

1 **High incidence of lost workdays in patients with subacromial impingement**
2 **syndrome**

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4 **Authors:**

5 Mikkel Bek Clausen^{1,2}, PhD

6 Mathias Fabricius Nielsen², MSc

7 Mikas Bjørn Merrild¹, MSc

8 Per Hölmich^{2,3}, PhD

9 Kristian Thorborg^{2,3}, PhD

10

11 **Affiliations:**

12 1) School of Physiotherapy, Department of Midwifery, Physiotherapy, Occupational Therapy and
13 Psychomotor Therapy, Faculty of Health, University College Copenhagen, Sigurdsgade 26, DK-
14 2200 Copenhagen N, Denmark

15 2) Sports Orthopedic Research Center – Copenhagen (SORC-C), Department of Orthopedic
16 Surgery, Copenhagen University Hospital Amager-Hvidovre, Kettegårds Allé 30, DK-2650
17 Hvidovre, Denmark

18 3) Department of Clinical Medicine, University of Copenhagen, Copenhagen, Denmark

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20 **Corresponding author:**

21 Name: Mikkel Bek Clausen

22 Address: University College Copenhagen, Sigurdsgade 26, 2200 Copenhagen, Denmark

23 Mail: mikkelsbek@gmail.com

24 Phone: +45 28607580

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5 **Abstract**

6 Introduction: Loss of workdays is the main societal cost related to shoulder disorders, with nine lost
7 workdays per six months in average. The most common shoulder disorder is subacromial
8 impingement (SIS) but it is unknown if SIS is also a leading cause of shoulder-related loss of
9 worktime. We aimed to investigate the incidence of workdays lost due to SIS during six months
10 after SIS diagnosis in specialized care.

11 Methods: From 157 consecutive patients diagnosed with SIS in secondary care, 129 (82%)
12 completed a structured six-month follow-up interview. Job-status, average working hours and sick
13 leave due to SIS was recorded. Only patients in job (n= 58) and patients who lost their job due to
14 SIS (n=8) were considered at-risk of losing workdays, leaving 66 patients in the at-risk group.
15 Number of lost workhours due to SIS was calculated and normalized to full-time workdays, and
16 incidences of lost workdays were estimated using Poisson regressions.

17 Results: In total, 1781 workdays were lost. Mean lost workdays per six months was 27 days
18 (95%CI:18-40) for patients at-risk (n=66), corresponding to 14 days in average (95%CI:9-21) for
19 the entire cohort (n=129). Thirty-three patients were responsible for all loss of workdays.

20 Conclusion: We found that an average of 27 workdays (>5 work-weeks) were lost due to SIS the
21 first 6 months after diagnosis in patients who were otherwise fit to work. This is 3 times higher than
22 the 9 days previously reported for shoulder problems in general indicating that productivity loss in
23 patients diagnosed with SIS is a major concern.

24 Funding: None

25 Trial registration: None

26 **Key terms:** productivity, sickness absence, shoulder, hospital, pain

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Accepted Version

28 **Introduction**

29 Loss of workdays is the main cause for the societal expenses related to shoulder disorders [1,2],
30 with an average of nine workdays lost due to a shoulder disorder per six-month [2]. As the most
31 common shoulder disorder in both general practice [3] and secondary care [4,5], subacromial
32 impingement syndrome (SIS) might be the leading cause of shoulder-related loss of worktime.
33 Existing evidence regarding the amount of lost worktime related specifically to SIS in specialized
34 care settings is limited to outcome data from RCTs [6,7]. As the generalizability of such data is
35 often limited due to the inherent problems with trial effects (e.g. treatment effect, protocol effect
36 and care effect) [8], the relevance of addressing and monitoring loss of worktime due to SIS
37 remains unknown. Therefore, we investigated the incidence of lost workdays for patients diagnosed
38 with SIS in a specialized care setting.

39
40 **Methods**

41 This retrospective observational study is a secondary reporting on the 6-month follow-up in a
42 consecutive cohort of 157 patients diagnosed with SIS [9], all referred to an orthopedic specialist
43 department from March to June 2014. Patients completed a structured telephone-interview
44 regarding treatment, job status and sick leave due to the shoulder disorder since baseline. The
45 current study is based on data regarding job status and sick leave. Details on patient flow and
46 baseline data for the full cohort of 157 patients has been reported elsewhere [9,10]. No formal
47 ethical approval was required; evaluated by the Capitol Region Committee on Health Research
48 Ethics in Denmark (H-3-2013-FSP29).

49
50 ***Data Collection***

51 *Patient demographics, disease characteristics and surgery since baseline*

52 Information on the following variables were collected at baseline: age, gender, affected side,
53 duration of symptoms at baseline, SPADI-score, pain during the last week and sick leave at
54 baseline. Information on surgery since baseline were obtained during the follow-up telephone
55 interview.

56 *Work status*

57 Data on the patient's job (description and status) were obtained during the ten-minute structured
58 self-developed interview with approximately twelve questions regarding paid work (See Table 1).
59 We further categorised all reported jobs according to International Standard Classification of
60 Occupations (ISCO) major group codes[11] based on the short descriptions of job type, which were
61 recorded during the interview.

62
63 *Outcomes*

64 For each patient, the number of paid fulltime workdays lost due to SIS was calculated from answers
65 to the structured interview. Total number of fulltime workdays lost was defined as the sum of
66 working hours lost due to SIS from sick leave, reduced working hours and lost jobs, normalized to
67 the Danish norm for full-time workdays of 7.4 hours (37 hours per week).

68
69 *Workdays lost to sick leave*

70 The number of fulltime workdays lost because of sick leave was defined as: (average daily working
71 hours (Q3 / 5) * self-reported number of days on sick leave (Q4c)) / standard workhours per day
72 (7.4 hours per work day).

73

74 *Workdays lost to part-time*

75 The number of fulltime workdays lost due to patients working part-time was defines as: (hours lost
76 per day (7.4 hours per working-day – average daily working hours (Q3a / 5)) * possible work days
77 (weeks from baseline to interview * 5 workdays per week)) / standard workhours per day (7.4 hours
78 per work day).

79

80 *Workdays lost to losing a job*

81 The number of workdays lost due to patients having lost their job due to SIS were calculated
82 differently for those who had lost their job at baseline and after baseline, respectively, as patients
83 could be without a job because of SIS at baseline and still be without job a follow-up or they could
84 have lost their job between baseline and follow-up. For patients who already had lost their job due
85 to SIS at baseline the number of fulltime workdays lost was defined as: (possible work days (weeks
86 from baseline to interview * 5 workdays per week) * average daily working hours (Q3 / 5)) /
87 standard workhours per day (7.4 hours per work day). For patients losing their job after baseline due
88 to SIS the number of fulltime workdays lost was defined as: (workdays since lost job (weeks since
89 stopped job (Q1d) * 5 workdays per week) * average daily working hours (Q3 / 5)) / standard
90 workhours per day (7.4 hours per workday).

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95 *Statistical analyses*

96 Demographics, baseline values and descriptive data on job status, sick leave and lost working hours
97 at follow-up interview are presented as means (SD) or numbers and proportions for patients who
98 participated in the interview. Patients were categorized as at-risk of losing workdays due to SIS if
99 currently working or having lost a previous job due to SIS. Poisson regression analyses were used
100 to estimate the incidence of fulltime workdays lost due to SIS during the follow-up period as well as
101 the incidence rate ratio (IRR) for patients having undergone surgery vs those who had not. Negative
102 binomial regression was used to investigate differences in incidence of lost workdays among job
103 category, and to estimate the incidence separately for each job category. A significance level of 0.05
104 was applied for all statistical tests. Data were analysed with IBM SPSS Statistics v. 22.

105

106 **Results**

107 In total, 129 of the 157 patients (82%) completed the telephone-interview. The average age was 55
108 years (SD 13), 80% reported symptoms for more than three months at baseline, and 57% were
109 females. Mean SPADI score was 59 (SD 19) and mean of average pain last week was 5.1 (SD 2.0).
110 Patients who did not complete the telephone-interview were similar to those who did in age (mean
111 diff. 3.2 years 95%CI: -2.1 to 8.6), SPADI score (mean diff. 5.2 95%CI: -2.9 to 13.8), gender
112 distribution (53% vs 57%) and proportion on sick leave at baseline (10.7% vs 8.5%). Sixty-six
113 patients were at-risk of losing workdays due to SIS, as they had a full-time job (n =47), reduced
114 hours (n= 11), or had lost their job due to SIS (n=8). In total, 1781 workdays were lost due to sick
115 leave (851 days), lost job (647 days) and reduced hours (283 days). Thirty-three of the 66 patients
116 at-risk were responsible for all lost workdays. The incidence of lost fulltime workdays was 27 days
117 (95%CI: 18.4-39.6) for the at-risk group, corresponding to 13.8 days in average (95%CI: 9.1-21.0)

118 when estimated for the full cohort. The incidence of lost fulltime workdays was three times higher
119 for patients who had undergone surgery compared to those who had not (IRR 3.0, $p < 0.01$), both in
120 the full cohort and the at-risk group. The 50 patients in the at-risk group who had not undergone
121 surgery accounted for 51% (912 of 1781) of the lost workdays. For further details, see Table 2. The
122 incidence of lost workdays differed significantly among job categories ($p < 0.001$). The highest rates
123 were found for Elementary Occupations (76.5 days, 95%CI: 41.3 to 141.7) and Services and Sales
124 Workers (48.9 days, 95%CI: 30.2 to 79.2), with rates that were significantly higher compared to all
125 or most of the other job categories (see Table 3).

126

127 **Discussion**

128 We found an incidence of 27 fulltime workdays lost during 6 months in patients at-risk of losing
129 workdays, corresponding to >5 fulltime working weeks. The incidence was 3 times higher in
130 patients undergoing surgery (54.3 days) compared to non-operative care (18.2 days).

131

132 To the best of our knowledge, no previous study has reported the extent of lost workdays related to
133 SIS in non-trial settings, nor specifically for patients considered at-risk of losing workdays. In a
134 population-based sample from specialized care we found an incidence of 9.3 lost workdays due to
135 SIS, which is similar to the 7.3 [12] and 8 days [6] previously reported for comparable population
136 of non-surgically treated patients in RCT-settings. However, when comparing groups who had or
137 had not undergone surgery, separately, the incidence of lost workdays found in our study (no
138 surgery: 9.3 days; surgery: 28 days) is comparable to that reported by Ketola et al. [6] in an RCT-
139 setting (no surgery: 8 days; surgery: 33 days). To put the difference between 9 and 28 lost workdays
140 into perspective, the cost of 19 lost workdays is approximately 29.000 DKK (1530 DKK per day

141 [2]) , while the combined costs of all healthcare services during one year in patients allocated to
142 surgery or active follow-up amounts to ≈ 26.000 DKK (£ 3147) and ≈ 12.000 DKK (£ 1451),
143 respectively [7], why loss of worktime constitutes approximately 50-70% of the societal costs
144 related to SIS in this population. In contrast to our findings, Kromer et al. [13] reported an average
145 of 2.9 lost workdays during one year follow-up, a low rate even considering that all patients
146 underwent non-surgical treatment. However, this disagreement is likely a consequence of
147 differences in study population as Kromer et al. [13] recruited patients from primary care [14] while
148 the current study and Ketola et al. [6] recruited from specialized care. This difference is also
149 reflected in a higher level of shoulder disability in the current study (Mean SPADI=58.5) compared
150 to Kromer et al. [13] (Mean SPADI=40), which in turn is linked to higher costs and more shoulder
151 related sick leave [1,2]. Collectively, this indicate that loss of workdays due to SIS is mainly a
152 concern in more specialized care settings, when the level of shoulder disability is generally higher,
153 and surgery is considered.

154

155 When investigating the extent of lost workdays specifically in patients considered at-risk, we found
156 a high incidence of 27 lost workdays due to SIS (95%CI 18.4-39.6) during six months,
157 corresponding to >5 fulltime working weeks. In addition, we found that loss of workdays in this
158 population is more of a concern in specific job categories, and less so in others. As was also the
159 case for the full cohort, shoulder surgery was related to a three times higher incidence of lost
160 workdays (54 vs 18 days, IRR 3.0, $p < 0.05$). Importantly, the incidence of lost workdays is also
161 noteworthy in patients undergoing non-operative care who are otherwise fit to work; a group which
162 constituted more than one third of the full cohort (50 out of 129) and accounted for more than half
163 of all lost workdays. These findings are novel and underpins that loss of worktime is a specific
164 concern when persons, who are otherwise fit to work, suffers from persistent SIS, regardless of

165 treatment strategy but possibly more so for patients working in service and sales as well as
166 elementary occupations.

167 *Strength and limitations*

168 The use of consecutive sampling and a high response rate (82%) increases the external validity of
169 our findings in the context of secondary care for SIS. It should be noted, however, that this study
170 was conducted in a single region of Denmark, why the results may not be generalizable to other
171 regions and countries. There is a risk of recall bias related to estimates of lost workdays, which may
172 lead to an underestimation compared to workplace-registered sick leave [15], the gold standard for
173 measuring absenteeism is company-based registers [16], skewing our results towards a more
174 conservative estimate. Nevertheless, such registries are not likely to detect lost work time due to
175 changes in job status [17] which accounted for 16% of the total number of lost workdays in this
176 cohort. Therefore, it seems relevant to investigate the impact of SIS on lost workdays using self-
177 reported data, as it is easily accessible, is highly correlated with register-based data on absenteeism
178 [18], and allows for data collection on the impact of lost jobs. In summary, the use of structured
179 interviews, which allowed us to capture more detailed data on lost worktime, positively affects the
180 internal validity of the results.

181 **Conclusion**

182 We found a high incidence of 27 lost workdays due to SIS during six months after diagnosis in
183 patients who are otherwise fit to work. The incidence of lost workdays per six months was three
184 times higher for the small group of patients who had undergone surgery, but the total amount of lost
185 workdays was distributed evenly between patients undergoing surgery and nonoperative care,
186 respectively. In summary, loss of workdays seems a relevant concern in relation to both surgical
187 treatment and non-operative care of patients with SIS.

188

189 **Competing Interests:** The authors declare that they have no conflict of interest.

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Table 1. Structured interview and calculation of lost fulltime workdays

Structured interview – Schematic overview

Q1a	Do you currently have a paid job? (yes/no)
Q1b	If no to Q1a: Is your shoulder problem the primary reason for you not having a job? (yes/no)
Q1c	If yes to Q1b: Is it more or less than 6 months since you stopped working?
Q1d	If < 6 months to Q1c: How many weeks have passed since you stopped your job/work?
Q2a	Is/was it a fulltime job or job at reduced hours?
Q2b	If reduced hours: Is the reduced working hours because of your shoulder problem?
Q3	How many hours do you work per week?
Q4a	Within the last 6 months, have you had any sick leave with the primary cause being your shoulder?
Q4b	If yes, which of the following categories fits the number of days: 0-1, 2-5, 6-10, 11-15, 16-30, 31-60, >60?
Q4c	Finally: How many days of sick leave would you think is the precise number?

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Table 2. Baseline characteristics and incidence of lost workdays

	At-risk group ^a	Not at-risk group	Full cohort
	(n=66)	(n=63)	(n=129)
Baseline characteristic			
Gender, female (%) (n=129)	32 (48%)	41 (65%)	73 (57%)
Age, years, mean (SD) (n=129)	47.9 (10.6)	62.2 (10.4)	55 (13)
Dominant side affected (%) (n=125)	36 (55%)	37 (59%)	73 (57%)
Duration of symptoms (n=127)			
0-1 month	-	2 (3.2%)	2 (2%)
1-3 months	11 (17%)	11 (17%)	22 (17%)
3-6 months	14 (21%)	14 (22.2%)	28 (22%)
>6 months	39 (59%)	36 (57%)	75 (58%)
SPADI Total (n=128)	54 (17)	63,1 (20)	59 (19)
Average pain last week, mean (SD) (n=121)	4.7 (2.0)	5.5 (2.0)	5.1 (2.0)
On sick leave at baseline, yes (%)	10 (15%)	1 (2%) ^b	11 (9%)
Surgery since baseline, yes (%)	16 (24%)	15 (24%)	31 (24%)
Incidence lost workdays in 6 months (95% CI)			
Total lost workdays	27.0 (18.4-39.6)		13.8 (9.1-21.0)
Sick-leave	12.9 (7.8-21.4)		6.6 (3.9-11.3)
Part-time	4.3 (1.6-11.4)		2.2 (0.8-5.9)
Lost job	9.8 (4.7-20.5)		5.0 (2.4-10.7)
Total incidence of lost workdays in subgroups			
Surgery since baseline	n=16		n=31
Incidence lost workdays in 6 months (95% CI)	54.3 (37.7-78.2)		28.0 (17.0-46.2)
No surgery since baseline	n=50		n=98
Incidence lost workdays in 6 months (95% CI)	18.2 (10.0-33.4)		9.3 (5.0-17.5)
Incidence rate ratio (Surgery vs no surgery)	3.0 (1.5-6.0) p<.01		3.0 (1.3-6.8) p<.01

^a: Patients were categorized as at-risk of losing workdays due to SIS if currently having a job or if having lost their previous job due to SIS

^b: One patient reported being on sick leave due to the shoulder disorder at baseline, but did not fulfil the criteria for being in the at risk group at follow-up, as he/she was unemployed (not due to the shoulder) and had not lost the job due to the shoulder disorder.

Table 3. Incidence of lost workdays for each job category

Job category (from ISCO codes)	Lost workdays (95% CI)	Number of patients (Surgery/no surgery)
Managers	23.5 (8.9 to 62.2) ^a	2 (2/0)
Professionals	15.0 (5.7 to 39.4) ^{a,b}	12 (3/9)
Technicians and Associate Professionals	2.3 (0.6 to 8.9) ^{a,b}	7 (1/6)
Clerical Support Workers	6.3 (1.7 to 23.5) ^{a,b}	9 (2/7)
Services and Sales Workers	48.9 (30.2 to 79.2)	18 (6/12)
Skilled Agricultural, Forestry and Fishery Workers		0 (0/0)
Craft and Related Trades Workers	1.2 (0.4 to 3.9) ^{a,b}	5 (0/5)
Plant and Machine Operators and Assemblers	19.4 (6.4 to 59.3) ^a	7 (2/5)
Elementary Occupations	76.5 (41.3 to 141.7)	6 (0/6)

^aSignificantly lower incidence rate when compared to Elementary Occupations (p<0.05)

^bSignificantly lower incidence rate when compared to Services and Sales Workers (p<0.05)

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