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Follow-up efficacy post environmental modifications; a guide for clinical practice

PEER REVIEWED

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Desleigh De Jonge	Associate Lecturer at The University of Queensland	Industry Panel

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Introduction

Occupational therapy (OT) is an allied health profession that works in public and private health industry across Australia, and internationally. In the majority of occupational therapy roles, as part of a range of interventions, it may be clinically indicated that the client requires an occupational therapy home visit (Hassal, 1993; Nygard, Grahn, Rudenhammar, & Hydling, 2004; Pardessus et al., 2002; Tse, 2005). During this visit the occupational therapist will assess the client's functional abilities (including predicted future functional ability) and the environmental barriers that prevent the client effectively interacting with their home environment, taking into consideration the importance and meaning this environment may hold to the person (Pynoos, Nishita, & Perelman, 2003). It should be stated that this paper is a basic overview of the theoretical approach occupational therapists consider when assessing a client's home environment, though for the purpose of introducing the profession, and the home environmental assessment and its purpose, this is all which is required in this instance.

M. Law, Di Rezze, B., and Bradley., L. (2010, p. 155) discusses occupational therapy interventions which may have a focus on 'removing environmental barriers and increasing supports in order to maximise an individual's occupational performance or participation. Occupational therapists have been recognised as an important part of discharge planning (Faul et al., 2009; Hassal, 1993; Nygard et al., 2004; Söderback, 2008) and their ability to screen for environmental hazards and recommend environmental changes has been advised by some research (Cumming et al., 1999; Gitlin, 2007; Gitlin et al., 2009b).

Environmental modification can range in scope. The most frequent modifications include installation of grab rails, removal of rugs and obstacles, contrast edge to steps, and installation of stair rails (M. Law, Di Rezze, B., and Bradley., L., 2010) although this can extend to more major modifications such as lifts, ramps or full redesign of bathroom and kitchen.

This review focuses on post environmental modification. When modifications are recommended, a home visit follow-up is undertaken, to ascertain whether the modification and the level of functional advantage or change were as expected, is recommended as standard best practice (Cumming et al., 2001; Cumming et al., 1999; Nygard et al., 2004; Tse, 2005).

It is expected that the growing ageing population and their projected medical needs will create an increased demand for occupational therapy (Boutin-Lester & Gibson, 2002). National and global health care trends suggest that home and community based care will increasingly serve as a setting for the delivery of health and human services. Home health occupational therapy, with its treatment focus on independent functioning in the client's own home and community, is an important component of home health services (Boutin-Lester & Gibson, 2002), and with the need for home modification services, particularly in rural areas, far exceeding the availability and capacity of relevant specialists (OTs) to provide them (Sanford & Butterfield, 2005). Alternative solutions need to be considered.

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Researchers such as (Fange & Iwarsson, 2007) explain that occupational therapists are facing increasing demands to demonstrate that their interventions are efficient and effective. In spite of this, many OT interventions are still being implemented without the use of structured, research-based methodology. In particular, there is a lack of studies investigating research to implementation processes in community OT practice (Fange & Iwarsson, 2007; Stewart et al., 2005).

Objectives

This report will provide a summation of current evidence of home modification follow-up and clear guidelines for occupational therapists to utilise to guide home modification follow-up practice.

Research Method

A systematic review has been utilised to ascertain current evidence of home modification follow-up practice. Findings were categorised against a matrix of factors. Given the lack of published comprehensive research available in the area of occupational therapy home assessment visits, there are many potential areas to be researched including: level of adherence to recommendations made during occupational therapy home visits; the usefulness of the implemented recommendations; and the costs associated with those recommendations (Harris, James, & Snow, 2008). In addition, the mechanisms for obtaining and financing home modification services remains fragmented and difficult to access or navigate, while practice lacks standards and guidelines (Gitlin, Mann, Tomit, & Marcus, 2001).

Purpose of report

This review of home modification follow-up aims to source research, to provide an evidence-based guideline to the occupational therapy profession in regards to the follow-up of environmental modifications.

2. Methodology

Systematic Review

An initial literature review was conducted pertaining to follow-up efficacy of environmental home modifications. A systematic review was implemented in this study, guided by the Protocol Guidelines for Systematic Reviews of Home Modification Information to Inform Best Practice (Bridge & Phibbs, 2003).

A search of the literature was undertaken including a variety of databases and government websites. A full list can be seen in Appendix 1. Search terms included occupational therapy, environmental adaption, follow-up, evaluation, post modification and home visit. Some parameters were set, such as dates from 1990 to 2010 and published in English.

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The research question was refined into an operational format that could be researched systematically by application of appropriate search criteria. Specific terms were identified from the research question and literature review, which were used to search for relevant materials on electronic databases and the World Wide Web.

Table 1. Search Terms (continued over page)

Problem	Intervention	Outcome	Comparison
Follow-up/ Adherence/ User preference	Occupational therapy home services	Home modification	Telephone follow-up
• Follow-up • Home visit • Adherence • Compliance • User preference • Usability • Safety • Appropriate/ Appropriateness • Acceptance/Acceptability • User/Patient/Customer satisfaction • User/Patient/Customer needs • Program evaluation • Service assessment • Service delivery • Professional practice	• Occupational therapy • Physical therapy • Home modifications service	• Home modification • Housing adaptation • Environmental adaptation • Architectural accessibility • Home assessment • Home environment • Assistive device	• Telephone follow-up • Telephone assessment • Telephone delivery • Telecare • Telehealth • Telemedicine

Inclusion criteria

- In order for material to be eligible for inclusion into this systematic review, it had to meet the following criteria:
- Written / published in English
- Attainable through the UNSW Library or via the World Wide Web (i.e. Google/Google Scholar)
- Based on studies that exclusively involve human subjects
- Searched, obtained via and related to specified keywords (outlined above in question refinement section)
- Written post 1990.

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Exclusion criteria

If material met any of the following criteria they were automatically excluded from this research. Excluded items included those:

- written/published in a language other than English;
- studies conducted included subjects that were animal or non-human;
- written before 1990;
- general or unoriginal editorials, whole of subject books or conference papers;
- that did not contain the key words/ search strings;
- did not include home modifications or home visiting as an assessment, intervention or treatment modality; and
- focused predominantly on physical therapy, behavioural intervention, stroke rehabilitation, pain, orthopaedics, psychological issues or other assessment, intervention or treatment modalities other than home modifications.

Choice of databases

A wide range of databases were selected to assess their relevance to the above problem. A variety of searches were done using keywords, synonyms, truncation and connectors. Table 2 (below) illustrates the terms that were searched using the above terms for relevance:

Table 2. Sources consulted during systematic search phase

Data Sources		
Medline (PubMed)	Cinahl	Cochrane
OT Seeker	Pedro	Science Direct
Embase	EBM Reviews	PsycInfo
Web of Science	Social Work Abstracts	ASSIA: Applied Social Sciences Index and Abstracts
International Bibliography of the Social Sciences	Informit e-Library : Health Collection	Family & Society Studies Worldwide
Google Scholar	Libraries Australia	HMinfo library
Government department websites	Organisation websites – e.g. Occupational Therapy Australia	

In addition to database searching, scanning of reference lists in articles and reviews led to further relevant research, which has been included in this review.

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Matrix development

The first author, based on knowledge of the occupational therapy profession, literature findings, and guided by informal discussions with peers, developed a matrix. The matrix of reference materials (see Table 3) logged eight factors, which could be considered to guide clinical practice of home modification follow-up.

The matrix originally included six additional factors; modification provider, age, language/culture, education, scope of modification and home ownership. No findings in the literature correlated with these areas and as such they were excluded from the matrix. The author still feels some may be of clinical importance, though further research in these areas is required to demonstrate this.

3. Results

Results of Systematic Review

As illustrated in Figure 1, the original search found 330 studies, 183 were excluded based on focusing on in home rehabilitation, excluding home modifications as an intervention and duplicates. 147 were reviewed in full text using a matrix to determine suitability, with 21 selected.

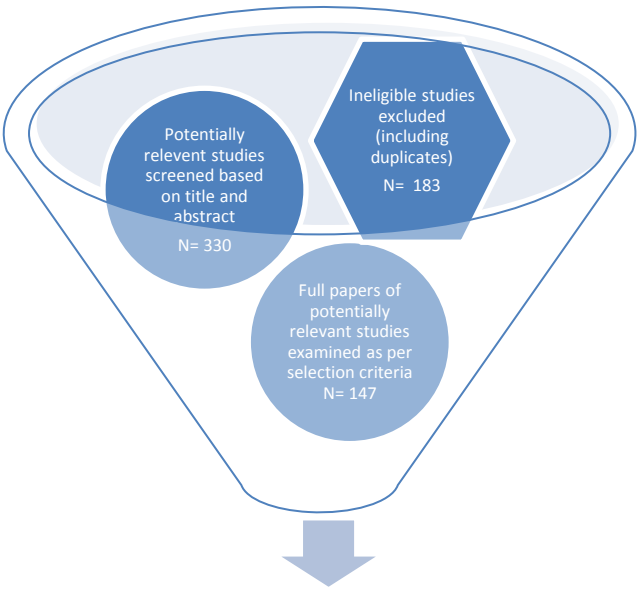

Figure 1. Flow chart of literature review (Reviewed using attached matrix N= 18)

The literature search identified 18 studies and 3 policies that provided evidence to guide follow-up clinical practice for occupational therapists. It should be noted, limited evidence was found on home modification follow-up research alone, and findings were drawn from evidence on a range of home modification studies which utilised follow-up

in their studies. The findings varied in their methodology with 4 systematic reviews, 3 randomised controlled trials, 6 quasi-experimental studies, 4 qualitative studies and 3 policies. Some studies focused on pre-discharge home visits, whilst others gave information pertaining to community occupational therapy practice. There were no major differences between the information provided for either clinical setting (inpatient or community), so the results have been not been segregated in this study.

To date, there is limited evidence concerning determinants associated with the issue of community dwelling older adults' use of recommended modifications (Gitlin, Corcoran, Winter, Boyce, & Marcus, 1999), although decisions regarding policy, funding and screening should be based on current best evidence of effectiveness (Barras, 2005).

As illustrated in Figure 2 (below), studies came from a variety of countries across the world. This adds to the belief that follow-up post environmental modifications, is an important issue for occupational therapists across the globe.

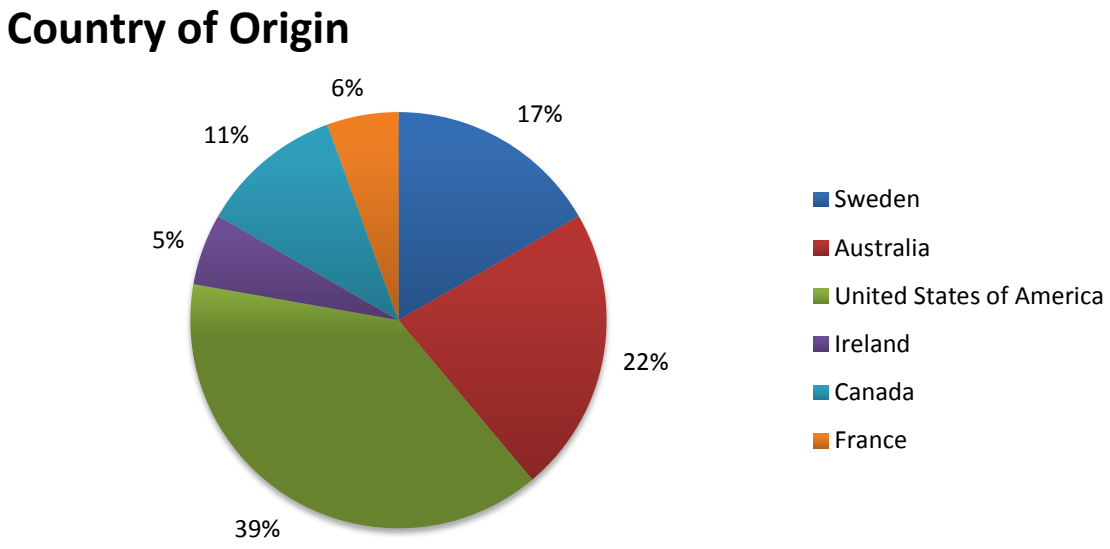

Figure 2. Geographical source of literature.

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Table 3 (below) lists the studies included in the review and the matrix factors which were identified within the study or policy.

Table 3. Matrix of evidence findings

	Timeframe	Tool type	Professional	Disability	Carer	Service delivery	Metro or rural	Cost	Systematic Review	RCT	Quasi-experimental	Qualitative	Expert Opinion	Policy/ guidelines
(Harris et al., 2008)		x						x						
(Tse, 2005)	x		x			x			x					
(Nygard et al., 2004)		x	x			x						x		
(Chiu & Oliver, 2006)		x									x			
(Faul et al., 2009)	x		x	x	x	x					x			
(Söderback, 2008)			x	x								x		
(Clemson, Mackenzie, Ballinger, Close, & Cumming, 2008)		x	x						x					
(Barras, 2005)			x						x					
(Niva & Skär, 2006)	x	x		x		x						x		
(Hoenig et al., 2006)	x		x			x	x	x			x			
(Gitlin et al., 2009a)						x				x				
(Boutin-Lester & Gibson, 2002)				x		x						x		
(Gitlin, Miller, & Boyce, 1999)	x	x				x					x			
(Sanford & Butterfield, 2005)			x			x					x			
(Cumming et al., 1999)	x		x			x				x				
(Pardessus et al., 2002)				x		x				x				
(Guay, Desrosiers, & Dubois, 2010)			x								x			
(M. Law, Di Rezze, B., and Bradley., L., 2010)						x			x					
HMMS State Council	x	x				x	x							x
QLD DOH		x												x
Department of Veterans' Affairs														x

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4. Discussion

Timeframe

Typical intervention includes post-assessment follow-up with clients and health care providers to gather additional information (Sanford & Butterfield, 2005). The three phases of assessment intervention and follow-up are iterative and interlinked as illustrated in Figure 3. The literature search found eight studies demonstrated timeframes for follow-up with large variation; from immediately following home modification installation, up to three months. All studies concurred with (Pardessus et al., 2002) who contacted patients to check the modifications had been made or to encourage their realisation. (Gitlin et al., 2009b) discuss the most in need (frail, post-hospitalisation, vulnerable elderly people) receive inadequate follow-up care, which describes the majority of occupational therapy client populations requiring home modification/s.

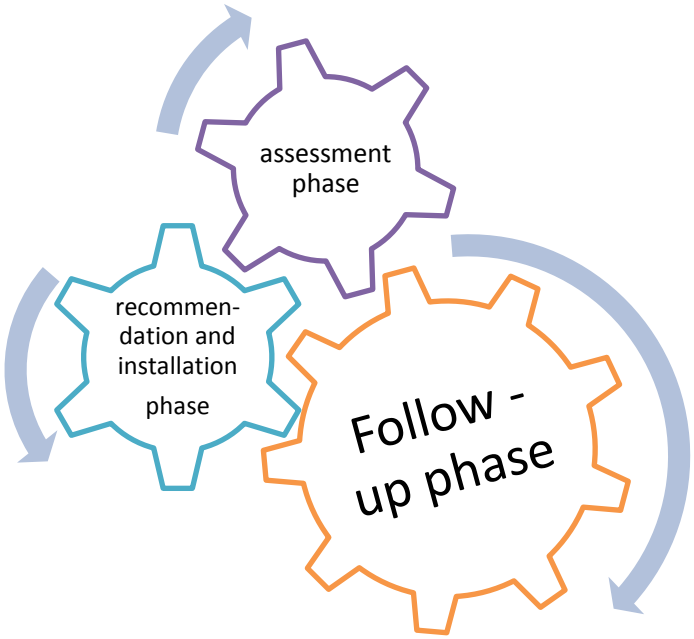

Figure 3. The relationship of assessment, intervention and follow-up

Two studies, Faul et al. (2009) and Hoenig et al. (2006) contacted clients several times in a short period (four visits over six weeks, and eight calls over twelve weeks) though these studies were reviewing other interventions in addition to home environmental modifications. In the study by Faul et al. (2009) this intensive follow-up showed no difference in outcomes to the control group. Whilst others (Gitlin, Miller, et al., 1999; Tse, 2005) report three months as a suitable period for follow-up of environmental modifications to reinforce the recommendations and provide instruction in safe self care techniques in areas identified as difficult by the client. Hoenig et al. (2006) stated that one of the difficulties with follow up is that some interventions may not have been able to be implemented within 6 weeks (e.g. a ramp).

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None of the studies identified specifically reviewed the effectiveness of follow-up at various timeframes post the environmental modification. Some papers reported that follow-up within three months is required for environmental modifications – whether this was a policy directive or considered best practice is not clear however in the explanation it is considered that this follow- up practice is required in order to:

- reinforce recommendations;
- instruct in safe self care techniques;
- encourage compliance; and/or
- review interventions additional to the home modifications such as carer instruction in safe usage of equipment.

Tool Type

A follow-up assessment determines whether the intervention was successful in changing the targeted environmental factor (M. Law, Di Rezze, B., and Bradley., L., 2010). There has been some difficulty in locating a suitable follow-up tool and Gitlin, Miller, et al. (1999, p. 147) explain 'we were unable to use a full standardised assessment with known reliability and validity. Similarly Harris et al. (2008, p. 91) state 'there was no mention of use of a standardised assessment in any of the patient histories'. Barras (2005) also states that no consistent assessment tool was identified. Other authors utilised a variety of checklists, attention direction frameworks, survey and observational techniques to guide follow-up process, measure completion of recommendations (Cumming et al., 1999) and/or review changes to the patients' ability and function.

Nygard et al. (2004) describes a registration form developed for their study that contains five variables; client's problems, therapist's interventions, outcomes from client's view, outcomes from therapist's view and other comments. The client problem was written in functional terms, for example, 'the client is unable to get up from bed due to crowded space.' Questions such as: 'how has this [specific intervention or adaptation] worked out for you?' were asked of each participant for each of the recommendations made by the occupational therapist. This appears to be a useful tool in ascertaining whether the modification is in place and whether it has met the functional needs of the client.

Gitlin, Miller, et al. (1999) used a telephone survey to complete their follow-up reviews. In the survey participants were asked 'whether they had received each piece of equipment' and for each device received was 'it currently in use'. Clients were also asked about the benefits of using the issued equipment. One question asked participants to rate the extent to which the equipment made self-care easier on a three-point scale. Clients were also asked about their satisfaction with the overall program. This tool shares some similarities with the study by Nygard et al. (2004) as it asks specific questions about each item recommended.

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The Adaptive Prescription Record was utilised by Hoenig et al. (2006). This is a checklist that covers a range of functional and environmental problems. It contains columns describing the issue and has 'recommended', 'implemented' and 'comments' as the columns to be utilised for feedback. This is a succinct tool that does incorporate follow-up.

The SAFER-HOME tool was reported by Chiu and Oliver (2006) who explain that an outcome measure often requires a minimum of two time points; pre and post intervention. This tool has 97 items focusing on daily activities such as 'carrying drinks or meals', and each item is rated on a 4-point scale. Occupational therapists using the tool reported using it to formulate goals, set priorities and measure changes over time. The Discharged Patients' Enquiry Questionnaire (DPEQ) was a research tool used by Söderback (2008). This tool was only administered post discharge from the hospital, not prior to admission. The questionnaire appears comprehensive, covering personal conditions, living circumstances, health status and perception of the quality of services, as well as perceived quality of interventions during discharge, and a self rated functional capacity score. This tool does not expressly ask about modifications or use of equipment post discharge.

A Falls Hazard checklist utilised by Faul et al. (2009) was used initially to guide occupational therapy practice however; not at the conclusion of the study to measure recommended modifications, or improvements in function problems. Pardessus et al. (2002) simply states that 'the occupational therapist checked if the home modifications had been made or encouraged their realisation.'

In two studies, Clemson et al. (2008) and Tse (2005) the number of falls of participants was used as a proxy outcome measure for improved safety following home modification interventions. This is important, as outcome measures are well-recognised means for measuring intervention quality. An outcome measure works to the extent that it can effectively measure the extent of change achieved by a home modification intervention as ascertained by comparison of a pre and post measurement (Laver-Fawcett, 2007). Follow-up criteria in occupational therapy include: an increase in quality of life, client satisfaction, an increase in functional ability and improved accessibility. Therefore the number of falls alone is not considered an appropriate outcome for follow-up of post home modifications.

Niva and Skär (2006) used two questionnaires pre and post modification to provide a description of the participants' activity patterns – Accessibility in My Home Questionnaire (Fange & Iwarsson, 1999) and the Occupational Questionnaire (Kielhofner, 2002). The first asked about activities of daily living (such as dressing, toileting, eating etc.) and also about how the person perceived the accessibility of their home (accessibility of entrances, gardens etc.). The second questionnaire focused on a self-report of occupational performance. Whilst results showed improvements in both activities of daily living and perceived occupational performance information on the installation, there were no questions specifically about the home modifications and their contribution to either aspect.

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Four key factors were identified in the literature to be included in follow-up post environmental modifications; installation, use, function and safety. A definition is each term is provided in Figure 4.

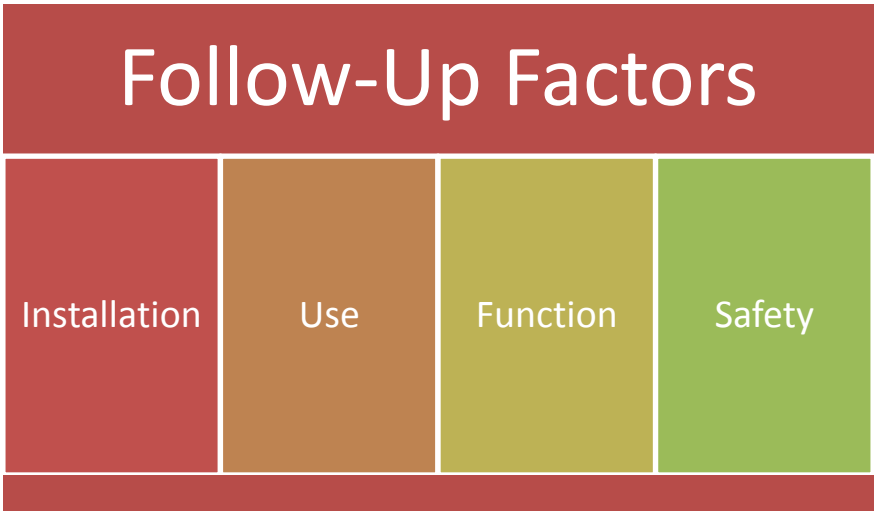

Figure 4. Key follow-up factors

Installation: in this context installation refers to communication and questioning around the environmental modification. That is asking if the modification has been installed by the builder/ checking if the equipment has been delivered and is in place. If the modification has been installed as per the occupational therapists' instruction and wether the modification is in the correct position (geographic location). Other questions regarding installation may include ensuring product specifications such as colour, texture and type.

Use: is explicit to the actual utilisation of the environmental modification. It seeks to ascertain if the client is using the recommended modification and if the user has any questions around how to use the device/implement/changed environment. In some literature the use of the term usability and function are used interchangeably – in this review it is worth noting that these terms have distinctly different definitions.

Function: refers to the purpose of the recommended action to solve a functional problem or improve a task. Has this modification solved the problem? Are you able to transfer/ stand/ mobilise/ dress/ toilet easier or better? Some interventions are designed to increase independence and safety, and other interventions the function may be intended for the carer's benefit, i.e. has the modification reduced their effort or decreased their risks.

Safety: is to ascertain any concerns regarding manual handling, use or risks associated with the modification. Here the therapist needs to be certain the modification has not caused an additional functional problem/issue or concern either for the client, carer or paid services that utilise the environment. In this section occupational health and safety factors may be identified which were unforeseen when

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prescribing the modification. In addition further hazards may come to light as the user/s function in the changed environment may encounter new functional barriers.

Tools to guide follow-up practice for post environmental modifications are diverse and inconsistent in the factors they considered. Three of the tools reviewed (Gitlin, Miller, et al., 1999; Hoenig et al., 2006; Nygard et al., 2004) expressly focus on each recommendation.

Table 4. Summary of home environmental follow-up tools (continued over page)

	QLD Dept of Housing	NSW HMMS State Council	HNE Health	Usability Rating Scale
Purpose	Review post home modification	Post Home Modification Report	Minor modifications follow up questionnaire	Review response to experience in physical environments
Factors considered	Looks at safety, function, quality of life, recommend-dations and adherence, and user satisfaction with process and outcome	Focus on adherence to OT recommend-dations, function, safety and client/carer satisfaction. Also gives checklist for action	Reviews each recommend-dation, adherence to recommend-dations, description of installation, use of modification, if the functional issue has been solved by modification and any problems (i.e. safety concerns)	Looks at usability of environment when performing an activity
Recording information	Has free text for some sections, 7 point scales for others. Functional and technical sections. Also tenant survey.	Yes/No questions and space for comments.	Free text answers	7 point scale

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	QLD Dept of Housing	NSW HMMS State Council	HNE Health	Usability Rating Scale
Outcome measurement	Recommen-dation adherence, user report of safety, QOL and functional score, user satisfaction and service feedback	Meet functional needs yes/no. Able to use in safe manner yes/no. Client/carer satisfied yes/no	Recommen-dation adherence, user report of use, problems (safety) and function	Usability of environmental when undertaking an activity
Impact measurement	Pre and post functional score	Nil	Pre and post functional information	Could use pre and post environmental modification
Strengths	Comprehen-sive, contains both outcome and impact measurement Could be used over the phone	Time take to complete tool Could be used over the phone	Succinct, reports on if the functional problem is solved by the modification Could be used over the phone	Simple scale using everyday language Published study
Weaknesses	Non standardised, draft unpublished format Length of tool Time required to complete tool	Non standardised, draft unpublished format Yes/no format over simplified – i.e. cannot contain a level or degree of risk as chosen by client/carer Focused on compliance rather than impact of modification on consumer outcomes	Non standardised, Draft Unpublished format	No reference to individual changes or modifications No information on adherence

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Profession completing follow up

Of the studies found in this review 11 of 18 identified the professional completing the follow up;

- in six studies an occupational therapist completed the follow-up (Barras, 2005; Clemson et al., 2008; Cumming et al., 1999; Hoenig et al., 2006; Nygard et al., 2004; Tse, 2005),
- two referred to a suitably qualified professional or home-modification expert (Clemson et al., 2008; Sanford & Butterfield, 2005),
- one included the general practitioner (Faul et al., 2009),
- one (Söderback, 2008) the chief nursing officers, and
- in the final study (Guay et al., 2010) discussed the usefulness of a home health aide in the home modification process.

Hoenig et al (2006) discuss patients receiving a home visit from an OT post discharge were more likely to receive equipment that fit correctly, and to bathe independently. Clemson et al. (2008) note that follow-up and support for recommendations are vital, and state that follow-up by the health professional and support for adaptations and modifications is one of four key areas for determining inclusion of studies into their systematic review. The authors explain professional training was considered at a high level when it involved an occupational therapist, ergotherapist or equivalent, as these professions have specific expertise evaluating both the person and the environment.

Sanford and Butterfield (2005) refer to typical post assessment follow-up with ‘health care providers’ and later ‘home modification experts’. This paper also discussed the use of the Comprehensive Assessment and Solutions Process for Aging Residents (CASPAR) in USA, where a local therapist or other service provider completes a paper based assessment and the information is sent to a home modification specialist to identify, design and specify individual solutions. The authors state that they did not include typical post assessment follow-up in this study.

The study by Guay et al. (2010) reviews home health aides’ ability to prescribe simple ADL equipment and modifications related to bathing. The findings indicate that there are few differences between OTs and home health aides when home health aides are provided with an algorithm (i.e. a procedure or formula for solving a problem) to assist in their clinical reasoning. The algorithm used in this particular research is the ‘Préalables aux soins d'hygiène’ developed by Desnoyers, Mercier, Caissy & Doyon (unpublished, available upon request at danielle@desnoyers.ca), a tool which includes an interview, clinical observations and a home visit. There is low statistical power in some aspects of these results.

Of particular note is the study by Faul et al. (2009) where follow-up was directed to each participant’s general practitioner. An interdisciplinary team sent results, including assessment and recommended care plans, to the GP. Participants were encouraged to follow-up with their primary care provider (GP) where needed. This study focused on

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interdisciplinary home-based geriatric assessment (including home modifications) and self-management support services to community dwelling older adults.

An important factor to be considered by an occupational therapist is adherence or compliance with the prescription. Without follow-up, adherence is unknown; recommendations may not have been implemented, or were implemented yet may have resulted in no real benefit to patients (Harris et al., 2008). With no follow up, this situation would remain undiscovered by the occupational therapist or health professional evaluating the environmental modifications.

Nygard et al. (2004) explains the need for investigating and reflecting on practice in order to enhance the development of scholarly practice in the caring sciences'. Additionally, this study revealed shortcomings and led to reflections on the occupational therapy interventions and clinical reasoning that foster development of clinical practice. This may indicate there are possible learnings where the same professional who recommended the modification, follows-up and evaluates and improves practice from information gathered. The study also identified that too many personnel visiting from different health care and community services are considered burdensome by clients; one of the themes identified in their study was the unacceptably high number of personnel entering the clients' homes and that occupational therapists had identified continuity of personnel as an important component in follow-up. The authors clearly recommend that the same occupational therapist who prescribed the modifications should complete the post modification follow-up.

Of the studies reviewed, all agreed that follow-up post an environmental modification is best practice. A suitably trained professional such as an occupational therapist should preferably complete follow-up. There is some evidence that other health professionals could be trained to complete follow-up if that training and the ongoing supervision were provided by an occupational therapist. With the increasing use of Allied Health Assistants in Australia this is an area requiring further research.

Disability

Few studies discussed the patients' disability or impairment, and none discussed it as a factor in clinical decision making when deciding to follow-up on environmental modifications, or when to use a specific method of service delivery over another.

One study (Faul et al., 2009) described 'community dwelling older adults' over 65 years with no recent acute medical illness or major medical event. Two participants were excluded due to a diagnosis of dementia with no reliable caregiver. Hoenig et al. (2006) targeted community dwelling frail elders who had recently been prescribed a walker or wheelchair as this was a group at high risk of falls and likely needing bathroom safety equipment. While Boutin-Lester and Gibson (2002) stated participants needed to be able to participate in interviews and verbally express their perceptions of the treatment process, therefore, those potential participants with impaired memory were excluded. Similarly Gitlin et al. (2009a) recruited older adults who were cognitively intact.

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Another study (Söderback, 2008) studied older persons over 75 years of age, admitted to an acute hospital ward, whom lived in the community (i.e. those from care facilities were excluded). People diagnosed with dysphasia or dementia was also excluded from this study. Pardessus et al. (2002) also excluded those with cognitive impairment. In a study by Niva and Skär (2006) where questionnaires were utilised it was essential participants could understand both written and verbal information.

Both inpatient and community populations were researched in the evidence located, and none of the evidence provided any information to guide clinical reasoning of follow-up practice that differed in one setting or another. A total of five studies excluded persons with dementia, memory or cognitive impairments. Whilst it is not explicit these participants were excluded due to their lack of ability to provide reliable information (or perhaps for ethical reasons) this review concludes cognitive impairment is a valid factor when determining follow-up process. Faul et al. (2009) indicated that this group may need a reliable carer or an alternative mode of service delivery than other client populations.

Carers

The role of carers is discussed in a number of studies. Gitlin, Corcoran, and Leinmiller-Eckhardt (1995) explain the importance of including caregivers and family members to develop interventions that fit within the family system of values and beliefs. Toth-Cohen et al. (2001) provide insight into the importance of caregiver inclusion; the provider shifts from one of 'expert' to one of partnership that includes the caregiver as a 'lay practitioner' referring to their unique expertise and knowledge which comes from providing daily care. Faul et al. (2009) also stated some of their participants lived with one other person, who may be their carer, or the participant themselves may be a caregiver.

None of the studies identified specifically indicated the use of carers in following progress of environmental modifications. When considering the evidence of caregiver inclusion in the home modification process in its entirety, inclusion of the carer in follow-up is appropriate.

Mode of Service Delivery

Traditional in-home assessments include interviewing the patient and/or caregivers to understand abilities and problems; walking through the home, usually with the client to analyse problem areas and observe task performance, and documenting the home using photographs, sketches and measurements of critical dimensions that impact on the clients performance (Sanford & Butterfield, 2005). However, the use of telephone and video are emerging as an alternative to face to face service delivery in a range of clinical situations (Bendixen, Levy, Olive, Kobb, & Mann, 2009; Cravens et al., 2005; Galea, Tumminia, & Garback, 2006; Parker, Dewey, & on Behalf Of The Total Study Group, 2000; Sanford & Butterfield, 2005; Sanford et al., 2007)

There are several different modes of service delivery for follow-up identified in the literature; traditional face to face home visiting, face to face interviewing, telephone with or without a survey, use of postal questionnaires and use of televideo devices. In three studies combined use of home visiting and telephone follow-up were utilised.

Three studies (Boutin-Lester & Gibson, 2002; M. Law, Di Rezze, B., and Bradley., L., 2010; Nygard et al., 2004) used face to face home visiting to provide education and training to clients and/or carers. Nygard et al. (2004) explain follow-up evaluations should be undertaken to identify deficiencies in the intervention; e.g. to reveal interventions which may be less useful to the client. Whilst three more (Faul et al., 2009; Gitlin, Miller, et al., 1999; Tse, 2005) utilise face to face home visiting to follow-up combined with other service delivery modes.

Face to face interviewing was used by (Söderback, 2008) where patients attended a regional hospital for a short interview on discharge planning (with home modification among the interventions studied).

Use of the telephone is routinely utilised in health care practices across Australia. Three studies, (Cumming et al., 1999; Gitlin et al., 2009a; Pardessus et al., 2002), specifically mention the use of telephone to conduct follow-up post home environmental adaptation. Three more (Faul et al., 2009; Gitlin, Miller, et al., 1999; Tse, 2005) utilise telephone follow-up combined with other service delivery modes. Two studies, (Faul et al., 2009; Gitlin, Miller, et al., 1999), utilised a telephone survey to guide the follow-up process.

One study (Niva & Skär, 2006) used postal questionnaires to gather information on activity patterns of elderly persons following housing adaptation. The number of participants in this study were small (5) though results suggested housing adaptation enabled more activities. Use of postal questionnaires has also been evaluated (Parker et al., 2000), though considerable effort was needed (telephone follow-up) to minimise non-responses.

Two studies (Hoenig et al., 2006; Sanford & Butterfield, 2005) investigate the use of teletechnology. As discussed previously technology use is emerging in clinical practice. Hoenig et al. (2006) discuss teletechnology alone, when used by home health aide or the patient themselves, does not provide real time interaction between provider and patient in thus is unlikely to replace traditional care but supplement it. In this study the teletechnology can be used for real time interaction between the home modification specialist and the patient. The findings do not incorporate follow-up post modification through the authors state this technology could enable cost-effective follow-up post environmental modification.

In particular, the use of technology has been applied to the home environmental adaptation arena (Sanford & Butterfield, 2005; Sanford, Jones, Daviou, Grogg, & Butterfield, 2004; Sanford, Pynoos, Tejral, & Browne, 2002). In the study by Sanford and Butterfield (2005) the researchers used video technology to complete a virtual ‘walk through’ of the clients home and can permit direct observation (task specific assessment) as required. Again the study did not incorporate follow-up in the scope,

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however the authors discuss when additional follow-up information is solicited in real-world situations, remote assessments will be effective (Sanford & Butterfield, 2005).

Despite many varied service delivery modes for follow-up practice, there is consistent use of follow-up post environmental modifications. (Gitlin, Miller, et al., 1999) state majority of clients had one or more difficulties with equipment orders, such as wrong equipment being delivered, and inability to use the equipment safely and effectively. Telephone is the most common way of completing follow-up, though a home visit may be required if the consumer or caregiver requires education and training in the use of environmental modification. It appears there is a need for 'real world' research to test effectiveness of teletechnological approaches to follow-up before this is integrated into clinical practice.

Urban or rural setting

Only one study (Hoenig et al., 2006) discuss the availability of therapists may be limited in rural settings. In these settings therefore it is imperative that service delivery is focused on the most efficient and effective use of resources. There were no findings, which recommended one service delivery mode over another due to service setting (rural or metropolitan).

Cost

For present purposes, 'cost' can be thought of in two different ways. The first is the service costs involved with following of post modification (for example; the hourly rate of the person completing the follow-up or travel costs). The second is the cost of the actual modification (such as materials, builder's fees to install modification etcetera).

Service costs

It is surprising little evidence (two studies) were identified on costs, especially considering the ageing population (Boutin-Lester & Gibson, 2002), demand for services (Hoenig et al., 2006), use of evidence to guide resource allocation (Clemson et al., 2008), as well as an apparent increase in occupational therapy home assessments (Boutin-Lester & Gibson, 2002; Patterson, Viner, Saville, & Mulley, 2001).

One study discussed the cost of follow-up (Hoenig et al., 2006, p. 287) stating that 'travel for follow-up outpatient therapy may be too difficult, too expensive or not possible'. As part of the paper, the authors discuss alternatives to face to face home visiting and describe the cost-effective benefits of a post-modification follow-up home visit by the occupational therapist. Taking a slightly different approach Harris et al. (2008) state that cost, time and human resources, which may impact on clients' following through with prescribed recommendations, have not been considered in their study. There are no findings in the studies reviewed that would recommend one method of follow-up mode over another due to cost, though we would be remiss not to mention that due to the relatively lower costs of telephone visits and teletechnology, these are considered to be more cost effective methods of service delivery for post-

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modification follow up than home visiting. In regard to the service delivery varying relative to the cost of the actual modification, we found no evidence to suggest that follow-up practice should vary proportional to costs of the environmental modifications.

5. Conclusion

This paper provides a synthesis of the best available evidence to guide clinical practice for occupational therapists' recommending environmental modifications. The implications of these findings may be utilised to guide the development of policies and procedures around home modification follow-up. There is sufficient evidence to support follow-up practice post environmental modification in routine clinical practice.

Future research is still required in this area to clarify clinical groups where this practice may require expansion or adaptation, test tool use, and randomise telephone and face-to-face home visiting to conduct follow-up.

Table 5. Summary of evidence for follow-up practice post modification

Variable considered	Best practice recommendation
Timeframe	Follow-up within 3 months is required for environmental modifications.
Tool type	A post modification follow-up tool should ask about each modification recommended. If the recommendation has successfully solved the functional problem for which is was prescribed. Safety (including problems the modification may have caused), and whether the modification is now in use.
Disability	This review concludes cognitive impairment is a valid factor when determining follow-up process.
Carer inclusion	Inclusion of the carer in follow-up is appropriate.
Professional completing follow-up	Follow-up should be preferably completed by a suitably trained professional such as an occupational therapist.
Service delivery mode	Telephone is the most common mode of completing follow-up, though a home visit may be required if the consumer or caregiver requires education and training in the use of environmental modification.
Urban or rural setting	There were no findings which recommended one service delivery mode over another due to service setting (rural or metropolitan).
Cost	No evidence was found to suggest that follow-up practice should vary proportional to costs of the environmental modifications. There were some studies which explored telephone and teletechnology as a more cost effective service delivery mode.

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Appendix 1

HMinfo Home Modification Follow-Up Tool

Scoring

	-3	-2	-1	0	+1	+2	+3
Installation	Vastly different to OT instruction		Quite different to OT instruction		Slightly different to OT instruction		Installed as per OT instruction
Use	Used 0% of the time	Used 15% of the time	Used 40% of the time	Used 50% of the time	Used 60% of the time	Used 85% of the time	Used 100% of the time
Function	Very difficult	Moderately difficult	Barely difficult	Neither	Barely easy	Moderately easy	Very easy
Safety	Very unsafe	Moderately unsafe	Barely unsafe	Neither	Barely safe	Moderately safe	Very safe

Instructions for use:

Using the above table rate each factor in the space provided in the tool below.

The function factor may be utilised pre and post modification; however allowances for recording this have not been included in the tool.

Information on the intended use of this tool is provided as appendix 2. It is strongly recommended that this tool is utilised in conjunction to reading the guidelines provided in this paper.

HMinfo Home Modification Follow-Up Tool

Demographic Data

Name:_____ Address:_____ DOB: __/__/__

OT: _____ Contact Details:_____ Date of follow-up: __/__/__

Mode of follow-up: face to face/ telephone/ other _____

Recommendation	Installation	Score	Use	Score	Function	Score	Safety	Score	Other comments
Describe specific recommendation (include clinical rational for recommendation)	Was it installed? Description of height, location, type, colour etc		Are you using it? Is it helpful? Any questions on how to use it?		Has it solved the problem? Is it helping with the functional task? Are you able to do _____ better/easier?		Do you feel safe using it? Has it caused other issues or concerns?		Service feedback

Example of HMinfo Home Modification Follow-Up Tool

Recommendation	Installation	Score	Use	Score	Function	Score	Safety	Score	Other comments
Describe specific recommendation (include clinical rational for recommendation)	Was it installed? Description of height, location, type, colour etc		Are you using it? Is it helpful? Any questions on how to use it?		Has it solved the problem? Is it helping with the functional task? Are you able to do _____ better/easier?		Do you feel safe using it? Has it caused other issues or concerns?		Client feedback Therapist notes etc
Example 1 the grab rail which was recommended to help you getting on/off the toilet.	Yes – left hand side about elbow height when seated	+3	Yes I use it	+2	It helps me to steady myself when getting up from sitting	+3	No concerns or problems	+3	The builder was so friendly.
Example 2 The handrail at the rear steps to make using the stairs safer	Yes it went in on Friday	+3	I hold onto it with my right side (good side) going down	+3	Yes it helps me when I am going down to keep my balance	+3	Well I think I need one (a rail) on the other side	+2	Thankyou

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Appendix 2

Tool development

There were three (3) key tools which shaped the development of the HMinfo Home Modification Follow-up Tool. The first the usability rating scale (Steinfeld & Danford) introduced the use of a Likert Scale (pronounced 'lick-ert') to follow-up practices. The second tool, which was influential in tool development, was the Post Home Modification Review (Middleton & Turnbull, 2002) for the Department of Housing Queensland. This tool also used a Likert Scale in some sections, and also use of a pre and post score to track functional outcomes. In addition this same tool provided many opportunities for free text which allows the occupational therapist or other suitably trained professionals to record information on the degree of change, other issues, or client perspective. Free text areas are important to avoid over simplification which can be see when utilising a yes/ no questioning approach. The final tool (NSW Health; Hunter New England Area Health Service, 2009) used only free text fields to allow expansion of information gathering as required.

As discussed in the body of the paper, four key factors were identified in the literature to be included in follow-up post environmental modifications; installation, use, function and safety. The three tools which guided the content of the HMinfo Home Modification Follow-up Tool included these key factors in their content. The usability rating scale (Steinfeld & Danford) asked participants and interviewers to rate the ease of a activity using the seven point Likert Scale provided. This can be seen in the HMinfo Home Modification Follow-up Tool where the therapist/ client is asked to rate the ease or difficulty of performing a specific functional task. In the Post Home Modification Review (Middleton & Turnbull, 2002) participants are invited to rate their level of safety and function following home environmental modifications, again on a seven point Likert Scale. Further in the same tool the occupational therapist is given free text to explore the installation of modification and if works were carried out to OT specifications. These aspects can be seen in the HMinfo Home Modification Follow-up Tool under the installation, function and safety sections using a seven point Likert Scale, and free text fields.

The final tool which was incremental in shaping the advancement of the HMinfo Home Modification Follow-up Tool was the (NSW Health; Hunter New England Area Health Service, 2009). This tool includes many of the same factors discussed above such as installation, function and safety and introduces one final factor named use. This tool prompts the therapist to ask the client if the modification is in use, e.g. “are you using it”.

The HMinfo Home Modification Follow-up Tool is designed to be flexible in its application. The tool can be utilised as a prompt for therapists over the phone, face to face or in a paper based mail format. The tool can be used electronically or printed and written upon. The tool can be utilised with any home modification funding provider

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(such as home modification service, Department of Veterans' Affairs, or Department of Housing) and is not influenced by the clients' disability or functional level.

Validity and reliability

The HMinfo Home Modification Follow-up Tool uses 'a Likert scale which is a type of psychometric response scale often used in questionnaires, and is the most widely used scale in survey research' (Wikipedia, 2011). Here the therapist or client is asked to rate the factor using the phrases given. Likert scaling is a bipolar scaling method, measuring either positive or negative response to a statement. For example the safety factor asks the respondent if the modification is very unsafe, moderately unsafe, barely unsafe, neither safe or unsafe, barely safe, moderately safe or very safe.

This scale collects ordinal data. Ordinal data is where ordering or ranking of responses is possible but no measure of distance is possible (Allen & Seaman, 2007). For example it would be preferable to all involved in the modification if the rank was safe as opposed to unsafe.

Sometimes a four-point scale is used; this is a forced choice method since the middle option of 'Neither agree nor disagree' is not available. (Wikipedia, 2011) This method of Likert scaling was used in the factor installation as the researchers felt a modification could not be installed as neither to the occupational therapists recommendation or no to the occupational therapists recommendation.

The design of the HMinfo Home Modification Follow-up Tool using a well known data collection technique, however, both validity and reliability of this tool requires further research.

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Appendix 3

Evidence of clinical need for follow-up post environmental modification and factors impacting on follow-up.

Author (Date)	Study Design	Sample size	Discussion
Tse (2005)	Systematic review	18 studies	Various follow up periods were identified ranging from 3 months for community based occupational therapy to reinforce the need for the recommendations to occur to 6 months, and again at 12 months in another study. The authors refer to Ray et al (1997) and the lack of validated tools for the environment, equipment, transferring techniques and care practices. Clemson et al (1999) recommend strategies to facilitate the environmental modification, such as follow up telephone calls, extra home visits if needed. Authors noted a multidisciplinary approach to care - nurses, psychiatrist etc may visit in a team. A telephone call was used in Pardessus et al (2002) and in a study by (Close et al., 1999) a postal questionnaire was completed every 4 months for 1 year via postal service to follow-up consumer outcomes.
Clemson et al. (2008)	Systematic review	6 studies	One of the criteria for inclusion of articles included for this systematic review was 'provision of adequate follow-up by the health professional and support for adaptations and modifications' (Clemson et al., 2008, p. 957). Articles had to meet 75% or three fourths of the inclusion criteria. Results state 'we support the Cochrane assertion (Gillespie et al., 2009) that a health professional who is trained to evaluate the person and the environment should be designing and conducting such interventions. Assessment, evaluation and follow-up all combine to produce positive results to prevent falls; 'we recommend using existing validated assessment tools to assist in priority setting and to evaluate the person and his or her fall history, and we note that follow-up and support for recommendations are vital'(Clemson et al., 2008, p. 969). Discussion around GPs managing patients who are falling at home need to know who to refer to and what standard of care they can expect. This review suggests that environmental interventions should be part of pre-discharge planning for those at high risk and post discharge follow-up for those with a history of falls.

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Author (Date)	Study Design	Sample size	Discussion
Barras (2005)	Systematic review	31 studies	Various practitioners including physiotherapists were on home visit with OT. Limited information regarding cost of home visits was found. In one study reported OT services completed a post discharge visit within 24 hours of discharge - limited results from this study as study follow-up was 4 months later and responses were vague and generalised. No consistent assessment tool was identifies across the papers (Barras, 2005, p. 335).
Cumming et al. (1999)	RCT	530	This study reviewing the effectiveness of home modifications by occupational therapists used the telephone to follow-up that home modifications had been made and to encourage compliance with the recommendations.
Pardessus et al. (2002)	RCT	60	This study was designed to investigate whether home visit by an OT reduced the risk of falling. Follow up post recommendation and modifications were completed over the phone. The occupational therapist checked if the home modifications were completed or encourages their realisation if they had not.
Faul et al. (2009)	Quasi-experimental	73	Initial home visit plus eight phone calls over a 12 week period to provide additional self-management support. GP follow up - care plan sent to GP. Participants were encouraged to follow up with their primary care providers where needed. Participants received a follow-up visit 12 weeks after the self-management care plan meeting. Follow-up telephone surveys timed to occur 6 months after the final follow-up visit. Additional telephone follow-up 8 calls over 12 weeks did not show improvements to the control group, i.e. this level of follow-up was not supported by the results. Results found these follow-up calls were not primarily focused on the self management plan, but were however focused on generic issues related to chronic illness. I.e. this could have been discussed with their primary care provider. Also the results 'highlight the potential to forego telephone intervention for moderately healthy older adults who are sufficiently motivated to keep themselves health following a comprehensive assessment' (Faul et al., 2009, p. 247).

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Author (Date)	Study Design	Sample size	Discussion
Gitlin et al. (2009a)	RCT	160	In this study the occupational therapist (and other professionals) completed four 90 minute home visits in the first 6 months, from 6-12 months 3 brief telephone calls to reinforce strategy use (including use of modifications to the home environment) and then completed a final home visit where to OT reviewed and reinforced strategies and obtained closure. The control group did not receive this support. Results indicate a decrease in mortality rate compared to the control at 2 years.
Hoenig et al. (2006)	Quasi-experimental	14	'Travel for follow-up outpatient therapy may be too difficult, too expensive or not possible ' e.g. clients cannot themselves access outpatient services. The therapist providing the in-home rehabilitation is seldom the same therapist or even employed by the same institution from which the patient received initial rehabilitation, which undermines continuity of care. Second, availability of therapists in home care settings may be limited, particularly in rural areas. Videoconferencing, which permits real time two-way video and audio between provider and patient, is potentially cost effective method of meeting some needs for in-home rehabilitation. Use in treating mental illness and monitoring pressure ulcers. Telerehabilitation for assessment necessitates a mobile rather than fixed camera for monitoring activity pg 288 'Home health care nurses might use teletechnology to provide therapists with important information prior to OT/PT home visit (increasing both efficiency and effectiveness), facilitate consultation with providers and enable cost effective follow-up after an OT/PT home visit. Patient and/or nurse could use. Used by certified nurse assistant, in home nurses or nurses. Findings: majority had implemented recommendations at 6 week follow-up. Larger modifications such as ramps may not have been able to be completed within 6 weeks. Discussion that expensive onsite therapy visits could be targeted to those patients who need them the most by utilising nurse aids with teletechnology.
Gitlin, Miller, et al. (1999)	Quasi-experimental	75	The study reviewed whether bathroom equipment (including grab rails and hand showers) itself reduced self care difficulties or if the OT was required to provide additional instruction in its use. In addition the study used a telephone survey to follow up whether the clients continued to use the equipment and if difficulties had arisen. Findings indicate clients who received OT were ordered more devices, though there were no other differences between groups.

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Author (Date)	Study Design	Sample size	Discussion
Sanford and Butterfield (2005)	Quasi-experimental	70	This study discusses the tradition of providing follow-up post home modification assessment. Also the study expresses that remote follow up will be effective in real world situations, though this was not covered in this research study.
Söderback (2008)	Qualitative	9	Discusses hospital discharge process including home follow-up of clients' care status (von Koch et al 2000) and evaluation of measures connected to hospital discharge. Patients with dysphasia or dementia were excluded. Use of DPEQ - discharge patients enquiry questionnaire to determine clients perceptions post discharge on care including occupational therapy effectiveness. Validity and reliability needs further exploration.
Niva and Skär (2006)	Qualitative	5	Surveys were used with participants immediately after assessment; five days post adaptation, and 10 weeks after adaptation. The results 5 days post adaptation and 10 weeks were the same in this study.
Boutin-Lester and Gibson (2002)	Qualitative	5	Participants with emotional, cognitive, expressive or physical states that rendered the patient unable to participate in lengthy interviews were excluded. This study found participants felt they had little or no control over discharge, and there was insufficient communication (follow-up) from the therapist in regard to discharge. Some described discharge as termination.
Nygard et al. (2004)	Qualitative	23	The author states ‘continuous evaluations should be carried out’ to review effectiveness of occupational therapy recommendations. Method of follow up for the purpose of this study was via group interviews. It is worth noting prior to the group interview the therapist telephoned the client to remind him or her as well as family members. The same OT completed follow-up in majority of cases with the exception of changes in employment and staff illness. Having ‘a multitude of service providers involved was expressed as burdensome’ - in particular when there was a 'secondary actor' concerning long delay in delivery or installation of devices or housing modification that led to safety concerns for the client. In addition the follow up led to the discovery of unrecognised needs. Discussed therapists 'choosing' if or not to follow up their own clients introduces an obvious risk of bias, though this is synonymous with clinical practice.

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Appendix 4

Evidence of design and use of a tool for follow-up post environmental modifications

Author (Date)	Study Design	Sample Size	Discussion
Nygard et al. (2004)	Qualitative		The tool as such for this research looked at the functional barriers experienced by the client and were categorised into motor capacity. The tool had five variables to be completed and documented; a) the client's problems, b) the therapist's interventions, c) the outcome from the client's view, d) the outcome from the therapist's view, and e) other comments. The original form simply stated 'outcome' however a pilot of the tool recommended splitting this section into 2' clients' and therapists' view as they could be different at times. Questions were worded to participants such as "how has this [specific intervention or adaptation] worked out for you?". The client was asked to specify satisfied, partly satisfied, dissatisfied, or alternative selected.
Chiu and Oliver (2006)	Quasi-experimental		OTs use a combination of observation, interviews and task performance to rate each item on the SAFER_HOME tool. 4 point rating scale to increase sensitivity to detect change. Results the study found the SAFER_HOME useful for formulation treatment goals, setting priorities, and tracking progress of intervention. This tool was established on the person-environment-occupation model (M. Law et al., 1996)
Faul et al. (2009)	Quasi-experimental		Follow-up telephone survey was used. This focused on a range of generic health issues such as fatigue, symptom management, pain, ADLs etc. No specific focus on home modifications.

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Author (Date)	Study Design	Sample Size	Discussion
Niva and Skär (2006)	Qualitative		Use of Accessibility in My Home Questionnaire (Fange & Iwarsson, 1999) and the Occupational Questionnaire (Kielhofner, 2002).
Gitlin, Miller, et al. (1999)	Quasi-experimental	20	A telephone survey provided a list of equipment the client had been provided with, and asked if the equipment was received, if it was currently in use. If in use the client was asked if they felt safe if there were any difficulties, and the perceived benefits of using the equipment. If the equipment was not in use the clients were asked why not and specific difficulties which had been encountered.
HMMS State Council	Policy/ guideline	n/a	The tool contains broad questions such as 'have the modifications been completed to the occupational therapists' specifications?' There is limited reference to the functionality of the modification.

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