need for national partnerships between the TAC, ISCRR and other organisations to apply a consistent framework for this evaluation and pool findings.

Supported accommodation should be viewed as part of a rehabilitation continuum within a lifetime care model

People with severe TBI have the capacity to make gains in independence and participation even many years post injury (Sloan et al., 2009b) although, despite this potential, they will also have varying support needs over their lifetime. Models of health and disability emphasise the importance of the physical, social, cultural, institutional and attitudinal environments and the influence they exert on participation, where participation is defined as involvement in a life situation (Kielhofner, 1985; WHO, 2001). Each of these environmental influences may facilitate or impede participation (Sloan et al., 2012). The availability of adaptable, affordable and accessible housing therefore has implications for people's participation and community integration, including access to services, natural support networks and transport (DHCS, 2010; NASHIA, 2003). "Ideally there should be a range of accommodation options available, so that a continuum of support is provided – as a person regains skills and abilities a move to more appropriate accommodation and support can follow. The problem with most existing services is they are institutions of final destination rather than a step in the pathway to a life of choice (Brain Injury Association of Queensland, 2010b, p. 4).

This review highlighted a "blurring line" in the literature between post-acute or transitional rehabilitation programs, neurobehavioral programs and assisted-living or supported

residential facilities (Trudel et al., 2007, p. 1009). In one study of thirty residential programs for people with brain injury in the USA, 27 of those considered themselves to be a treatment program (Glenn et al., 2005, p. 396). The inclusion criteria of the current literature review allowed only permanent or long term accommodation and so precluded the reporting of the significant international body of literature on post-acute or transitional rehabilitation facilities, some of which were residential and offered slow stream rehabilitation. A review of models of accommodation and support which gathers information on such settings is necessary, and has been commissioned by ISCRR through the ABI Rehabilitation research program. However, an important finding from the current review is that within a lifetime support model, supported accommodation needs to be viewed as part of a rehabilitation continuum (Brain Injury Association of Tasmania, 2006).

Noting this continuum, the role of the environment in relation to a person's level of participation points to the importance of carefully tailoring models of housing and support for people with brain injury. Given that each person has their own set of strengths and weaknesses, as well as values, life goals and accommodation history and preferences, it is necessary to consider a person's accommodation and support needs on an individualised basis (Sloan et al., 2012, p.26). However, there may be limited options when considering accommodation and support models, such that individuals may end up living in a setting or having a support model that is inflexible to their changing needs over time, or impedes their wellbeing and level of participation (Winkler et al., 2007b). The TAC have identified the need for strategic planning to deliver a greater range of options for their clients within this continuum (TAC, 2011), and evaluation of the impact of these models on outcomes will be integral to business intelligence and service planning.

5. CONCLUSION

This comprehensive systematic review on existing models of supported accommodation for people with TBI indicates that currently, for those people with TBI unable to return to home-like settings, there is a restricted number and range of housing and support models available to them. Of the existing models, there is a dearth of evidence regarding their impact on outcomes for people with TBI. By increasing the range and type of accommodation models for a greater number of people with TBI, accessibility, flexibility and choice of housing and support is also increased. The development of this expanded

range of housing and support models, and body of evidence of the impact of models on outcomes, is underpinned by the recognition that *one size does not fit all* (DADHC, 2009).

6. Appendix A – Review Search Terms

Search notes

1. exp Brain Injuries/
2. exp Craniocerebral Trauma/
3. exp Brain Edema/
4. exp Glasgow Coma Scale/
5. exp Glasgow Outcome Scale/
6. exp Unconsciousness/
7. exp Cerebrovascular Trauma/
8. (head or crani* or cerebr* or capitis or brain* or forebrain* or skull* or hemispher* or intra-cran* or inter-cran*) adj3 (injur* or trauma* or lesion* or damag* or wound* or destruction* or oedema* or edema* or fractur* or contusion* or concus* or commotion* or pressur*)).ti,ab. (108776)
9. ((head or crani* or cerebr* or brain* or intra-cran* or intercran*) adj3 (haematoma* or hematoma* or haemorrhag* or hemorrhag* or bleed* or pressure)).ti,ab.
10. (Glasgow adj3 scale).ti,ab.
11. “rancho los amigos scale”.ti,ab.
12. (“diffuse axonal injury” or “diffuse axonal injuries”).ti,ab.
13. “persistent vegetative state”.ti,ab.
14. ((unconscious* or coma* or concuss*) adj3 (injur* or trauma* or damag* or wound* or fracture* or contusion* or haematoma* or hematoma* or haemorrhag* or hemorrhag* or bleed* or pressure)). ti,ab.
15. or/1-14

Medical subject headings (MeSH)

Residential Facilities [+6]

Assisted Living Facilities

Group Homes

Halfway Houses

Homes for the Aged

Nursing Homes [+2] (Intermediate care facilities, Skilled nursing facilities)

Orphanages

Home Care Services

Hemodialysis, Home

Home Care Services, Hospital-based

Home Infusion Therapy

Home Nursing [+1] (Respite Care)

Homemaker Services

Parenteral Nutrition, Home [+1] (Parenteral Nutrition, Home Total)

Free text terms

(assist* or support* or commun* or independen* or residen* or cluster* or soci* or affordab* or public or arrange* or group*) adj3 (liv* or accommodation* or hous* or facilit*)

(congregate* or home) adj3 (care* or caring or nursing)

(group* or aged or nursing or boarding) adj3 (home* or facilit*)

(halfway or half-way or boarding) adj3 (house* or home*)

(Home or homemaker or nursing) adj3 service*

Convalescence home

Extended care facility

Lead tenant

-ABI

- TBI

- Brain Injury

- Cognitive impairment

- Cognition

- Behaviours of concern

- Challenging behaviour

- Neurorehabilitation

- Disability/Disabled/Disabilities

- Neurological disease

- Accessible accommodation/housing
- Accommodation
- Adaptable home/housing/house
- Cluster settings
- Cluster units
- Social housing
- Affordable housing
- Community housing
- Congregate care
- Transitional living unit
- Transitional living centre
- Transitional housing
- Supported accommodation service
- Supported residential service
- Skilled nursing facility
- Residential aged care/Nursing home/Aged care - do we include these?
- Bungalow
- Unit
- Moveable unit
- Residential care
- Accommodation model
- Shared supported accommodation
- Community residential unit
- Supported accommodation
- Group home
- Half-way house
- Boarding house
- Home
- Housing/house/houses
- Lifetime care/home
- Home environment
- Supported living/housing
- Residence
- Residential design

- Assisted living
- Community based
- Community support
- Deinstitutionalisation
- Home care
- Innovation/innovative
- Independent living

7. Appendix B – Literature describing models of supported accommodation

Characteristics	Australian Government and peak body reports	Other references identified from expert consultation	Journal articles and texts identified via data base search	International website and peak body reports
Model of housing				
Cluster apartments	AIHW,2010 AIHW,2009	Martin & Beamish 2008a	Burleigh et al, 1998 Jackson, 1992 Jackson, 1994 Sohlberg et al, 2005	On With Life Brain Injury Association of North Carolina Eisenhower Center Hope Network ResCare Premier Wisconsin Health Care
Cluster units	Brain Injury Association of Tasmania, 2006 Fisher et al, 2008 VCASP, 2007 Department for Communities and Social Inclusion, 2012	YPINH National Alliance, 2007 MS Australia, 2007 Australian Home Care Pty Ltd, 2011 Hugget & McDonald, 2011 DADHC, 2007 Sloan et al, 2012 Winkler et al, 2010		Casa Colina Eisenhower Center
Cluster housing	VCASP, 2007 Fisher et al, 2008	DHCS, 2010 Strettles et al, 2005 DHS, 2005	Vander Schaaf, 2001	Opportunities Unlimited
Unit housing hub		DHCS, 2010		
Residential group home	Brain Injury Association of Tasmania, 2006 Fisher et al, 2008 Department for Families and Communities, 2006 URBIS, 2009 AIHW,2011 AIHW, 2010 AIHW,2012 Pearson, 2008 Brain Injury Association of Queensland, 2008 VCASP, 2007 Department for Communities and Social Inclusion, 2012 DHS, 2011	DHCS, 2010 YPINH National Alliance, 2007 Hugget & McDonald, 2011 DADHC, 2009 Strettles et al, 2005 Winkler et al, 2010 DHS, 2011	Bell et al, 1994 Burleigh et al, 1998 Flaherty, 2008 Glenn et al, 2005 Jackson, 1992 Jackson, 1994 Kelly et al, 2007 Vander Schaaf, 1990	Brain Injury Association of North Carolina Hope Network ReMed ReNu ResCare Premier Department of Labor and Employment Division of Workers' Compensation, Colorado, 2005
Adult Foster/ Family Homes			Barry et al, 1993 Bell et al, 1994	Brain Injury Association of North Carolina Wisconsin Health Care
Adult Foster Care Group Homes				Accessible Space Inc.
Co-Residency (home-share) model		Hugget & McDonald, 2011		

	Australian Government and peak body reports	Other references identified from expert consultation	Journal articles and texts identified via data base search	International website and peak body reports
Assisted Living Facility (private unit with kitchenette)			Bowe, 1993	
Duplex, dual occupancies and triple occupancies	Department for Communities and Social Inclusion, 2012	DHCS, 2010		
Unit housing under a single roof		DHCS, 2010		
Integrated Apartment Living			Vander Schaaf, 1990	
Supported Living Model- characteristics not defined	URBIS, 2009 Brain Injury Association of Queensland, 2010 Brain Injury Association of Queensland, 2008	Sloan et al, 2012	Adams, 1991 Beecham et al, 2009 Eicher et al, 2012 Trudel et al, 2007 Vander Schaaf, 1990	Centre for Neuroskills ' Core Health Care Wisconsin Health Care Neuro Restorative Department of Labor and Employment Division of Workers' Compensation, Colorado, 2005
Model of Support				
24 hour (shared) support	Fisher et al, 2008 AIHW, 2010 AIHW,2009 VCASP, 2007 DHS, 2011 Department for Communities and Social Inclusion, 2012 Pearson, 2008	YPINH National Alliance, 2007 MS Australia, 2007 Australian Home Care Pty Ltd, 2011 Martin & Beamish, 2008a NSW DADHC, 2007 Sloan et al, 2012 Strettles et al, 2005 Winkler et al, 2010 DHS, 2005 DHCS, 2010	Alexander & Roughan, 1997 Eicher et al, 2012 Jackson, 1994 Trudel et al, 2007 Vander Schaaf, 1990	Brain Injury Association of North Carolina Centre for Neuroskills Eisenhower Center Hope Network Neuro Restorative ReMed ReNu ResCare Premier Accessible Space Inc.
Detail of overnight supervision and part-time day time supervision	VCASP, 2007	YPINH National Alliance, 2007 Winkler et al, 2010	Beecham et al, 2009	
Description of ratio of staff to residents		YPINH National Alliance, 2007 2007 MS 2011 Australian Home Care Pty Ltd DHCS, 2010	Bowe, 1993 Eicher et al, 2012 Glenn et al, 2005 Jackson, 1994 Vander Schaaf, 1990	Hope Network ReMed ResCare Premier
Detail regarding qualifications of direct support staff	Pearson, 2008	Australian Home Care Pty Ltd, 2011 Martin & Beamish, 2008a	Alexander & Roughan, 1997 Eicher et al, 2012 Jackson, 1992 Jackson, 1994 Sohlberg et al, 2005	Casa Colina Centre for Neuroskills Hope Network Neuro Restorative ReMed Spectrum Health
Detail of the use of technology to deliver support		Martin & Beamish, 2008a & 2008b	Vander Schaaf, 1990	

	Australian Government and peak body reports	Other references identified from expert consultation	Journal articles and texts identified via data base search	International website and peak body reports
Description of availability of allied health/medical staff	Fisher et al, 2008	YPINH National Alliance, 2007 Australian Home Care Pty Ltd, 2011 Hugget & McDonald, 2011 DHS, 2005 Strettles et al, 2005	Glenn, 2005 Alexander & Roughan, 1997 Bowe, 1993 Eicher et al, 2012 Jackson, 1992 Jackson, 1994 Sohlberg et al, 2005 Vander Schaaf, 1990	Brain Injury Association of North Carolina Casa Colina Centre for Neuroskills Eisenhower Center Neuro Restorative Opportunities unlimited ReMed ReNu ResCare Premier Wisconsin Health Care Spectrum Health
Detail of the use of technology to deliver support		Martin & Beamish, 2008a Martin & Beamish, 2008b	Vander Schaaf, 1990	
Documented community integration program	VCASP, 2007	Strettles et al, 2005 YPINH National Alliance, 2007 Martin & Beamish, 2008a Winkler et al, 2010 Hugget & McDonald, 2011 Sloan et al, 2012 DHCS, 2010	Glenn et al, 2005 Alexander & Roughan, 1997 Eicher et al, 2012 Flaherty, 2008 Jackson, 1992 Jackson, 1994 Sohlberg et al, 2005 Vander Schaaf, 1990	Casa Colina Centre for Neuroskills Eisenhower Center Hope Network Neuro Restorative Open Door Center ReMed ResCare Premier Wisconsin Health Care Spectrum Health Accessible Space

8. Appendix C – Level of detail provided on models of supported accommodation, by author

	Description of the characteristics of housing	Description of the characteristics of paid support model	Description of the characteristics of direct support staff	Description of the characteristics of support other than paid support	Description of location and community characteristics	Description of cost of model
Journal articles & texts identified via data base search						
Adams, 1991	✓					
Alexander & Roughan, 1997	✓	✓✓✓	✓✓✓			
Barry et al, 1993	✓					
Beecham et al, 2009	✓	✓				✓
Bell et al, 1995	✓					
Bowe, 1993	✓✓	✓✓	✓✓			
Burleigh et al, 1998	✓					
Eicher et al, 2012	✓	✓✓	✓✓			
Flaherty et al, 2008	✓	✓✓			✓	
Glenn et al, 2005	✓	✓✓	✓✓		✓	
Jackson, 1992	✓✓	✓✓	✓✓		✓	
Jackson, 1994	✓✓	✓✓	✓✓			
Kelly & Winkler, 2007	✓	✓✓				
Sloan et al, 2009b	✓	✓				
Sloan et al, 2007	✓	✓				
Sohlberg et al, 2005	✓✓	✓✓	✓		✓	
Trudel et al, 2007	✓	✓	✓			
Vander Schaaf, 1990	✓	✓✓	✓		✓	
Vander Schaaf, 2001	✓	✓				
Dikmen et al, 1996 (As cited in Grant & Adams text)	✓					
Worthington & Merriman, 2008 (As cited in Tyerman & King text)	✓					
International website & peak body reports						
Rescare Premier	✓✓	✓✓✓	✓✓		✓✓	
ReNu Life	✓	✓	✓			
On With Life	✓✓	✓			✓✓	
Hope Network	✓✓	✓✓	✓✓		✓	
Acadia Rehab	✓					
Centre for NeuroSkills	✓✓	✓✓	✓✓		✓✓	

	Description of the characteristics of accommodation	Description of the characteristics of paid support model	Description of the characteristics of direct support staff	Characteristics of support other than paid support	Description of location and community characteristics	Description of cost of model
Spectrum Health	✓✓	✓✓	✓✓		✓✓	
Opportunities Unlimited	✓✓	✓	✓		✓	
Casa Colina	✓✓✓	✓✓✓	✓✓		✓✓	
Wisconsin Health Care	✓✓	✓✓				✓
Eisenhower Center	✓✓	✓✓	✓✓			
NeoroRestorative	✓	✓✓	✓✓			
Core Health Care	✓	✓			✓	
ReMed	✓	✓✓	✓✓			
Accessible Space Inc.	✓✓	✓✓	✓✓		✓	
Brain Injury Association of North Carolina	✓✓	✓✓	✓			
Department of Labor and Employment Division of Workers' Compensation, Colorado, 2005	✓					
Australian government & peak body reports						
Brain Injury Association of Tasmania, 2006	✓					
Fisher et al, 2008	✓✓	✓✓	✓			
AIHW, 2009	✓	✓				
AIHW, 2010	✓	✓				
AIHW, 2011	✓					
AIHW, 2012	✓					
Winkler et al, 2012	✓	✓	✓	✓		
Department for Families and Communities, 2006	✓					
URBIS, 2009	✓					
DHS, 2011	✓	✓	✓		✓	
Department for Communities and Social Inclusion, 2012	✓	✓			✓	
Brain Injury Association of Queensland, 2010	✓					
Brain Injury Association of Queensland, 2008	✓					

	Description of the characteristics of housing	Description of the characteristics of paid support model	Description of the characteristics of direct support staff	Description of the characteristics of support other than paid support	Description of location and community characteristics	Description of cost of model
VCASP, 2007	✓✓✓	✓✓✓	✓		✓✓	✓✓
Pearson, 2008	✓	✓✓	✓✓			✓✓
Other references identified from expert consultation						
DHCS, 2010	✓✓	✓✓	✓		✓	
Young People in Nursing Homes Alliance, 2007	✓✓✓	✓✓✓	✓		✓✓	
MS Australia, 2007	✓✓✓	✓✓	✓		✓✓	
Australian Homecare Pty Ltd, 2011	✓✓✓	✓	✓✓		✓✓✓	
Hugget & McDonald, 2011	✓✓	✓✓	✓	✓		
Martin & Beamish, 2008a	✓✓	✓✓	✓	✓	✓✓	✓
Martin & Beamish, 2008b	✓			✓		
DADHC, 2004	✓✓	✓	✓		✓	
DADHC, 2009	✓					
Sloan et al, 2004	✓✓					
Sloan et al, 2009a	✓					
Sloan et al, 2012	✓	✓				
Strettles et al, 2005	✓✓	✓✓	✓		✓	
Winkler et al, 2010	✓✓	✓✓	✓		✓	✓✓
DHS, 2005	✓✓	✓✓	✓			✓✓✓

✓ Limited description
✓✓ Some description
✓✓✓ Detailed description

Description of the characteristics of housing: type of dwellings, security etc
Description of the characteristics of the paid support model: services provided, staff ratios, hours of support, access to therapy assistant or allied health support.
Description of the characteristics of direct support staff: who are the staff, qualifications, training of staff
Description of characteristics of support other than paid support: including family, community members, or the use of technology
Description of location and community characteristics: location, proximity to shops etc.
Description of cost: cost of support, accomm etc.

9. Appendix D

Summary of quality assessment for studies assessing the effectiveness of supported accommodation (adapted from the Newcastle-Ottawa Scale)

Selection		
1. Representative of the exposed cohort	a) Truly representative of TBI patients living in the community	Burleigh et al, 1998
	b) Somewhat representative of TBI patients living in the community	Sloan et al, 2009 Sloan et al, 2012 Winkler et al, 2012
	c) Select group of users e.g., living in supported accommodation setting	Eicher et al, 2012 Winkler, 2010
	d) No description of the derivation of the cohort	
2. Selection of the non exposed cohort	a) Drawn from the same community as the exposed cohort	Burleigh et al, 1998 Eicher et al, 2012 Sloan et al, 2009 Sloan et al, 2012 Winkler et al, 2012 Winkler et al, 2010
	b) Drawn from a different source	
	c) No description of the derivation of the non exposed cohort	
3. Ascertainment of exposure	a) Secure record (e.g., medical records)	Burleigh et al, 1998 Eicher et al, 2012 Sloan et al, 2012 Winkler et al, 2012 Winkler et al, 2010
	b) Structured interview	Sloan et al, 2009
	c) Written self report	
	d) No description	

Comparability		
1. Comparability of cohorts on the basis of the design or analysis	a) Study controls for injury severity	
	b) Study controls for any additional factor (e.g., level of disability, support needs)	
Outcome		
1. Assessment of outcome	a) Independent blind assessment	
	b) Record linkage	Eicher et al, 2012 Sloan et al, 2012 Winkler et al, 2010
	c) Self report	Burleigh et al, 1998
	d) No description	Winkler et al, 2012
2. Was follow up long enough for outcomes to occur?	a) Yes (12 months or more)	Eicher et al, 2012 Sloan et al, 2012 Sloan et al, 2009 Winkler et al, 2012
	b) No (less than 12 months)	
3. Adequacy of follow up of cohorts	a) Complete follow up – all subjects accounted for	Eicher et al, 2012 Sloan et al, 2009 Burleigh et al, 1998
	b) Subjects lost to follow up unlikely to introduce bias i.e., small number lost to follow up, or description provided of those lost	Sloan et al, 2012 Winkler et al, 2010
	c) Significant proportion lost to follow up and no description of those lost	
	d) No statement	Winkler et al, 2012

REFERENCES

Accessible Space Inc. (n.d). Adult Foster Care Homes and Assisted Living Plus, from http://www.accessiblespace.org/Pages/default.aspx

Alexander, E. W., & Roughan, J. (1997). Supported living programs for survivors of acquired brain injury. *Care Management, 8*(6), 59-63.

Australian Bureau of Statistics. (2011). *Census Population and Housing 2006 and 2001*. Canberra, Australia: Author.

Australian Institute of Health and Welfare. (2007). Disability in Australia: Acquired brain injury. Canberra, ACT: Author.

Beer, A., & Faulkner, D. (2008). The housing careers of people with a diability and carers of people with a disability. Victoria, Australia: Australian Housing and Urban Research Institute

Bowe, J. (1993). Specialization gains momentum. Assisted living provider adds head trauma care. *Contemporary Longterm Care, 16*(3), 38, 40.

Brain Injury Association of North Carolina. (n.d). Residential Options. *Section U*, 1-14.

Brain Injury Association of Queensland. (2010a). Nowhere to Call Home. Accomodation Issues and Complex Needs *Synapse,* 3-4.

Brain Injury Association of Queensland. (2010b). Nowhere to Call Home. Accomodation Issues and Complex Needs. *Synapse,* 3-4.

Brain Injury Association of Tasmania. (2006). *Brain injury Issues? Solutions? Final Community Consultation Issues Paper*. Tasmania, Australia: Author.

Callaway, L., Winkler, D., Sloan, S., Tate, R., & Hopwood, M. (2012). Evaluation of quality of life outcomes for TAC and Worksafe claimants. Melbourne, Australia.

Department of Ageing Disability & Home Care. (2004). *Models of Supported Accommodation for People with a Disability. A Discussion Paper inviting feedback.* New South Wales, Australia: Author.

Department of Ageing Disability and Home Care. (2009). *Innovative Accommodation Support Options for NSW*. New South Wales, Australia: Author

Department of Housing and Community Services. (2010). *From House to Home. Housing, Tenancy and Support for people with complex needs related to their disability*. ACT, Australia: ACT Government.

Department of Human Services. (2001). *Acquired Brain Injury Strategic Plan.* Victoria, Australia: Author.

Department of Human Services. (2005). *Creating New Opportunities Responding to the needs of younger people in Victoria's Residential Aged Care services*. Victoria, Australia: Author.

Department of Human Services. (2011). *Evaluation of the NSW Younger People in Residential Aged Care (YPIRAC) Program Final Report.* New South Wales, Australia: Author

Eicher, V., Murphy, M. P., Murphy, T. F., & Malec, J. F. (2012). Progress assessed with the Mayo-Portland Adaptability Inventory in 604 participants in 4 types of post-inpatient rehabilitation brain injury programs. *Archives of Physical Medicine and Rehabilitation, 93*(1), 100-107. doi: http://dx.doi.org/10.1016/j.apmr.2011.06.038

Fisher, K., Parker, S., Purcal, C., Thaler, O., Abelson, P., Pickering, E., . . . Griffiths, M. (2008). Effectiveness of Supported Living in relation to Shared Accommodation. For disability policy and research working group. New South Wales, Australia: University of New South Wales Consortium.

Glenn, M. B., Rotman, M., Goldstein, R., & Selleck, E. A. (2005). Characteristics of residential community integration programs for adults with brain injury. *The Journal of Head Trauma Rehabilitation, 20*(5), 393-401.

Gould, E., & Gross, C. G. (2002). Neurogenesis in adult mammals: some progress and problems. *Journal of Neuroscience, 22*(3), 619-623.

Gruen, R., Bragge, P., Sedgman, C., Pitt, V., & Chau, M. (2011). An environmental scan of traumatic brain injury and spinal cord injury for the Transport Accident Commission. Victoria, Australia: National Trauma Research Institute.

Huggett, C., & McDonald, D. (2011). Accommodation and Support Services Market Research Report for The Transport Accident Commission (TAC) Final. Victoria, Australia: Market Access Consulting & Research.

Jacobs, H. E., Blatnick, B. S., & Sandhorts, J. V. (1990). What is Lifelong Living, and how does is relate to quality of life? *Journal of Head Trauma Rehabilitation, 5*(1), 1-8.

Kielhofner, G. (1985). *A model of human occupation: theory and application* (Second ed.). Baltimore, MD: Williams & Wilkens.

Liberati, A., Altman, D., Tetzlaff, J., Mulrow, C., Gotzche, P. C., Ioannidis, J., . . . Moher, D. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *PLoS Med, 6*(7). doi: 10.1371/journal.pmed.1000100

Lippert-Grüner, M., Maegele, M., Haverkamp, H., Klug, N., & Wedekind, C. (2007). Health-related quality of life during the first year after severe brain trauma with and without polytrauma. *Brain Injury, 21*(5), 451-455

Martin, S., & Beamish, E. (2008a). The Ceder Foundation. Evaluation of Ardkeen Supported Living Option. Belfast, Ireland: Social Research Centre.

MS Australia. (2007). Fact Sheet- St Martin's Court. Australia: Author.

National Disability Services Victoria. (2010). *Victorian Parliamentary inquiry into supported accommodation for Victorians with a disability and/or mental illness.* Melbourne, Australia: Author.

National Health and Medical Research Council. (2009). *NHMRC additional levels of evidence and grades for recommendations for developers of guidelines*. Canberra, Australia: Author.

Papastrat, L. A. (1992). Outcome and value following brain injury: A financial provider's perspective. *Journal of Head Trauma Rehabilitation, 7*(4), 11-23.

Pearson, D. D. R. (2008). *Accommodation for People with a Disability*. Victoria, Australia: Victorian Government Printer.

Ponsford, J. L. (2003). *Outcome 10 years following traumatic brain injury.* Paper presented at the 26th Annual Brain Impairment Conference, Sydney, NSW.

Ponsford, J. L., Sloan, S., & Snow, P. (2012). *Traumatic Brain Injury: Rehabilitation for Everyday Adaptive Livind* (Second ed.). Hove, UK: Psychology Press.

Ponsford, J. L., Sloan, S., & Snow, P. (2012). *Traumatic Brain Injury: Rehabilitation for Everyday Adaptive Living* (Second ed.). Hove, UK: Psychology Press.

Sloan, S., Callaway, L., Winkler, D., McKinley, K., & Ziino, C. (2012). Accommodation Outcomes and Transitions Following Community-Based Intervention for individuals with Acquired Brain Injury. *Brain Impairment, 13*(1), 22-43.

Sloan, S., Callaway, L., Winkler, D., McKinley, K., Ziino, C., & Anson, K. (2009a). The Community Approach to Participation: Outcomes Following Acquired Brain Injury Intervention. *Brain Impairment, 10*(3), 282-294.

Sloan, S., Callaway, L., Winkler, D., McKinley, K., Ziino, C., & Anson, K. (2009b). Changes in care and support needs following community-based intervention for individuals with acquired brain injury. *Brain Impairment, 10*(3), 295-306.

Strettles, B., Bush, M., Simpson, G., & Gillet, L. (2005). Accommodation in NSW for adults with high care needs after Traumatic Brain Injury. Sydney, NSW: Brain Injury Rehabilitation Unit, Liverpool Health Service.

Tate, R. L. (2003). *Long term psychosocial outcome after severe traumatic brain injury: A 20-25 year follow-up.* Paper presented at the 26th Annual Brain Impairment Conference, Sydney, NSW.

Tierney, J. (2004). Environment enrichment: Putting evidence into practice. Melbourne, Australia: Victorian Brain Injury Association.

Transport Accident Commission. (2011). TAC 2015 Independence: Accommodation Strategy Project. Victoria, Australia: Author.

Trudel, T. M., Nidiffer, F. D., & Barth, J. T. (2007). Community-integrated brain injury rehabilitation: treatment models and challenges for civilian, military, and veteran populations. *Journal of Rehabilitation Research & Development, 44*(7), 1007-1016.

Vander Schaaf, S. V. (1990). An operational model of lifelong living. *Journal of Head Trauma Rehabilitation, 5*(1), 40-46.

Victorian Coalition of ABI Service Providers. (2007). Final Report of Accommodation Project. Victoria, Australia: Author.

Whiteneck, G. G., Gerhart, K. A., & Cusick, C. P. (2004). Identifying environmental factors that influence the outcomes of people with traumatic brain injury. *Journal of Head Trauma Rehabilitation, 19*(3), 191-204.

Winkler, D., Farnworth, L., Sloan, S., Brown, T., & Callaway, L. (2010a). Comparison of People with ABI Liiving in Two Accommodation Settings: Shared Supported Accommodation and Residential Aged Care. *Brain Impairment, 11*(3), 313-325.

Winkler, D., Farnworth, L., Sloan, S., Brown, T., & Callaway, L. (2010b). Comparison of people with ABI living in two accommodation settings: Shared supported accommodation and residential aged care. *Brain Impairment, 11*(3), 313-325.

Winkler, D., Sloan, S., & Callaway, L. (2007a). From a home to their home. Alternatives to young people living in nursing homes. Melbourne, Australia: Summer Foundation Ltd.

Wisconsin Health Care. (n.d.). Residential options, from http://www.dhs.wisconsin.gov/bqaconsumer/residopts/defntns.htm

World Health Organisation. (2001). International classification of functioning, disability, and health (ICF). Geneva, Switzerland: Author.

Worthington, A., & Merriman, R. (2008). Residential Services. In A. Tyerman & N. S. King (Eds.), *Psychologcal Approaches to Rehabilitation after TBI* (pp. 91-). Oxford: Blackwell Publishing

Ylvisaker, M. (2003). Context-sensitive cognitive rehabilitation after brain injury: theory and practice. *Brain Impairment, 4*(1), 1-16.

www.iscrr.com.au