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Health Care Resource Utilization after Acute Ankle Sprains

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Abstract

Ankle sprains are common soft-tissue injuries that are often treated in emergency departments. These injuries can have significant consequences for the patient, including long-term morbidity and loss of productivity. The objective of this study was to examine the direct and indirect health resource utilization associated with ankle sprains. 296 adult patients with acute ankle sprains participated in the study in Kingston, Ontario, Canada. Data were collected using a one-month productivity questionnaire. Overall, 11% (95% CI, 8–15%) of the participants visited a physician following the initial emergency department visit. Almost all (95%; 95% CI, 92–97%) of the participants used medications or supportive treatments and 55% (95% CI, 50–61%) reported taking time off from work, school, or housework. The use of unpaid assistance was indicated by 56% of the participants (95% CI, 50–62%). Findings from this analysis highlight the significant patient-related and health care system burden of acute ankle sprains.

Key words: ankle sprains, Canada, health resources, productivity loss

Słowa kluczowe: Kanada, urazy stawu skokowego, utrata zdolności do pracy, zasoby ochrony zdrowia

Introduction

Ankle sprains are soft-tissue injuries caused by damage to one or more of the ligaments of the ankle joint [1]. These injuries affect 206 to 215 per 100,000 people per year [2, 3], and make up 3% to 5% of all emergency room visits annually in the United Kingdom [4]. Recovery time from ankle sprains can be affected by numerous factors including age, body mass index, and the characteristics of the sprain including its type, severity, and number of ligaments involved [5, 6]. Acute ankle sprains can have significant and long-term consequences for the affected individual, both clinically and economically. Up to three-quarters of participants with soft-tissue injuries to the ankle report long-term morbidity and pain affecting their mobility up to18 months following the sprain [7, 8]. The physical consequences of acute ankle sprains may remain for six weeks and even for up to four months after the initial injury, leading to chronic problems [9, 10]. The most commonly reported problems after the injury include ankle weakness, loss of quality of life, and absenteeism from work, school or sports [7, 8, 11, 12].

Medical and physiotherapy treatments for ankle sprains are costly [12–14]. Studies conducted in the United Kingdom, Belgium, and the United States show that the costs of ankle sprain diagnosis and treatment for individual cases range from $490 to $4,662 (2012 Canadian dollars), depending on the severity of the sprain, the need for immobilization or invasive procedures, and time lost from work [4, 13, 15, 16]. Ankle sprains can particularly affect amateur and professional elite athletes if they inhibit their return to work [17, 18].

To date, a limited number of studies have investigated the health resource utilization of individuals with ankle sprains. Cooke *et al.* conducted a randomized controlled trial of three types of mechanical ankle support treatments among 584 individuals with grade 3 ankle sprains in the United Kingdom [4]. The authors collected information on consultations, imaging, inpatient episodes, prescribed and purchased medications, and sick leave. Another study done by Audenaert *et al.* included 200

individuals with occupational accidents resulting in ankle sprains that were captured in an insurance database in Belgium [15]. The authors presented information on days missed from work and resource utilization during the initial medical visit for the sprain but did not include resource utilization following this visit. Neither study presented health resource utilization data for less severe ankle sprains (grades 1 and 2).

Data on the burden of acute ankle sprains are limited and a better understanding of the health care utilization and productivity loss is required to determine the impact of these injuries on both the health care system and the participant. These data are needed in order to address resource allocation and determine how patients can prepare for their recovery from such injuries. Therefore, the purpose of this paper is to assess the participant-related resource utilization associated with ankle sprains in terms of health care professional visits, use of medications and other treatments, productivity loss post-injury, and the use of paid or unpaid assistance following the sprain.

Methods

This study is based on a sub-sample of adult participants with acute ankle sprains who participated in an ongoing randomized controlled trial investigating the clinical utility and cost-effectiveness of a therapeutic management program involving physiotherapy in Kingston, Ontario, Canada, of which the authors are the principal investigators (R.B. and B.B.) and co-investigators (W.P. and A.J.). The participants included individuals who were 16 years of age and older and presented with a grade 1 or 2 ankle sprain (stretched ligament of the ankle joint or partially torn ligament, respectively [19, 20]) to one of two emergency departments in Kingston between the years of 2009 and 2012. Individuals with grade 3 ankle sprains (completely ruptured ligaments [19]), ankle fractures, injuries requiring immobilization, multiple injuries that could have impacted the recovery from the ankle sprain, prior ankle sprain in the preceding six months, or mobility limiting conditions such as arthritis or neurological diseases were excluded. The randomized controlled trial received ethics approval from the Queen's University Health Sciences Research Ethics Board (approval #EMED-114-09).

Self-reported data were collected prospectively by trained research assistants using a telephone-based interviewer-administered productivity questionnaire completed one month after the initial emergency department visit for the ankle sprain. Estimates included health care utilization of services covered by the provincial government of Ontario through the Ministry of Health and Long-Term Care such as outpatient family physician and specialist physician visits, subsequent emergency department visits, and imaging ordered outside of the initial emergency department visit. Services paid for out-of-pocket by the participant or covered through the participant's private insurance company including prescription and over-the-counter drugs, supportive treatments, and travel time and distances during the past month were also estimated. In addition, data on yearly income and productivity loss from work, school, or housework, disability payments collected, and the duration of paid and unpaid assistance for self-care, child or elder care, or domestic help were collected. Information on physiotherapy received was not included in the analysis as it was part of the therapeutic management program in the randomized controlled trial. Percentages and median travel times and distances along with their interquartile ranges were calculated for a subsample of the study population who had data available at the time of analysis. Study data were collected and managed using REDCap – electronic data capture tools hosted at Queen's University [21].

Results

Overall, 296 participants had completed the one-month productivity questionnaire at the time of data analysis. The mean age of the participants was 31 years with a range of 16 to 71 years of age. Ankle sprain grade was available among 202 participants with 34 (17%; 95% Confidence Interval [CI], 12–23%) having grade 1 ankle sprains and 168 (83%; 95% CI, 77–88%) having grade 2 ankle sprains. Study data were collecled and maraged using REDCap electronic data capture tools hosted at Queen's University [21]

Health Care Provider	Participants n = 296 (%; 95% CI)	Number of Visits	Median (IQR*) Travel Time (minutes)	Median (IQR*) Travel Distance (kilometres)
Family Physician or Specialist Visit	33 (11.1%; 8.1–15.2%)	37	16 (10–30)	12 (8–25)
Emergency Department Revisit	11 (3.7%; 2.1–6.5%)	14	13 (6–25)	10 (5–18)
Imaging Post Emergency Department Visit[1]	17 (57% 3,6–9.0%)	18	n/a	n/a

Table I. *Health Care Professional Visits after Initial Presentation to Emergency Department.*

** IQR = interquartile range; n/a = not available.*

[1] Includes x-ray, computed tomography, magnetic resonance imaging done after initial emergency department visit.

Treatments	Number of Participants n = 296 (%; 95% CI)
Medications	**204 (68.9%; 64.1–74.6%)**
Over-the-counter medications	
1 medication	155 (52.4%; 46.7–58.0%)
2-3 medications	39 (13.2%; 9.8–17.5%)
Prescription medications	22 (7.4%; 5.0–11.0%)
Supportive Treatments	**269 (90.1%; 87.1–93.7%)**
Crutches	156 (52.7%; 47.0–58.3%)
Cane	17 (5.7%; 3.6–9.0%)
Tensor	183 (61.8%; 56.2–67.2%)
Ice or cryotherapy	227 (76.7%; 71.6–81.2%)
Heat	28 (9.5%; 6.6–13.3%)
Creams or balms	20 (6.8%; 4.4–10.2%)
Ultrasound	8 (2.7%; 1.4–5.2%)
Brace	41 (13.9%; 10.4–18.3%)
Other	11 (3.7%; 2.1–6.5%)
Any Medication or Treatment	**282 (95.3%; 92.2–97.2%)**

Table II. *Use of Medications and Other Treatments.*

Health Care Professional Visits

Table I presents the health care utilization of services paid for by the Ministry of Health and Long-Term Care in Ontario. These services include the participants' visits to health care professionals, emergency department revisits, and the use of imaging services after the initial presentation to the emergency department along with median travel times and distances. Overall, 33 participants (11%; 95% CI, 8–15%) visited a family physician or specialist on one or more occasions following the initial emergency department visit. The emergency department was revisited by 11 participants (4%; 95% CI, 2–7%). Imaging investigations, including x-rays, computed tomography scans, and magnetic resonance imaging following the initial emergency department visit, were reported to have been done for 17 participants (6%; 95% CI, 4–9%).

Use of Medications and Other Treatments

Table II describes the use of medications, both over-the-counter and prescription, as well as supportive treatments paid for out-of-pocket by the participant or covered by the participant's private insurance. Overall, 282 (95%; 95% CI, 92–97%) of the participants used either medications or supportive treatments for their ankle sprain. Most of the participants (69%; 95% CI, 63–74%) took over-the-counter medications or prescription medications. A majority of the participants (91%; 95% CI, 87–94%) used some form of supportive treatment for their sprain with ice or cryotherapy (77%; 95% CI, 72–81%), tensor (62%; 95% CI, 56–67%), and crutches (53%; 95% CI, 47–58%) being the most common.

Productivity Loss and Disability Payments

Over half of the study participants (55%; 95% CI, 50–61%) reported taking time off from work, school, or housework in the preceding month. The time off was for an average of 6 days (median = 3 days; interquartile range [IQR]: 2–7 days). Of the participants who reported productivity loss, 110 (67%; 95% CI, 60–74%) were employed with the remainder being unemployed, students, or retired. A large proportion of these individuals (69 participants) reported earning an income of less than $39,999 per year (2012 Canadian dollars) (**Table III**). Disability benefits due to time off from work for the ankle sprain were reported to have been received by 8% (95% CI: 4–15%) of the employed individuals with productivity loss.

Use of Paid and Unpaid Assistance

The use of unpaid assistance from family or friends was reported by 166 participants (56%; 95% CI, 50–62%) following the ankle sprain injury. This form of help was used for an average of four days (median = 4 days; IQR: 2–7 days). Child or elder care was reported to have been used by 29 participants (10%; 95% CI, 7–14%) for an average of nine days (median = 5 days; IQR: 2–14 days). A small proportion of the study sample (8 participants) required the use of paid assistance following their sprain.

Discussion

The study findings highlight the participant-related resource utilization following acute ankle sprains. Overall, 11% (95% CI, 8–15%) of the participants visited their family physician or a specialist physician on one or more occasions and 4% (95% CI, 2–7%) of the participants

Income (2011 CAD*)	Number of Participants n = 296 (%; 95% CI)	Participants with Productivity Loss n = 164 (%; 95% CI)
Not employed	**102 (34.5%; 29.3–40.0%)**	**45 (27.4%; 21.2–34.7%)**
Employed	**183 (61.8%; 56.2–67.2%)**	**110 (67.1%; 59.6–73.8%)**
< $10,000	45 (15.2%; 11.6–19.7%)	29 (17.7%; 12.6–24.2%)
$10,000–$19,999	27 (9.1%; 6.3–12.9%)	18 (11.0%; 7.1–16.7%)
$20,000–$29,999	15 (5.1%; 3.1–8.2%)	8 (4.9%; 2.5–9.3%)
$30,000–$39,999	24 (8.1%; 5.5–11.8%)	14 (8.5%; 5.2–13.8%)
$40,000–$49,999	22 (7.4%; 5.0–11.0%)	12 (7.3%; 4.2–12.4%)
$50,000–$59,999	17 (5.7%; 3.6v9.0%)	10 (6.1%; 3.4v10.9%)
≥ $60,000	33 (11.1%; 8.1–15.2%)	19 (11.6%; 7.6–17.4%)
Not answered	**11 (3.7%; 2.1–6.5%)**	**9 (5.5%; 2.9–10.1%)**

Table III. *Employment Information and Productivity Loss.*
** CAD – Canadian dollars.*

revisited the emergency department following the initial emergency department visit. Reasons for subsequent health care visits were not collected. In this study, 6% (95% CI: 4–9%) of the participants reported receiving repeat imaging following their acute ankle sprain. The use of over-the-counter or prescription medications was reported by 69% (95% CI, 63–74%) of the study participants while 90% used supportive treatments for their sprain. Regarding productivity loss, the majority of the individuals with ankle sprains reported missing an average of 6 days (median = 3 days; IQR: 2–7 days) from work, school, or housework due to their injury. However, it is not possible to distinguish between paid and unpaid work in the study questionnaire. Nonetheless, ankle sprains can cause functional limitations and affect the person's everyday life. In fact, a majority of the participants (56%; 95% CI, 50–62%) reported using unpaid assistance from family or friends following their ankle sprain.

The use of radiography was investigated in a study from the Netherlands which looked at volleyball players participating in a proprioceptive board training programme who suffered an ankle sprain [22]. Overall, 8 of the 39 participants who completed a cost diary reported having radiography or casting done. Another study from the United Kingdom looked at imaging following grade 3 ankle sprains [4]. The authors found that 6% to 10% of the participants had imaging performed. In the current study, 6% (95% CI: 4–9%) of the participants reported receiving repeat imaging following their acute ankle sprain. Regarding the use of medications, the study from the United Kingdom found that 14% to 26% of the participants with grade 3 ankle sprains reported having been prescribed analgesics while 40% to 55% of the study participants reported using bought medicines and supportive aids [4]. The use of prescription medications was lower in the current study. Overall, 7% of the participants used prescription medications, 69% used over-the-counter medications, and 90% used supportive treatments for their sprain.

Productivity loss among individuals with ankle sprains has been previously reported. In a study done by Verhagen *et al.* in the Netherlands, 18 of study participants reported missing a total of 92 days from paid work (average of 5.1 days) and 19 participants reported absenteeism from unpaid work for a total of 829 hours (average of 43.6 hours) [22]. In the study by Audenaert *et al.*, the authors found that the average period of unemployment lasted for 29 days (standard deviation = 33) [15]. No information was available on the grade of the injury. Due to a prolonged unemployment period, it is likely that the injuries included more severe ankle sprains. Lastly, the study from the United Kingdom found that patients with grade 3 sprains reported losing 7 to 10 days off work [4], which is in line with the results of the current study which looked at grades 1 and 2 sprains only.

This was the first study to assess the health care resource utilization and productivity loss of individuals with grades 1 or 2 acute ankle sprains. The study included both health care system insured (Ministry of Health and Long-Term Care in Ontario) and non-insured services to look at the patient burden of ankle sprains. One of the limitations of this analysis was the exclusion of physiotherapy visits, which are paid for out-of-pocket or by private insurance companies in Ontario. However, given that physiotherapy was part of the management strategy of the treatment arm in the randomized controlled trial, these data were not reported. Information on visits to allied health care professionals such as chiropractors and podiatrists was not reported in this analysis due to low cell counts.

The findings of this analysis highlight the significant patient-related burden of ankle sprains in terms of health care visits, out-of-pocket expenses, productivity loss, and use of paid and unpaid assistance. The results of this study are important to consider for patients suffering from ankle sprains and their health care professionals in order for patients to properly prepare for the course of their recovery from the ankle injury. This may be especially important for individuals with a lower income for whom productivity loss would most likely have a greater

impact. Future studies could consider investigating the reasons for why participants revisit the emergency department and do not choose other health care options such as their family physicians or walk-in clinics. The average cost of an emergency department visit in Ontario is estimated to be $148 (2009 CAD) to the health care system [23]. Perhaps emergency departments could routinely provide patients with handouts about the recovery process from ankle sprains. In the future, the direct and indirect costs associated with the diagnosis and treatment of acute ankle sprains could be investigated.

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