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SUMMARY WITH CRITICAL APPRAISAL

Walkers with Wheels Versus Walkers Without Wheels for Fall Prevention in Older Adults: A Review of the Comparative Clinical Effectiveness

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Abbreviations

CASP	Critical Appraisal Skills Programme
COPD	Chronic Obstructive Pulmonary Disease
TUG	Timed up and go test;
PCI	Physiological cost index
6MWT	6-minute walk test

Context and Policy Issues

Walking aids are often prescribed to reduce the risk of falling.¹ In Canada, approximately 1,125,000 community-dwelling individuals who were 15 years old or older used walking aids in 2011, representing 4.1% of the Canadian population.¹ The users of walking aids (including walkers, canes, walking sticks, and crutches) had a mean age of 68 years and were predominantly female.¹ Of these individuals, 465,340 used a walker.¹ The walkers include the standard four footed pick-up frames without wheels, which are also referred to as fixed frames, wheeled frames which are the fixed-frames with front wheels, and rollators.² Rollators are walkers with three or four wheels, the front wheels of which can swivel for steering.² The Canadian prevalence of walking aid use increase use by 2% since 2004, which is likely related to the aging of the population.¹ Among older adults 65 years or older in Canada, falling is the leading cause of injuries.³ The direct health care costs of falling is approximately \$2 billion annually in Canada.³ The objective of this report is to evaluate the comparative clinical effectiveness of walkers with wheels versus walkers without wheels for fall prevention in older adults.

Research Question

1. What is the comparative clinical effectiveness of preventing falls in older adults using walkers with wheels versus walkers without wheels?

Key Findings

One systematic review was identified regarding the comparative effectiveness of walkers with wheels versus walkers without wheels for fall prevention in older adults. Evidence of limited quality from the systematic review suggested that older patients walking with a non-wheeled frame would cover shorter distances and use more energy than those walking with wheeled frames. The evidence presented in this report should be interpreted with caution based on the limitations and paucity of comparative data.

Methods

Literature Search Methods

A limited literature search was conducted by an information specialist on key resources including MEDLINE, Cumulative Index to Nursing and Allied Health Literature (CINAHL), the Cochrane Library, the University of York Centre for Reviews and Dissemination (CRD) databases, the websites of Canadian and major international health technology agencies, as well as a focused Internet search. The search strategy was comprised of both controlled vocabulary, such as the National Library of Medicine's MeSH (Medical Subject Headings), and keywords. The main search concept was wheeled walkers. Where possible, retrieval was limited to an adult population. No filters were applied to limit the retrieval by study type.

The search was also limited to English language. The search was run on June 17, 2019. No date limits were used in the search.

Selection Criteria and Methods

One reviewer screened citations and selected studies. In the first level of screening, titles and abstracts were reviewed and potentially relevant articles were retrieved and assessed for inclusion. The final selection of full-text articles was based on the inclusion criteria presented in Table 1: Selection Criteria.

Table 1: Selection Criteria

Population	Older adults (over 65 years of age)
Intervention	Walker with wheels (two wheels or all four wheels)
Comparator	Walker without wheels
Outcomes	Clinical effectiveness (e.g. hospital admissions, mobility changes, severity of fall, length of hospital stay, QALY)
Study Designs	Health technology assessments, systematic reviews, meta-analyses, randomized controlled trials, non-randomized studies

Exclusion Criteria

Articles were excluded if they did not meet the selection criteria outlined in Table 1, or included as primary study in the systematic review. Guidelines with unclear methodology were also excluded.

Critical Appraisal of Individual Studies

The included systematic reviews were critically appraised by one reviewer using AMSTAR 2,⁴ Summary scores were not calculated for the included studies; rather, a review of the strengths and limitations of each included study were described narratively.

Summary of Evidence

Quantity of Research Available

A total of 331 citations were identified in the literature search. Following screening of titles and abstracts, 325 citations were excluded and Six potentially relevant reports from the electronic search were retrieved for full-text review. One potentially relevant publication was retrieved from the grey literature search for full text review. Of these potentially relevant articles, four publications were excluded for irrelevant population; one publication was already included in the selected systematic reviews; and one was excluded as it was a review article. One publication met the inclusion criteria and were included in this report. This included one systematic review. Appendix 1: Selection of Included Studies presents the PRISMA⁵ flowchart of the study selection.

Additional references of potential interest are provided in Appendix 5: Additional References of Potential Interest.

Summary of Study Characteristics

Additional details regarding the characteristics of included publications are provided in Appendix 2: Characteristics of Included Publications.

Study Design

One systematic review² was included in this review. The systematic review was published in 2013. It included 15 cohort, crossover controlled, quasi experimental pre and post, or case control studies, and one economic evaluation study.² Out of the 15 studies, two observational studies of cohort and case control design were relevant to this report. With the range of study designs and different outcomes of walker use, no meta-analysis of results was conducted.² The authors ranked the studies using the hierarchical model by Sackett and independently assessed the quality of individual studies using the Critical Appraisal Skills Programme (CASP) critical appraisal tools.² Studies with low quality scores were not excluded due to the limited number of relevant articles.² Detailed explanations of the methods of rating the evidence and recommendations are provided in Table 2.

Country of Origin

The included systematic review was published by authors in the United Kingdom.²

Patient Population

The included systematic review reported on patients aged 65 or over in studies directly related to the use of walking frames.² Of the two relevant studies included in the systematic reviews with the comparisons relevant to the present report, one study had a sample size of 30 patients admitted to geriatric care, with 6 males and 24 females; another study included 27 patients with Chronic Obstructive Pulmonary Disease (COPD) with 15 males and 12 females.²

Interventions and Comparators

The intervention of interest in the systematic review was wheeled frames, including rollators and gutter frames.² The comparators of interest were fixed walkers or Zimmer frames, a type of walker without wheels.^{2,6}

Outcomes

The clinical effectiveness of wheeled and fixed walkers was assessed through physiological cost index (PCI), speed 10 m course, heart rate maximum, timed up and go test (TUG), spirometry and reversibility, 6-minute walk test (6MWT), and oxygen saturation.² Safety outcomes and length of follow-up were not reported.² A detailed summary of outcome findings are provided in Table 4.

Summary of Critical Appraisal

The strengths of the systematic review were that the population, intervention, comparator, and outcomes of interest were described as part of the objectives; inclusion and exclusion criteria were reported and justified; multiple databases were searched; keywords for the literature search and search strategies were provided; and the authors critically assessed the quality of the individual included studies.² However, the systematic review did not explicitly state whether the review methods were established prior to the conduct of the review was not provided.² It was not clear whether the authors performed study selection

and data extraction in duplicate.² The list of excluded studies, descriptions of the study settings, or conflicts of interest statements were not reported.²

Additional details regarding the strengths and limitations of included publications are provided in Appendix 3.

Summary of Findings

The authors of the systematic review reported a higher walking physical energy consumption, measured by mean physiological cost index (PCI,) for fixed frame than for rollator walker (2.01 and 1.23, respectively).² The maximum heart rate for rollator walker was lower than for fixed walker in the speed 10-meter course.² The timed up and go test results showed faster speed for rollator walker user than for fixed walkers.² Note that statistical significance for the comparison was not reported in the systematic review for the first relevant primary study. In the second relevant primary study included in the systematic review, the effects on exercise capacity and oxygenation in patients with COPD were reported as that a gutter style frame with wheels enabled subjects to walk furthest with the lowest readings for oxygen desaturation when compared to the Zimmer frame without wheels, and rollators.² Users of the Zimmer frame without wheels covered the shortest walking distance in the six-minute walking distance test compared to rollators and gutter frames.^{2,6}

Appendix 4 presents a table of the main study findings and authors' conclusions.

Limitations

The systematic review primarily included relevant evidence from low quality, namely observational studies of either cohort or case control design.² Despite being an appropriate and feasible option for studying chronic conditions with severe and transient symptoms such as falls, observational studies are inherently susceptible to patient selection, measurement, and reporting biases.² These studies lacked allocation concealment, blinding, and comprehensive reporting of outcomes.² Additionally, there was considerable heterogeneity in the patient populations and uncertainty about the designs of the interventions across the systematic review.² The populations were diverse and included patients with COPD, and patients admitted to geriatric care; while the study samples sizes were small.² There was lack of comparative statistical analysis in one primary study in the systematic review.² Descriptions of the components and designs of different walkers, such as gutter and Zimmer frames, were not readily available thereby introducing a level of uncertainty in the results.² There is a gap in the comparative evidence on hospital admissions, severity of fall, health-related quality of life for the wheeled and fixed walkers and the use of walkers in the Canadian context.

Conclusions and Implications for Decision or Policy Making

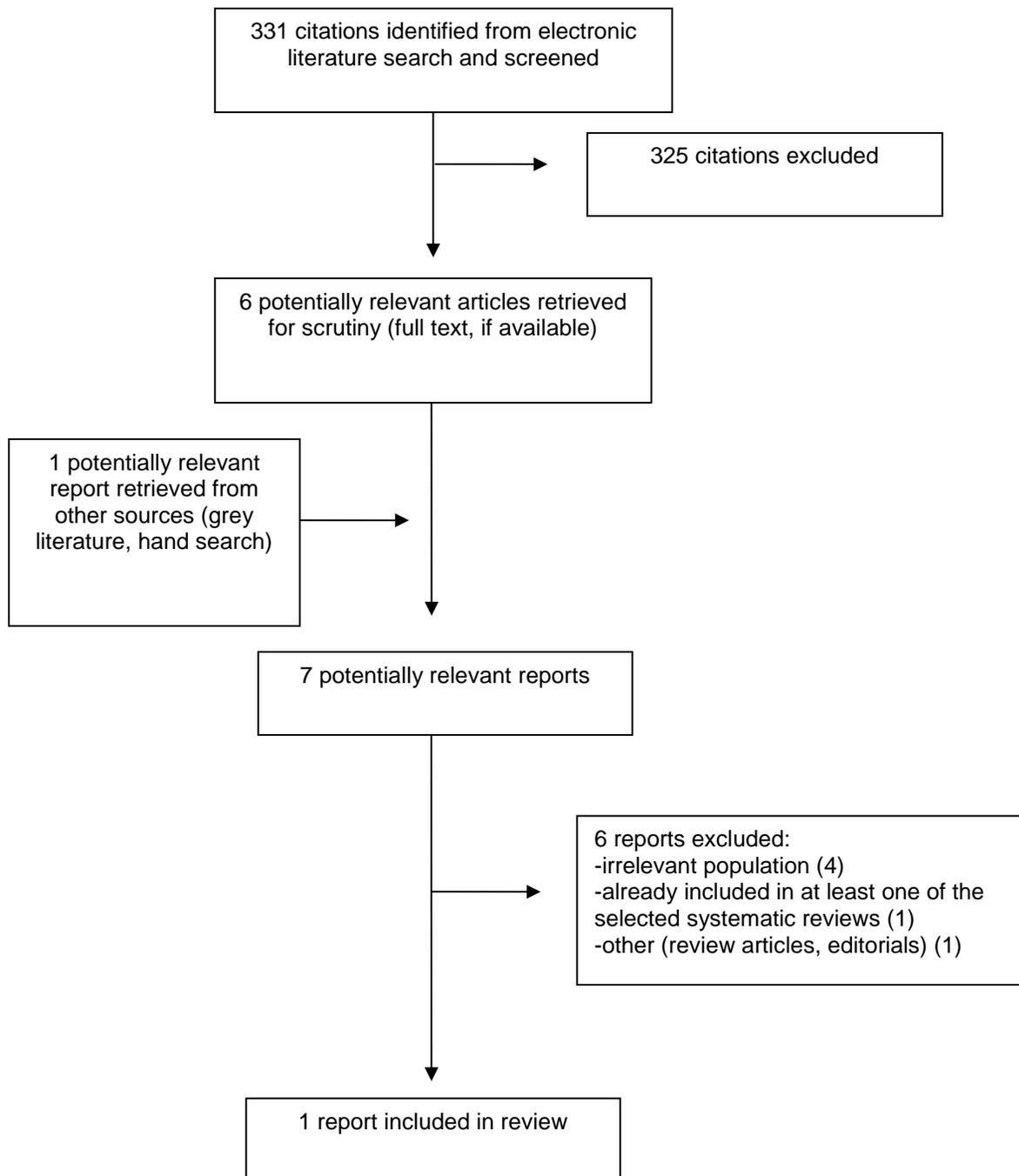
One systematic review² was identified regarding the comparative effectiveness of walkers with wheels versus walkers without wheels for fall prevention in older adults. The evidence, drawn primarily from two observational studies of cohort and case control design suggested that older patients walking with a non-wheeled frame had reduced mobility, resulting in shorter distances travelled and more energy use compared with patients using wheeled walkers.² No comparative evidence on hospital admissions, severity of fall and health-related quality of life for the wheeled and fixed walkers was found.

The evidence presented in this report should be interpreted with caution based on the limitations and paucity of comparative data.² While the systematic review on clinical effectiveness had strengths, there were limitations related to the quality of the included primary studies, potential for patient selection, measurement, and reporting biases.² These limitations suggest that caution must be taken in making clinical decisions about the effectiveness and safety of wheeled and fixed walkers in the Canadian context. Further research with randomized controlled trial designs addressing wheeled walkers versus walkers without wheels may help to reduce uncertainty and inform clinical practice.

References

1. Charette C, Best KL, Smith EM, Miller WC, Routhier F. Walking aid use in Canada: prevalence and demographic characteristics among community-dwelling users. *Phys Ther.* 2013;98(7):571-577.
2. O'Hare M, Pryde SJ, Gracey JH. A systematic review of the evidence for the provision of walking frames for older people. *Phys Ther Rev.* 2013;18(1):11-23.
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6. Roomi J, Yohannes AM, Connolly MJ. The effect of walking aids on exercise capacity and oxygenation in elderly patients with chronic obstructive pulmonary disease. *Age Ageing.* 1998;27(6):703-706.

Appendix 1: Selection of Included Studies



Appendix 2: Characteristics of Included Publications

Table 2: Characteristics of Included Systematic Review

First Author, Publication Year, Country	Study Designs and Numbers of Primary Studies Included	Population Characteristics	Intervention and Comparator(s)	Clinical Outcomes, Length of Follow-Up
O'Hare, 2013 ² UK	16 included studies; two studies with comparisons relevant to the present report Non-randomized studies (cross-sectional cohort studies and case control studies), a economic valuation study and a surveillance data study	Adults aged 65 or over	Intervention: wheeled frames, rollators Comparator: fixed frames, no aid	PCI, speed 10 m course, heart rate maximum, TUG, spirometry and reversibility, 6MWT, oxygen saturation Length of follow-up not reported

6MWT: 6-minute walk test; TUG: Timed up and go test; PCI: physiological cost index; UK = United Kingdom.

Appendix 3: Critical Appraisal of Included Publications

Table 3: Strengths and Limitations of Systematic Review using AMSTAR 2⁴

Strengths	Limitations
O'Hare, 2013 ²	
<ul style="list-style-type: none"> • The statement of objectives included the population, intervention, comparator, and outcomes of interest • The authors searched four databases, and provided key words and a search strategy • The study eligibility criteria included the population and intervention • The exclusion criteria included patient characteristics, study types and publication language • The authors described the populations, interventions, and outcomes of the included study in detail • The level of evidence was reported for each primary study • The authors critically assessed the quality of individual studies and the body of evidence for each outcome 	<ul style="list-style-type: none"> • An explicit statement that the review methods were established prior to the conduct of the review was not provided • It is not clear whether the authors performed study selection and data extraction in duplicate • The authors did not provide a list of excluded studies for the exclusion criteria • The authors did not provide descriptions of the study settings • The risk of bias assessment technique was unclear in the report • The sources of funding of the primary studies were not reported in supplemental documentation • The authors did not provide conflicts of interest statements

Appendix 4: Main Study Findings and Authors' Conclusions

Table 4: Summary of Findings Included Systematic Review

Main Study Findings	Authors' Conclusion
O'Hare, 2013 ²	
<p>PCI: Mean PCI 2.01 for fixed frame. 1.23 for rollator walker</p> <p>Speed in 10 m course: Max heart rate for rollator walker lower after 30 seconds than for fixed walker</p> <p>Heart rate max: Faster speed for rollator walker for 10 m course than for fixed walker</p> <p>TUG: speed for TUG faster with rollator walker than with fixed walker</p> <p>6MWT: Zimmer users covered the shortest distance, no significant change in oxygen desaturation compared to rollator and gutter frame</p> <p>Oxygen saturation: Gutter frame users had greater walk distance and significantly less oxygen desaturation compared to rollator and Zimmer frame</p>	<p>"In summary from the evidence reviewed it was concluded that subjects walking with a fixed frame covered shorter distances than those walking with wheeled frames. However, some wheeled frames did reduce stride length." (Page 19)</p>

6MWT: 6-minute walk test; TUG: Timed up and go test; PCI: physiological cost index.

Appendix 5: Additional References of Potential Interest

Systematic Reviews and Meta-Analysis – Alternative Population

Bertrand K, Raymond MH, Miller WC, Martin Ginis KA, Demers L. Walking aids for enabling activity and participation: a systematic review. *Am J Phys Med Rehabil.* 2017;96(12):894-903.

[PubMed: PM29176406](#)

Salminen AL, Brandt A, Samuelsson K, Toytari O, Malmivaara A. Mobility devices to promote activity and participation: a systematic review. *J Rehabil Med.* 2009;41(9):697-706.

[PubMed: PM19774301](#)

Non-Randomized Studies

Alternative Population

Cubo E, Moore CG, Leurgans S, Goetz CG. Wheeled and standard walkers in Parkinson's disease patients with gait freezing. *Parkinsonism Relat Disord.* 2003;10(1):9-14.

[PubMed: PM14499200](#)

Holder CG, Haskvitz EM, Weltman A. The effects of assistive devices on the oxygen cost, cardiovascular stress, and perception of nonweight-bearing ambulation. *J Orthop Sports Phys Ther.* 1993;18(4):537-542.

[PubMed: PM8220412](#)

Included as Primary Study in the Included Systematic Review

Roomi J, Yohannes AM, Connolly MJ. The effect of walking aids on exercise capacity and oxygenation in elderly patients with chronic obstructive pulmonary disease. *Age Ageing.* 1998;27(6):703-706.

[PubMed: PM10408664](#)