A Scoping Review of the delivery of Education and Training for Occupational Therapists Internationally

Abstract:

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Background: Occupational therapists play a key role in the provision of wheelchairs and seating. Wheelchair and seating educational training is not mandated in occupational therapy programmes in the Republic of Ireland which is a major concern for wheelchair users who may have received inadequate provision from clinicians with insufficient training.

Objective: To investigate the training and education afforded to practicing clinicians in developed countries and to prioritise building sustainable wheelchair and seating education systems for future practicing clinicians on an international level.

Method: A qualitative scoping review of scientific and grey literature was undertaken internationally of 10 Organisation for Economic Co-operation and Development (OECD) countries.

Results: A review of the scientific literature revealed that no universal education and training mandates have been established internationally to ensure effective provision of wheelchair and seating. Grey literature also revealed that the WFOT approved programmes investigated in the study have developed ad hoc frameworks for education and training frameworks for wheelchair and seating provision, as no national or international mandatory guidelines exist.

Conclusion: There is a need for mandatory training courses or programmes to exist as part of undergraduate or graduate educational programmes on an international level.

In order for appropriate wheelchair and seating provision to become a practical reality, policy-makers and health professionals should recognise and appreciate training inadequacies in the delivery of educational programmes internationally and aim to alleviate long-term healthcare expenses.

Keywords: wheelchair, seating, occupational therapist, education, training, provision.

Word count: 5000.
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Introduction

The provision of an appropriate wheelchair cannot be underestimated (Gowran et al 2012). “Mobility and movement are core to peoples identities, life experiences and opportunities” (Imrie 2000) and are the mechanisms by which a human can exercise their human rights and achieve equal inclusion and participation within society. The World Health Organisation (WHO 2008) makes a powerful case for adequate wheelchair and seating provision, stating: ‘A wheelchair often makes all the difference between a person being a passive receiver and an active contributor’. Despite an increased recognition of this phenomenon, concerns remain that newly-qualified therapists might not be sufficiently equipped to accurately address the clinical needs of their wheelchair-user clients (White 2003).

As posture, movement and mobility are all prerequisites for survival; appropriate sustainable wheelchair and seating provision needs to be understood as a human rights issue (Gowran 2004). According to the WHO, provision of an appropriate wheelchair is ‘a wheelchair that meets the users’ needs and environmental conditions; provides proper fit and postural support; is safe and durable; is available in the country and can be obtained and maintained and services sustained in the country at the most economical and affordable price’ (WHO 2008, p.11). At present there is approximately a total cohort of 40,000 wheelchair users in Ireland, with 9000 awaiting wheelchairs (CSO 2008). In an attempt to address this fragmentation, this research will investigate the training and education afforded to clinicians in high-income countries as part of a global scoping review through a scoping review of scientific and grey literature internationally.

Literature review

Ganesh et al (2007) make a strong case for the establishment of statutory guidelines for adequate and sufficient wheelchair and seating training, claiming that US national healthcare expenditures data estimates of total historical public and private expenditures on durable medical equipment was over $20 billion in 2003. This astronomical figure implies that there is no room for complacency in the training and education afforded to therapists in order to provide an effective and sustainable wheelchair and seating provision system. The need for qualified therapists to provide
the expertise necessary for adequate wheelchair assessment and provision was first identified in the McColl report in 1986 which outlined the state of wheelchair provision in England (McColl 1986). McColl (1986) identified poor standards of wheelchair prescription and assessment which resulted in the issue of unsuitable wheelchairs. In accordance with this, Article 26 of Convention on the rights of Persons with Disabilities stipulates that in order to enable persons with disabilities to attain maximum independence and ability, countries are to provide comprehensive habilitation and rehabilitation services in the areas of health, employment and education. Researchers who have looked at this subject are Casey and Gowran (2013); Cook and Hussey (2002); White and Lemmer (1998) and Tiernan (2013). They argue that newly-qualified therapists may not be sufficiently equipped to accurately address the needs of wheelchair users. Experts in the assistive technology community have also recommended the development of a standard of practice for wheelchair assessment to aid clinicians in the provision of wheelchairs (Cohen, 2007; Sprigle, Cohen, & Davis, 2007; Finalyson & Hammell, 2003). In 2008, however, the WHO established guidelines for appropriate provision of wheelchair and seating in less resourced countries, stipulating that individuals need to be trained to; design, produce, and test wheelchairs that meet these procedures by introducing guidelines to students or practitioners of related disciplines. In 2012, the WHO further developed a Wheelchair Service Training Package; Trainer’s Manual, at a basic level as a framework for wheelchair training.

These developments thus prompt the need to question compliance and implementation of the training guidelines on entry-level occupational therapy courses internationally to support the training of personnel in wheelchair and seating provision. As occupational therapists, there is a heavy onus to provide a duty of care to service users. According to the HCPC Standards of Proficiency in the UK, occupational therapists must;

• be able to exercise a professional duty of care,
• know the key concepts of the biological, physical, social, psychological and clinical sciences which are relevant to their profession-specific practice and
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- also understand the need to establish and maintain a safe practice environment (Dimond, 2004).

Hence, debate centres on the issue of adequacy of wheelchair and seating provided to clients by therapists who have not received mandatory training skills in the provision of such services. From a clinical standpoint, it is important to identify best practices as findings from this research may be used to enhance or inform future education and training systems for clinicians concerning the provision of wheelchair and seating services. Examining the literature, it appears that little professional research has directly addressed the efforts of education providers in meeting the WHO guidelines of wheelchair provision. Hence, my proposed research will investigate the training and education afforded to practicing clinicians in predominantly developed countries as part of a larger study examining this internationally. The primary purpose of this scoping review is to provide a broad overview of the current research on wheelchair and seating training and education internationally and to identify if WHO guidelines on training and education are adhered to on an international basis.

**Methodology**

Concerns exist in relation to the equity of wheelchair and seating education and training (Silcox 1995; Gowran, 2012; Tiernan, 2013). The objectives of this research are:

1. To identify the formats of wheelchair and seating education and training on occupational therapy course curricula
2. To assess whether other occupational therapy education programmes adhere to national mandates in their delivery of wheelchair and seating provision and
3. To determine whether other societies have developed an advanced approach towards wheelchair and seating education.

The method employed for this study was a scoping review. This methodology was utilised to examine the extent and nature of wheelchair provision internationally and to provide a mechanism for disseminating research findings to policy makers,
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practitioners and educators who might lack time or resources to undertake such work themselves (Antman et al 1992). Arksey and O’Malley (2005) describe scoping studies as a means of mapping the range, extent and nature of research on a topic, which can enable the identification of research gaps, provide a summary of the available evidence to researchers, practitioners, consumers and policy makers, whilst also assisting in determining if a full systematic review is warranted, as identified by McKinistry et al (2013). This process was best placed to map rapidly the key concepts underpinning a research area, particularly when an area is complex or has not been reviewed comprehensively before (Mays et al 2001). Levac et al, (2010) further postulate that examining literature through the lens of a scoping review is also suitable in establishing key research priorities and directing future research carving the path for future research and investigating. A scoping review of both scientific literature and grey literature mapped the literature landscape to date in identifying evidence from previous studies and other relevant sources of wheelchair and seating education. The scoping review entailed sourcing both published research materials from various online databases in addition to grey literature through specific database searching, inter-library loan requests and requesting general course content information from 249 occupational therapy programme administrators.

An inclusion and exclusion criterion was established from the outset based on the research question, to ensure consistency in decision-making. It was decided that a sampling frame of approximately half of the population of Organisation for Economic Co-operation and Development (OECD) high-income countries would be created, with the intention that this would give more depth and accuracy of data than a random sampling technique. According to the World Bank, countries can be grouped according to their gross national income (GNI). Based on its GNI per capita, Australia, Canada, Denmark, Finland, Iceland, Norway, Republic of Ireland, Sweden, United Kingdom and Northern Ireland and the United States fit the criterion for classification as high income OECD countries, using convenience sampling.

In the first instance, a series of systematic and health-related literature searches were conducted to ascertain wheelchair and seating education and training studies relevant to occupational therapy have been published. Reflecting time and word constraints,
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only those studies published between 1993 and 2013 were included. The search parameters utilised included literature published in English and published in a peer-reviewed journal. Foreign language scientific literature was excluded due to cost and time constraints involved in translating material. The following databases were searched: CINAHL, Medline, AMED, Cochrane Library and PsycINFO on the basis of key words identified in the protocol stage of the study: wheelchair, seating, occupational therapist, training, education, and provision. This was an iterative process with searches changed and refined in accordance with the results produced. Searches generated a vast range of bibliographic references which were further defined under the thesaurus terms; medical care, wheelchairs, education, and occupational therapy. Search engines, journals, book chapters, books were also sourced. There were four stages in selecting scientific literature for inclusion: (i) Identification of studies from bibliographic databases and references; (ii) Screening of titles and abstracts; (iii) Complete review of papers to identify eligibility; and (iv) in-depth review and narrative synthesis of the final set of included papers. Only eight references were identified as meeting the inclusion criterion for answering study aims after duplicates were deleted and their findings synthesised into table formats.

Six of the eight articles retrieved were published in one of the following journals and archives: British Journal of Occupational Therapy, Archives of Physical Medicine and Rehabilitation, British Journal of Therapy and Rehabilitation, Division of Physical Medicine and Rehabilitation and Assistive Technology. Each of these articles was accessed from at least three or more electronic databases (e.g., CINAHL, PsycINFO, Medline, Cochrane Library and AMED) as part of their search strategy. One article was retrieved from the European Seating Symposium and one from the Institute of Public Administration.

In addition, a search of grey literature was rigidly scrutinised from various sources including: papers, reports, technical notes and other materials that are not indexed by commercial publishers, in order to provide further richness to the study. When examining grey literature, universities were included if they offered an entry-level (bachelor and graduate) occupational therapy programme in 10 countries, that was accredited or had received provisional accreditation from WFOT. At the time of this
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study, a total of 249 occupational therapy entry-level programmes in Australia, Canada, Finland, Denmark, Iceland, Norway, Republic of Ireland, Sweden, United Kingdom, and the United States were accredited or provisionally accredited and scoped (see Appendix). Literature was scoped by gleaning information from websites of the 249 WFOT accredited programmes. Emails were also circulated to each 249 occupational therapy course administrators requesting readily available information on wheelchair and training education provided on courses, to provide a thorough analysis of education needs relating to wheelchair and seating. There was a very poor response rate from administration with only 9 administrators replying with readily available information about course content and the delivery of wheelchair and seating education. Through a prolonged search of healthcare databases, forums, and national policies, only 3 other items met the inclusion criteria in answering the research questions; Australia’s accreditation standards, the development of measures by the DHSSPS in Northern Ireland and the establishment of clinical standards for wheelchairs and seating in Scotland. All data retrieved from the search engines and information gleaned from university websites were recorded in a spreadsheet on a personal computer and stored on an external key. As part of the scoping review, each paper was examined to identify the main concepts of the study, study setting, and findings.

Data Analysis

It was decided to employ a content analysis in this study to condense raw data into categories for data evaluation based on interpretation of data. This process uses inductive reasoning, by which categories emerge from the data through careful examination. According to Titscher et al. (2000), content analysis is "the longest established method of text analysis among the set of empirical methods of social investigation" (p.55). Content analysis is further described by Holsti (1969) as “any technique for making inferences by objectively and systematically identifying specified characteristics of messages” (p.14). It also determines explicit and implicit answers to the questions that the text implies. As the use of content analysis draws inferences from texts and information, it was deemed a suitable tool for the analysis of large volumes of information scoped in this review.
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Through the use of subjective interpretation of data content, the core meaning of the data was identified and explained from multiple sources. This level of analysis classified the data into informative information which were concisely summarised into tables (see findings). Information was omitted from findings if it did not contribute towards answering research aims. From interpretation various categories were established. The first general category was the need for specific wheelchair and seating training on occupational therapy programmes. The second category was the ad-hoc format of wheelchair and seating education delivered on programmes and the third category was the expectancy of attendance at in-service training. Through the use of generalization theory, content was selected based on clear definitions for determining content and categories in order to foster objectivity. This theory provided a basis for generalizing about the data collection. The establishment of procedures for inclusion and exclusion of data in the study also contributed towards consistency and systematic, impartial selection.

Credibility

Adhering to Krefting’s (1991) pivotal theory for assessing credibility, caution was exercised in the approaches to tertiary level research in investigating wheelchair and seating provision in order to avoid publication bias. While unpublished work is commonly thought of as being of poor quality for publication, the evidence on publication bias convincingly demonstrates that it has more to do with the significance of the results rather than the quality of a study. Prolonged and persistent scoping of the data was utilised to enhance the credibility of findings. Furthermore, assigning inclusion and exclusion regulations prevented the occurrence of biases and self-serving selections.

Research Ethical Considerations

Throughout the scoping review, appreciation was given to other researchers concerning their valuable contributions to this field of thought. The work of other
Authors was also critically appraised and the strengths of their research critically evaluated.

Findings

Eight papers met the scientific literature inclusion criteria, highlighting the need for the implementation of standardised training and education on entry level occupational therapy programmes. Table 1 provides a brief description of the scientific findings and their related studies. Over half of the papers retrieved were journals, echoing the need for the development of education programmes within the last 20 years. Table 2 provides a brief summarization of the content of wheelchair and seating training provided on the 8 WFOT university courses who replied to emails circulated and 3 developments made to date in the specified countries in the study on wheelchair and seating training and education. Five studies scoped employed quantitative methods to examine wheelchair provision, one study used a qualitative methodology, whilst two studies utilised a mixed methodology.
**Table 1: Scientific literature**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Data Analysis</th>
<th>Aims</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Silcox (1995)</td>
<td>Quantitative</td>
<td>To discover the amount of time spent on and some of the content of the training presently available to therapists, both in colleges and from the wheelchair service</td>
<td>From the 21 colleges of occupational therapy included in the study, findings revealed that a mean average of 26 hours was spent on wheelchair training. When comparing the ratings of importance of the subject, colleges of occupational therapy rated their perceptions of the importance of the subject higher (74) compared to colleges of physiotherapy (60). The study also revealed that material from the Department of Health Wheelchair Training Resource Pack (1991) was more commonly used by colleges for teaching than the wheelchair service.</td>
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<tr>
<td>White and Lemmer (1998)</td>
<td>Integrated</td>
<td>To identify and investigate key factors which propose effectiveness in the post-devolution wheelchair service.</td>
<td>Wheelchair therapists were found to be predominantly occupational therapists and training needs for wheelchair therapists to equip them in accurate skills were also highlighted and the absence of an accredited training programme was evident (p.302). Key findings for effectiveness include; clinical effectiveness, service effectiveness and consumer effectiveness in addition to <strong>training developments</strong>.</td>
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<tr>
<td>White (2003)</td>
<td>Quantitative</td>
<td>To assess the effect that course attendance had made to both personal and service developments.</td>
<td>All participants had made use of knowledge gained on the course during their clinical work with 71% noting it had benefited their service. All course participants were also in favour of the delivery of a university-validated course, such as the one they had attended.</td>
</tr>
<tr>
<td>Coolen et al (2004)</td>
<td>Quantitative</td>
<td>To test the hypothesis that a brief formalized</td>
<td>The wheelchair skills training added to the standard curriculum,</td>
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<table>
<thead>
<tr>
<th>Study</th>
<th>Design</th>
<th>Methodology</th>
<th>Research Questions</th>
<th>Findings</th>
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<tr>
<td>Kirby <em>et al</em> (2011)</td>
<td>Quantitative</td>
<td>To test the hypothesis that a multicomponent workshop about wheelchairs, tailored for undergraduate medical students, is effective in improving medical students’ wheelchair-related knowledge, skills, and attitudes.</td>
<td>A four hour Wheelchair Skills Training Program workshop resulted in a significant improvement in medical students’ wheelchair-related knowledge and skills. Practical performance of wheelchair skills, reflective exercises and a written knowledge test was utilised as an outcome measure for this workshop in addition to a practical examination.</td>
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<tr>
<td>Isaacson (2011)</td>
<td>Qualitative and Quantitative</td>
<td>To describe the perceptions of occupational and physical therapists who specialize in seating and mobility evaluations about the current best practices of the leaders in the field.</td>
<td>Best practices involved the expert clinician using experience, hands-on techniques, skills, technology, resources, self-directed learning, follow-up, and a relationship with the consumer in the provision of services.</td>
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<tr>
<td>Tiernan (2013)</td>
<td>Quantitative</td>
<td>To investigate the provision of special seating services for wheelchair users in Ireland, and to make recommendations based on the findings.</td>
<td>Survey feedback indicated that primary care staff currently taps into the support offered by sub-specialist teams in physical and sensory disability, but could benefit from formal training to enhance their knowledge and skills in the area (p.65).</td>
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<tr>
<td>Brownlee <em>et al</em> (2013)</td>
<td>Qualitative</td>
<td>To evaluate SeatTech Assessment and Solutions training programmes within a context of limited education and training.</td>
<td>All participants identified that courses had provided them with an opportunity to develop new skills in the area of assessment, while the majority of participants felt it had extended their overall knowledge in the area of</td>
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wheelchair and seating provision and also enabled transferable skills. Ninety six per cent of participants felt there was not enough training and education available in Ireland generally.

In examining the content of training and education available to therapists, Silcox (1995) found that the situation has improved slightly since the McColl report (1986). White and Lemmer (1998) also directly questioned the effectiveness in wheelchair service since the introduction of the McColl report in 1986 and highlighted the need for increased training. Further research conducted by White (2003) assessing the impact of training for wheelchair service specialists underlines the need for the introduction of university-validated courses. However, a landmark development in the provision of wheelchair and seating on education programmes to date has been the development of a Wheelchair Skills Training Program for clinicians formulated by Coolen et al (2004) in Canada. A wheelchair workshop for medical students, undertaken by Kirby et al (2011) also corroborated the benefits of the introduction of a wheelchair skills training programme into education curricula. Research undertaken by Isaacson (2011) described the perceptions of occupational and physical therapists who specialize in seating and mobility evaluations about the current best practices of the leaders in the field. What Isaacson (2011) fails to elicit from the study, however, is the means in which therapists acquire such skills and techniques. Research recently conducted by Tiernan (2013) investigating the adequacy of special seating service provision in Ireland also indicates that further training is necessary for effective provision of wheelchairs and seating.

Research conducted by Brownlee et al. (2013) on wheelchair and seating assessment and prescription, reveals there are currently no stipulation for mandatory education and training for service providers, with little or no visible evidence within course outlines for any of the undergraduate and postgraduate occupational therapy and physiotherapy courses. Post-graduate training in courses such as the National Assistive Technology Training and Seating Solutions from Enable Ireland or the
Central Remedial Clinic is the primary means of gaining the necessary skills required for wheelchair provision and prescription in the Republic of Ireland.
Table 2: Grey literature

<table>
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<tr>
<th>Context</th>
<th>Findings</th>
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<tr>
<td>Quebec, Canada</td>
<td>In Canada, occupational therapists are responsible for 100% of wheelchair provision i.e. provision of parts, repairs, intervention, and evaluation in the province of Quebec. However, there is no systematic assessment or training provided to therapists – as each rehabilitation facility has its own process for wheelchair and seating training.</td>
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<td>Stockholm, Sweden</td>
<td>No uniform mandates exist in the provision of wheelchair and seating on occupational therapy programmes in Stockholm. Two main sources for wheelchair and seating education are utilised; adherence to wheelchair techniques and driving ergonomics book and a spinal cord injury website. In addition, there is expectancy for participation by practising clinicians in external training workshops.</td>
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<tr>
<td>Toronto, Canada</td>
<td>Prism Moving and Handling Certification Program was established in Toronto, Ontario to equip qualified healthcare professionals in moving and handling skills. Educational training on wheelchair and seating provision, however, is not provided on entry-level curricula.</td>
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<tr>
<td>Norwich, UK</td>
<td>This occupational therapy programme adheres to a wide variety of resources including Seating Matters, the Disability Living Foundation resources, in addition to material from local Wheelchair Services.</td>
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<tr>
<td>Liverpool, UK</td>
<td>The occupational therapy programme in Liverpool have a workshop related to use of wheelchairs at a basic level in year one.</td>
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<tr>
<td>Bradford, UK</td>
<td>This occupational therapy programme obtains material and resources from external services such as The Oxford Wheelchair Service and the charity Back-Up Trust.</td>
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<tr>
<td>Derby, UK</td>
<td>University of Derby cover basic wheelchair and seating awareness delivered in a skills component of the course which is repeated as a refresher at a later interval. This was established in response to the development of The National Wheelchair Managers Forum, in 2004. The Forum produced a document entitled “Minimum Standards for Wheelchair Services” in an effort to produce a framework of adherence in service provision.</td>
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<tr>
<td>Northern Ireland</td>
<td>The provision of wheelchair services in Northern Ireland has been guided by legislation which includes disability legislation. The Department of Health, Social Services and Public Safety (DHSSPS) in consultation with occupational therapy managers have begun to address this issue by developing measures following proposals for the reform of Northern Ireland wheelchair services. One proposal includes; professional practice within the wheelchair service should be of the highest quality and uniform throughout Northern Ireland; and a regional implementation team should take the reform of the wheelchair service forward. Researchers in this field are currently in the preliminary phases of developing National Guidelines on Seating and will be of huge importance for the forward development of wheelchair provision in Northern Ireland.</td>
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</table>
A scoping review of grey literature amongst countries who met the inclusion criteria indicated that broad disparities prevail amongst the delivery of wheelchair and seating provision. While not desirable, this phenomenon is not unique to the Republic of Ireland. Information gleaned from university web pages and information returned in emails from course administrators revealed that there are no specific mandates or frameworks of adherence for wheelchair and seating on education curricula in the countries included in this study. Rather, there is an expectation for participation by practising clinicians in external training workshops, which was a common thread throughout the findings. Other universities have developed pre-service workshops to address this fragmentation in education delivery. There have, however, been some positive advances in the legislative development of sustainable wheelchair provision as evidenced in the findings from Scotland and Northern Ireland, indicating a response to this unacceptable phenomenon.
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Discussion

The purpose of this study was to investigate the training and education afforded to practicing clinicians in developed countries. Findings indicate that disparities remain in the delivery of education and training internationally. The introduction of the McColl report has somewhat altered the delivery of educational curricula, as developments like those at the University of Ulster, providing specialist wheelchair and seating modules, are most likely to have lasting implications for the development of future programmes. Both scientific and grey scoping reviews revealed no findings of statutory legislation for the provision of wheelchairs in Denmark, Sweden, Norway, Finland and Iceland. Findings from the USA, Australia, and the Republic of Ireland are somewhat similar; there is an expectation for post-graduate training to equip therapists with the skills ultimately required for enhancing a client’s quality of life. Canada, the United Kingdom and Northern Ireland, however, appear to be advancing their legislative and education systems to cater for addressing this complex healthcare issue by introducing standardised measures for training clinicians.

Scientific and grey findings also reveal that though significant improvements have been made in the delivery of education and training since the development of WHO (2008, 2012) guidelines and training, little evidence was found on adherence to such initiatives. Information gleaned from WFOT accredited courses illustrates that though innovative efforts have been made in wheelchair and seating provision, without the development of national standards, disparities will exist internationally in maintaining Standards of Proficiency, as described by Dimond (2004). Broader external barriers play a crucial role in the facilitation and delivery of those attributes to the highest standards by not providing mandatory frameworks to adhere to.

A great cause for concern highlighted in the findings is the overreliance on textbook materials and resources to educate students on wheelchair and seating provision on entry-level programmes. The teaching of complex skills through the medium of lectures and presentation formats is not sufficient to wholly equip students to perform wheelchair and seating evaluations or assess wheelchair and seating needs of individuals who may be confined to wheelchairs for the course of their lifetime. As
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the leading providers of wheelchair and seating, there is an important onus on occupational therapists to work in a competent manner to meet the individual needs of clients. As a client-centred practice, placing the premium on the client’s goals, it is of paramount importance that client’s receive the appropriate treatment required for their maximum engagement and participation in life. The result of inadequacies in the delivery of wheelchair and seating training on education programmes has the capacity to bare enormous implications on the health and well-being on patients. Inappropriate wheelchair or seating provision can have devastating effects on the individual causing both physical tissue damage and social exclusion from engagement in occupations. This is of huge concern as occupational therapists are the leading professionals in wheelchair and seating provision.

There have been some positive advances, however. The establishment of the Wheelchair Skills Training Program (WSTP), developed by Coolen et al. (2004) has become the landmark framework for the forward development of wheelchair and seating provision to date. The mandatory addition of Wheelchair Skills Training Programs workshops to educational curricula internationally may prove valuable in enhancing clinicians’ confidence in wheelchair provision. However, on an international level there appears to be inconsistency in the delivery of wheelchair and seating provision. As specific knowledge and skills are not prescribed under accreditation standards, programme providers have the flexibility to develop and deliver curricula to meet their institutional and regional requirements. This flexibility means that content may vary between programmes, which may equate to graduate preparedness for entering practice.

For therapists currently in practice, in-service educational activities in assistive technologies that supplement the individual’s professional training and experience are widely utilised (e.g. Prism Moving and Handling Certification Program, RESNA, and Back-Up Trust). These forms of educational activity which are much focused and of short duration are being employed by a variety of rehabilitative facilities as opposed to pre-service training on entry-level courses. Pre-service educational activities are part of professional preparation at the undergraduate or graduate level for practice in specific fields such as occupational therapy. As evident in the findings, the scope of
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wheelchair and seating provision in pre-service educational program varies widely internationally and is generally limited (University of Ulster and Dalhousie University). Often workshops are offered in conjunction with major conferences of professional associations (e.g., AOTA, and RESNA) as a convenient way for conference participants to obtain in-service education in a cost-effective manner. Should pre-service training be introduced in accordance with the WHO’s (2012) training guidelines, States could avoid astronomical financial expenditure on medical equipment, as outlined by Ganesh et al (2007). Training clinicians to provide high standards sustainable in wheelchair and seating provision would consequently alleviate pressure on healthcare systems to reduce the occurrence of wasted equipment and demand for new equipment on a regular basis.

It can rightly be claimed therefore that education and training in wheelchair and seating provision on occupational therapy entry-level programmes is limited (Brownlee et al. 2013; Tiernan 2013 and White 2003). Significantly, Routhier et al’s (2012) randomised controlled trial on the efficacy and retention of the French-Canadian version of wheelchair skills training program for wheelchair users poses the question, how can therapists train users on effective use of wheelchair and wheelchair skills when therapist themselves are receiving inadequate training in this field? With the increasing role of technology in the lives of individuals with disabilities, it is crucial that newly trained professionals entering their respective fields have some level of formal training in assistive technology applications.

The categories established throughout the research comprising; the need for specific wheelchair and seating training on university programmes, the ad-hoc format of wheelchair and seating education delivered on programmes, and the expectancy of attendance at in-service training, suggests that there is no coherent mechanism for progressing towards meeting WHO (2012) guidelines. As specific knowledge and skills courses are not prescribed under accreditation standards, programme providers have the flexibility to develop and deliver curricula to meet their institutional and regional requirements. Such flexibility enables that content of wheelchair and seating training to vary amongst programmes, which may affect the preparedness of graduates for practice and provision. Because there is no specific WFOT programme recognised
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and accredited in wheelchair and seating provision, disparities and inadequacies will continue to remain in the provision of wheelchair and seating. There exists a well-recognised need for the development of legislative mandate for practitioners undertaking clients with such seating needs to adhere to. Findings thus highlight urgency for policy makers to introduce uniform measures for education of wheelchair and seating to clinicians.

This research is closest to that of Tiernan (2013) in investigating the adequacy of wheelchair and seating provision, however, this research explores wheelchair and seating training education through a peripheral lens of international countries. Tiernan’s (2013) quantitative work highlights the need for the establishment of a specific post of responsibility to manage service provision throughout Ireland. My contribution highlights the need for education providers and policy makers, on an international level, to implement strategies for adherence to the WHO (2012) guidelines for effective wheelchair training.

The findings from Coolen et al (2008) have significant implications for the future education of occupational therapists and clinicians alike. However, professional rehabilitation educational programs and policy makers need to recognise the importance of having some level of standardised assistive technology applications training for newly trained professionals as they enter their respective fields. It can be justifiably claimed therefore, that there is work to be done on prioritising building sustainable wheelchair and seating education systems for future practicing clinicians on an international level. The outcome and reporting’s of this study may cause concern amongst the community involved in wheelchair prescription, given the importance of this as a basic need for survival.

Study Limitations

Convenience sampling was used in this study when choosing countries to include and therefore the findings cannot be generalized to a wider population. Ten developed countries were included in this study, limiting the generalizability of the findings to a greater proportion of contexts with diverse educational provision systems. Scoping
reviews as a methodology do not appraise the quality of evidence in the primary research literature in any formal sense. Because the inclusion criteria were based on both the type of study and the type of wheelchair provision, potentially useful papers may have been omitted from this study if the abstract did not clearly indicate the nature of the voluntary agreement being evaluated. It is also important to note that the grey literature encapsulating educational course curricula included in this scoping review were carried out at a specific point in time, and course content may have subsequently changed in terms of its wheelchair and seating related modules, workshops etc. Therefore, the findings of these studies may not be valid for a later time period. No detailed quality assessment of the scientific studies or grey literature was conducted because of the timescale but also because the purpose was to describe the nature and scope of the literature rather than to provide an overall summary of where the “weight of evidence” on wheelchair and seating education lies.

Conclusion

This research identifies shortcomings in the adequacy of wheelchair and seating provision on education programmes internationally, as a result of a lack of statutory and legislative frameworks for adherence. It also highlights the challenges faced by occupational therapists encompassing a comprehensive overview of wheelchair and seating provision internationally. The introduction of the WHO (2008) guidelines on the effective provision of wheelchairs in less resourced settings, and subsequently the development of the WHO (2012) Wheelchair Service Training Package have been significant stances in developing international policy. Inconsistencies occur in adherence to these guidelines, however. As one of the most commonly used assistive devices for enhancing personal mobility, the education and training of wheelchair and seating provision requires urgent attention in order to develop the skills and knowledge of personnel providing such services. While there have been many developments, current systems of wheelchair and seating provision lack uniformity socially and economically in accordance with policies and context.

The importance of standardised wheelchair and seating education and training on occupational therapy university curricula may be perceived in different ways by
different parties. This very much depends on the context and the healthcare systems worldwide. In order to improve international standards for the provision of wheelchair and seating on education programmes, it needs to be highlighted by the WFOT on an international level and the outcomes integrated into university programmes. If there was a specific criterion for the skill set of medical personnel there would no longer be an ad hoc system of skill sets with medical personnel trained differently there would be fewer implications for the equity and service provision of wheelchair and seating. Hence, there needs to be an acknowledgement by the WFOT to review this in detail, as occupational therapists have a duty of service to provide to a high standard and meet the needs of patients.

The WFOT must also ensure that mandatory standards are developed for the provision of wheelchair services on an international basis to address the financial pressure placed on healthcare systems as a result of the inadequate provision of medical equipment. An accredited programme is required to equip therapists with necessary skills for undertaking effective wheelchair and seating provision and to sustain effective wheelchair provision on an international basis. The development of agreed standards between academic institutions and the WFOT on the uniform delivery of wheelchair and seating provision internationally will offer a strategy for counteracting these issues. Should standards be correctly implemented and monitored, there would be increased training opportunities for practising clinicians to support wheelchair users in meeting their highly individualised needs. Subsequently, wheelchair users would not be denied their basic human right and would achieve an optimal level of participation in society. Findings from this study should be utilised to inform the ongoing delivery of the course to future cohorts of occupational therapists providing wheelchairs.

Without a full review, it is not possible to determine the true extent of the delivery of education and training to occupational therapists. A deeper exploration of how to approach this project in terms of data collection and analytical approach would be beneficial to education providers and policy makers in the future. For the forward development of healthcare systems worldwide, findings should be utilised to inform
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policy and practice in transforming wheelchair users from being passive receivers towards active contributors in society (WHO 2008).

Acknowledgements

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### Appendix

#### Table 1

<table>
<thead>
<tr>
<th>Countries reviewed in grey literature</th>
<th>No. of States reviewed</th>
<th>No. of WFOT-accredited programmes reviewed</th>
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<td><strong>Total</strong></td>
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