The purpose of this study was to determine the extent to which the Canadian Occupational Performance Measure (COPM) assessed performance in elderly people after hip fracture. Correlations were found between the COPM and the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Although functional improvement was noted, participants did not attain the functional status they had before hip fracture. The greatest recovery occurred within the first 130 days after surgery. These findings suggest some central implications for occupational therapy practice, although further research is required to determine the optimal time for intervention to begin. Because the COPM is sensitive to change in function in patients recovering from hip fracture, COPM use with this population is desirable and advisable.


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KEY WORDS
• Canadian Occupational Performance Measure (COPM)
• geriatric
• hip fracture
• outcomes
• rehabilitation

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Some key functional outcomes can be expected after hip fracture in older adults, together with factors that are associated with functional recovery. However, other factors exhibit contradictory findings. A brief review of this literature will assist in setting the context for the current study. Evidence also will be provided related to commonly used assessment tools in the evaluation of functional outcomes after hip surgery.

Functional Outcomes After Hip Surgery

Most people recovering from hip surgery do not regain the functional abilities they had before hip fracture, including functional abilities in areas of motor skills and
ambulation as well as in activities of daily living (ADLs) and instrumental ADL (IADL). Dai, Huang, Yang, Tsauo, and Yang (2002) evaluated the effects of an in-hospital multidisciplinary rehabilitation program (MRP) on basic ADLs (BADLs) with a population of inpatients in Taiwan. The researchers showed that an MRP had a continuous positive effect on patients who had had a hip fracture, thus facilitating improved recovery in BADLs and mobility 6 months after discharge. However, in a similar study by Koot, Peeters, de Jong, Clevers, and van der Werken (2000), results indicated that the chance of a patient recovering further after 4 months post-operatively is minimal. Most recovery takes place within the first 4 to 6 months after the fracture and is more specific to toileting, transferring, and walking; bathing and walking up stairs may continue to improve for 1 year (Shyu, Chen, Liang, Wu, & Su, 2004).

The importance of identifying the admission profiles of patients entering a hospital for hip surgery was underscored by Koval, Skovron, Aharonoff, and Zuckerman (1998), who found that patients living at home before hip fracture benefited most when surgery occurred within 3 days of injury. The importance to the Koval study is linked to the need for these patients to regain higher functional status on discharge. Other studies provide a rich background to this area of inquiry, focusing more specifically on certain ADL skills. For example, bathing and dressing are particularly affected in people who were functionally independent before hip fracture, and transferring from one surface to another is affected in people who have cognitive impairment (Cree, Carriere, Soskolne, & Suarez-Almazor, 2001; Sirkka & Branholm, 2003).

Factors Affecting Functional Recovery

Many and varied factors are associated with functional return after hip fracture in older adults. Factors that mitigate against recovery include coexisting diseases and general and local complications (e.g., depression, dementia). Cognitive issues, particularly delirium and dementia, negatively affect functional recovery (Cree et al., 2001; Marcantonio, Flacker, Michaels, & Resnick, 2000; Marcantonio, Ta, Duthie, & Resnick, 2002). Marcantonio et al. (2000) concluded that delirium is common, persistent, and independently associated with poor functional recovery 1 month after hip fracture, even after adjusting for frailty that existed before the fracture. They strongly advocated for further research to identify the mechanisms through which delirium contributes to poor functional recovery and to determine whether interventions designed to prevent or reduce delirium can improve recovery after hip fracture. People with delirium are less likely to return to living at home (Zakriya, Sieber, Christmas, Wenz, & Franckowiak, 2004); however, people recovering from hip fractures and also living with dementia can still benefit from rehabilitation (Huusko, Karppi, Avikainen, Kautiainen, & Sulkkava, 2000).

Poor mental health (e.g., depression) is related to poor functional recovery, as Kirk-Sanchez (2004) showed in a study of Cuban Americans over 50 years of age, and self-efficacy relative to rehabilitation is positively related to functional recovery (Fortinsky et al., 2002). An increase in age is negatively related to functional recovery (Cree et al., 2001; Hannan et al., 2001; Kirk-Sanchez, 2004; Koot et al., 2000; Koval et al., 1998; Shah, Aharonoff, Wolinsky, Zuckerman, & Koval, 2001). Similarly, the presence of other conditions and the exponential increase in the number of such conditions are clear factors in poorer functional recovery (Cree et al., 2001; Koot et al., 2000; Koval et al., 1998; Shyu et al., 2004; Van Balen, Essink-Bot, Steyerberg, Cools, & Habbema, 2003).

Impact of status before hip fracture. Functional abilities before hip fracture can predict functional outcomes (Hannan et al., 2001); in particular, the ability to walk indoors with no aids before fracture is positively related to functional recovery (Ingemarsson, Frandin, Mellstrom, & Moller, 2003; Lin & Chang, 2004). Pre-motor abilities are more predictive than cognitive abilities of functional recovery (Belooesky et al., 2002). Pain is negatively related to functional return (Cree et al., 2001; Morrison et al., 2003), and complications after fracture and surgery, not surprisingly, decrease functional recovery (Koot et al., 2000).

Availability of social support. The presence of social support is positively related to functional recovery (Kirk-Sanchez, 2004; Lin & Chang, 2004). However, an over-abundance of physical support can be detrimental to functional recovery. Too much physical support may lead to reduced expectations and fewer opportunities for the patient to resume pre-fracture status, which may result in increased burden on caregivers (Kirk-Sanchez, 2004).

Gender. Other factors present contradictory findings. Some studies have reported that women had a worse prognosis after hip fracture (Dai et al., 2002; Kempen, Sanderman, Scaf-Klomp, & Ormel, 2003); however, a study by Kirk-Sanchez (2004) suggested that men had a lower incidence of sound recovery. Yet another result, reported by Lieberman and Lieberman (2004) in their comparative study between men and women, concluded that there was no difference.

Multiple or previous fractures. The presence of multiple fracture sites is another factor that presents diverse results. Some studies have reported that previous multiple fractures may be predictive of a better outcome because of the connection with pre-fracture status (Shabat, Gepstein, Mann, &
Stern, & Nyska, 2003). Others concluded that the occurrence of previous fractures had no impact on the most recent functional recovery (Di Monaco, Di Monaco, Manca, & Cavanna, 2002) and that multiple fracture sites made no difference in functional outcomes (Di Monaco, Vallero, Di Monaco, Mautino, & Cavanna, 2003).

Service delivery. The type of care provided to the patients also presents a varied picture. Tinetti et al. (1999) found that a multidisciplinary approach did not appear to make a difference to functional outcomes, whereas other investigators concluded the reverse (Dai et al., 2002; Huusko, Karppi, Avikainen, Kautiainen, & Sulkava, 2002; Munin et al., 2005). Tinetti et al. (1999) found that intensive rehabilitation resulted in better functional outcomes. In the debate surrounding the relative merits of home versus institutional care, when a home rehabilitation program was given, no difference was reported in functional recovery but caregiver burden was decreased (Crotty, Whitehead, Miller, & Gray, 2003; Tinetti et al., 1999). Home programs were deemed to result in better functional outcomes in the studies undertaken by Crotty, Whitehead, Gray, and Finucane (2002) and Kuismio (2002), who undertook randomized controlled trials of home versus institutional rehabilitation programs.

Evaluating Functional Outcomes

The evaluation of functional outcomes is a complex endeavor that provides many challenges to investigators. Common assessments used in such evaluations include several well-known rehabilitation measures, including the FIM™ (Beloosesky et al., 2002; Munin et al., 2005), the Barthel Index (Crotty et al., 2003; Mahoney & Barthel, 1965), the Katz Index of Independence in ADL (Beloosesky et al., 2002; Di Monaco et al., 2002; Katz, Ford, Moskowitz, Jackson, & Jaffe, 1963), the Lawton IADL scales (Curry, Hogstel, & Davis, 2003; Lawton & Brody, 1969), and the Functional Recovery Score (Zuckerman, Koval, Aharonoff, & Skovron, 2000). Use of a telephone or proxy response for evaluating functional abilities has been shown to provide comparable results (Petrella, Overend, & Chesworth, 2002; Shaw, McColl, & Bond, 2000).

Construct Validity

Because no gold standard exists for attributes such as health-related quality of life, functional status, and occupational performance, clinical measurement studies have applied a construct rather than criterion validation process. Construct validation involves forming theories concerning the attribute of interest and examining the extent to which the measure of interest provides results consistent with the theory. Used in this context, the term theory represents something more than a hypothesis (i.e., there is reasonable evidence supporting the premise) and less than a law (i.e., the event will not occur without exception). With respect to the sequela after hip fracture, substantial evidence supports the premise that the functional status of patients improves over time (Hawkes et al., 2004; Jaglal, Lakhani, & Schatzker, 2000).

Outcome Measures

In the larger study, the investigators chose to use a wide range of measures, with one of the main tools being the COPM (Law et al., 1998). The COPM has been shown to possess sound properties and has great benefit because it seeks to distinguish among what is important to the patient, how an activity is performed, and the patient’s satisfaction with that performance. This approach was supported by Chen and Kane (2001), who addressed the effects of using consumer and expert ratings on an ADL scale when predicting functional outcomes after acute care.

The COPM

In the 1980s, the Department of National Health and Welfare Canada and the Canadian Association of Occupational Therapists worked together to develop quality assurance guidelines for the practice of occupational therapy in Canada (Department of National Health and Welfare, 1983, 1986, 1987). The work of this task force culminated in three publications, the last of which recommended that measurement tools be developed for the sole use of occupational therapy practitioners to determine the effectiveness of their work. The COPM, developed in response to this recommendation (Law et al., 1998), is an individualized measure designed for occupational therapists to detect change in a patient’s self-perception of occupational performance over time.

The COPM is intended to be used as an outcome measure, to be administered at the beginning of occupational therapy services and at certain intervals afterward as determined by the patient and therapist during evaluation and intervention.

The COPM is used to identify problem areas in occupational performance and
• Provide a rating of the patient’s priorities in occupational performance,
• Evaluate performance and satisfaction relative to those problem areas, and
• Measure changes in a patient’s perception of his or her occupational performance.

A recent review of the literature in which use of the COPM was explored (Carswell, McColl, Baptiste, Law, Polatajko, & Pollock, 2004) suggests that the measurement
properties (reliability, validity, responsiveness) of the COPM repeatedly have been shown to be satisfactory to excellent. The COPM has been used successfully with a wide variety of patients, from children and their families to adult patients coping with various illnesses, disabilities, and life circumstances (e.g., Atwal, Owen, & Davies, 2003; Bowie, Shackleton, & Zehnal, 1999; Chesworth, Duffy, Hodnett, & Knight, 2002; Lyons & Raghavendra, 2003; Reid, Hebert, & Rudman, 2001; Tryssenaar, Jones, & Lee, 1999). The purpose of the current study was to determine the extent to which the COPM assessed performance in elderly people after hip fracture.

Methodology

All study participants were older adults admitted to a large regional teaching hospital after a hip fracture during an 8-month study period. To be eligible for the study, participants needed to be older than 65 years of age, admitted to hospital for surgery to repair a hip fracture, able to provide informed consent to participate, and able to converse in English for the administration of the outcome measures via interview. For this study, the Clock Drawing test (Sunderland et al., 1989) was used to identify patients with cognitive deficits, and participants who received a score of less than 16/20 were deemed unable to provide informed consent. People also were excluded from the study if there was a plan for immediate repatriation back to a community hospital after their surgery.

The study was approved through the normal ethics review committee process at the local university and teaching hospital where the study took place. Participants were seen 3–5 days after their surgery by a trained clinical evaluator. The study was explained to the patients, and consent forms were completed. If patients did not officially decline on the first visit but wanted time to consider their participation, the clinical evaluator returned the next day to offer the patient another opportunity to consent to participate. If the patient did not explicitly decline participation but was hesitant to complete the consent forms on the third visit, they were considered having declined to participate.

Outcome Measures

Table 1 provides the timeline for the administration of outcome measures.

COPM

The COPM (Law et al., 1998) was used to assess patients’ perceptions of performance in daily activities. The COPM, which takes 40–60 min to complete, is a well-validated, individualized measure designed to detect change in performance in daily activities over time. The COPM has excellent test–retest reliability (0.75 and above) (Law et al., 2005) and has been demonstrated to measure changes in performance and satisfaction that are similar to changes in overall function as perceived by caregivers, occupational therapists, and patients.

WOMAC

The Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC); (Bellamy, Buchanan, Goldsmith, Campbell, & Stitt, 1988) was originally conceived as an outcome measure for people with osteoarthritis of the hip or knee (Bellamy, 1989; McConnell, Kolopack, & Davis, 2001; Roos, Klassbo, & Lohmander, 1999); however, it has been applied to people with hip fractures (Jain et al., 2002; Tidermark, Bergstrom, Svensson, Tornkvist, & Ponzer, 2003; Wood, McDowell, Kerstetter, & Kelley, 2003).
2000) and people undergoing total joint arthroplasty. The WOMAC is a self-report, functional-status measure consisting of 24 items: 5 for pain, 2 for stiffness, and 17 for physical function. Patients are asked to rate various aspects of their pain, stiffness, and function on a 5-point Likert scale, with lower scores indicating higher levels of functional status. Test–retest reliability has been demonstrated (ICC 0.58–0.96), and the WOMAC also has been shown to correlate moderately well in appropriate domains with the SF-36 (Kosinski, Keller, Hatoum, Kong, & Ware, 1999), the Patient Specific Index (PASI); (MacKenzie, Charlson, DeGioia, & Kelley, 1986), and the Harris Hip Scale (Wright & Young, 1997). The instrument takes approximately 10 min to complete and has been translated into other languages.

**ADL/IADL Assessment**

Pre-hospital functional status and functional status at the 3-month follow-up contact point were measured using subscales of the Multilevel Assessment Instrument (Lawton & Brody, 1969). Two administrations of the assessments were determined by the need for baseline data (pre-hospital status) and to allow sufficient time for functional recovery to occur (at 3 months after surgery). Additional measurements were not conducted so that study participants would not be overburdened. The Instrumental Activities of Daily Living (IADL) (shopping, food preparation, housekeeping, and mode of transportation) and Physical Self-Maintenance Scale (which measured ADLs) (dressing, physical ambulation, bathing) were used. This instrument was designed to be self-rated but was administered by the clinical evaluator for the study.

**Data Analysis**

The participants’ responses on the COPM were manually reviewed and collated. Occupational performance issues (OPIs) identified for each section of the COPM (Self-Care, Productivity, Leisure) were listed, and the number of times they were identified was recorded. The total number of OPIs for the study group was calculated, as were the numbers and percentages in each COPM section. OPIs were kept in the category identified by the participants even if the clinical evaluator thought that they were more suitable for another category; therefore, some OPIs are listed under more than one category. Pearson’s correlation coefficient and 95% confidence intervals were used to quantify the cross-sectional and longitudinal validity of the COPM.

The Standardized Response Means (SRM) was applied to quantify change. The SRM is computed by dividing the average change by the standard deviation of the change scores. A bootstrap procedure was used to estimate the confidence intervals for the SRMs and to formally compare the difference in SRMs between the COPM performance measure and the WOMAC physical function subscale. A nonlinear model was used to develop a profile of change in COPM performance scores over time (growth curve) (see Figure 1).

**Results**

**Demographics**

During our study, 198 people (99 women, 99 men), presented with a hip fracture with a mean age of 82.3 years ($SD = 10.9$ years). Of the 198 potential participants, 50 met the eligibility criteria. People were ineligible for the following reasons: declined to participate, 101 (51%); too confused, 64 (32.3%); English not first language, 15 (7.6%); and other, 18 (9.1%). Of the 50 eligible participants, 38 were women and 12 were men. This sample’s mean age was 80.8 years ($SD = 7.3$ years), with no difference between women and men.

**Descriptive Results**

Table 2 reports descriptive statistics for the measures. The results show an improvement in functional status for both the COPM and WOMAC physical function subscale. Also presented in Table 2 are the retrospectively recalled and T4 values for ADL. Forty-four patients provided recall and T4 ADL values, and a comparison of these values revealed that patients had not regained their pre-fracture ADL status by T4 ($t_{43} = 5.90, p < 0.001$).

Figure 1 provides a modeled representation of change in average COPM scores over the first 300 days after surgery. Of particular interest is the finding that most of the change in reported performance occurred within 130 days of surgery.
In total, the 50 participants identified 166 OPIs, with 119 (72%) in the self-care category, 27 (16%) in leisure, and 20 (12%) in productivity. Table 3 lists the common OPIs identified in each category. It is useful to note that walking, driving, and shopping were identified as both self-care and leisure activities, and meal preparation was identified as both self-care and productivity. There was an average of 3.32 OPIs per participant, with 2.38 in self-care, 0.54 in leisure, and 0.4 in productivity.

Validity

Both cross-sectional and longitudinal convergent construct validity were examined using correlation analysis. Table 4 reports the cross-sectional correlation coefficients between the COPM performance and satisfaction scores with the WOMAC physical function scores for occasions T1 (upper right values) and T4 (lower left values). Also reported at T4 are correlations between the COPM and ADL. The negative correlations with the WOMAC physical function scores occur because more positive COPM scores are associated with higher levels of functional status, whereas lower WOMAC physical function scores are associated with higher levels of functional status.

The correlation between COPM and WOMAC physical function change scores was –0.54 (95% CI: –0.72, –0.29). Again, the negative correlation in change scores occurs because more positive COPM scores are associated with higher levels of functional status, whereas lower WOMAC physical function scores are associated with higher levels of functional status.

The SRMs for the COPM performance measure and WOMAC physical function subscale were 1.77 (95% confidence interval: 1.38, 2.35) and 1.89 (95% CI: 1.46, 2.63), respectively. The difference in SRMs was 0.12 (95% confidence interval: –0.49, 0.84).

Discussion

Improvement was noted in participants’ functional status as measured by the COPM and WOMAC, but not to the level of pre-fracture status. This finding confirms the utility of using the COPM as an outcome measure in rehabilitation for people with hip fracture. Most recovery occurred within the first 130 days after surgery. Most (72%) OPIs that were identified were in the category of self-care, with an average of 3.32 OPIs per participant.

Because no gold standard exists for functional status, the validation of measures intended for assessing this attribute draws heavily on a construct validation process. In brief, construct validation involves forming theories about the attribute of interest—in this study, functional status—and then determining the extent to which the measure provides results consistent with the underlying theories. With respect to cross-sectional validity, we hypothesized that the results from measures designed for a similar purpose should correlate. COPM scores were correlated with WOMAC physical function scores at T1 and T4 and with ADL scores at T4. Correlations between the COPM and comparison measures were statistically significant (i.e., confidence intervals did not include zero) and consistent with the magnitude of complementary measures reported in the literature.
lower correlations at T1 are a result of a greater homogeneity in the sample at this point time—they all have significant disability—compared to T4.

We also applied a construct validation process to assess the COPM’s longitudinal validity. This time we hypothesized that the change scores of measures intended for a similar purpose should display a moderate correlation. Once again, the observed correlation between COPM performance and WOMAC physical function change scores was consistent with correlations among complementary functional status measures.

**Practice point.** The COPM correlated well with a measure that was specifically designed to measure functional status in people with orthopedic conditions of the hip or knee. This finding provides reassurance to clinicians that selecting the COPM as an outcome measure for people with hip fracture is a valid and sound strategy.

We applied the SRM to ascertain the relative ability of the measures to detect change, hypothesizing that patients would improve after surgery and that the measure displaying the larger SRM would be more adept at assessing change. The difference in SRMs between the COPM performance measure and the WOMAC physical function subscale was 0.12 in favor of the WOMAC. Unfortunately, little information is available concerning what constitutes a clinically important difference in SRMs. Liang, Fossel, and Larson (1990) suggested that a difference as great as 0.26 was not important; however, they did not provide the rationale for this statement. In our study the confidence interval for the difference in SRMs included zero, suggesting that the difference in sensitivity to change of the measures was not statistically significant. The width of the confidence interval was large, however, and included the value of 0.26. Accordingly, given our sample size, we cannot rule out the possibility that the sensitivity to change of the WOMAC physical function subscale is greater than that of the COPM.

**Practice point.** More research is needed to determine whether the WOMAC is more sensitive to change than the COPM and to explore the relationship of the two measures in clinical situations.

Because 50% of the potential participants declined to participate or were ineligible, we need to question whether this refusal rate is representative of the population or whether the patients were approached too early when they were still concerned with their fall or affected by postoperative delirium. Other interesting questions include whether a large proportion of potential participants had pre-existing cognitive deficits and whether this age group and population did not wish to participate in research activities.

**Practice point.** Although this refusal rate is predominantly a research concern, it has implications for determining the timing of initiating occupational therapy evaluation and intervention and how best to engage with patients in clinical practice. If early intervention is advised, but patients are unable to provide informed consent because of cognitive impairment, then involvement of a substitute decision maker must be considered when practicing in a patient-centered fashion.

Most of the functional recovery occurred in the first 130 days after surgery, which has important implications for occupational therapy intervention in acute care and immediately after discharge home. This result reinforces the potential negative impact of long waiting periods for home-care services or transfer to rehabilitation services. Although this aspect is not the major focus of this study, it is worth noting that most participants had not regained pre-fall functional status 3 months after discharge, which mirrors the findings of Shyu et al. (2004), in which participants achieved approximately 50% of previous functional levels in ADL and IADL.

**Practice point.** Occupational therapy interventions should be initiated as soon as possible after hip fracture. However, occupational therapists should be aware that pre-fall functional status is unlikely to be attained even with optimal treatment.

OPIs most frequently identified were in self-care, then leisure and productivity, which reflects common clinical thinking and is what would be expected from this sample of mostly retired people. Self-care is obviously of prime importance to enable discharge to pre-hospital locations. Some OPIs were identified in more than one category; for example, driving, shopping, and walking were identified as both self-care and leisure, and meal preparation was...
classified as both self-care and productivity. These classifications reflect the patients’ interpretation of each activity.

**Practice point.** We health care providers must be cognizant of the meaning that patients place on tasks and their consequent importance in the treatment and recovery process. In addition, the central role that occupational therapists play in evaluation and intervention of self-care activities mirrors patient-expressed needs and reinforces resource allocation in this area of practice.

Our findings suggest some central implications for occupational therapy practice. They confirm the primary focus on self-care within this population, which is relevant and helpful in the determination and allocation of limited occupational therapy resources in our current health care environment. Results also highlight the importance of occupational therapy intervention within the first 130 days after surgery, to capture the period where most recovery is experienced. These results support the need for occupational therapists to be involved in both the immediate phase after hip surgery within the acute care environment and in the longer term rehabilitation context within various residential settings. Although early intervention is purported to be critical, it would appear that engaging too early with this patient population might be equally detrimental.

Limitations of this study included the small sample size and the length of time of the funded study period, including follow-up. As noted previously, despite a potential sample size of 198, many more participants declined to participate than we expected. Additionally, the funding period did not allow extension of the study timeline to recruit additional numbers. More research is required to determine the optimal time to begin intervention for people recovering from hip fracture and surgery. In addition, exploring further application of the COPM as an outcome measure with specific populations remains a priority.

Both the WOMAC and the COPM detected change over time. It is encouraging to note that the COPM is sensitive to change in function in patients recovering from hip fracture; thus, the use of the COPM with this population is desirable and advisable. Although this research may not appear to be groundbreaking, it does reaffirm what we have believed intuitively as clinical occupational therapists. ▲

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**Note**

1. FIM™ is a trademark of the Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc.

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