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Work Participation in Patients With Carpal Tunnel Syndrome Referred to Departments of Occupational Medicine—A Danish Register-Based Cohort Study

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ABSTRACT

Background: We describe long-term work participation of patients with carpal tunnel syndrome (CTS) referred to Danish departments of occupational medicine and compare to patients with contact dermatitis.

Methods: One thousand seven hundred and sixty CTS-patients were included in this register-based nationwide longitudinal follow-up study and compared to 3158 contact dermatitis patients. We extracted register data on public benefits 5 years before and after assessment at a department of occupational medicine between 2000 and 2013. We defined a work participation score (WPS) as weeks where the patient was working divided by number of potential work weeks per year, dichotomized into low and high at the 75th percentile. We analyzed the risk of low WPS and of receiving permanent health-related public benefits during follow-up.

Results: Before assessment, both CTS and contact dermatitis patients had high work participation. In the follow-up period work participation decreased permanently for both patient groups. Comparing women with CTS to women with contact dermatitis, odds ratios (OR) of low WPS were 2.56 (2.11–3.11) and 1.68 (1.38–2.05) one and 5 years after assessment. For men, OR of low WPS were 2.01 (95% CI, 1.67–2.44) and 1.27 (95% CI, 1.04–1.56). ORs of receiving permanent health-related public benefits during follow-up were 2.10 (95% CI, 1.56–2.83) for men and 1.97 (95% CI, 1.54–2.54) for women with CTS compared to those with contact dermatitis.

Conclusions: Patients referred to Danish departments of occupational medicine due to CTS have increased risk of reduced long-term work participation and of receiving permanent health-related public benefits compared to patients referred due to contact dermatitis.

1 | Introduction

The most common form of mononeuropathy is carpal tunnel syndrome (CTS) with a prevalence of approximately 5% in the adult European population [1]. The aetiology is primarily idiopathic but pregnancy, obesity, and hypothyroidism, among others, are associated factors [1]. It is well-known that various occupational factors such as hand exposure to vibrating tools

and forceful and highly repetitive work [2, 3] increase the risk of CTS. Multiple studies have found extended sick leave after carpal tunnel release surgery among patients with manual compared to nonmanual work [4–7].

In a Swedish study from 2011, Atroshi et al found the incidence of physician diagnosed CTS to be 428 in women and 182 in men per 100,000 adults per year with peak incidence in women aged 45–54 years [8]. They reported that surgery was used in 33% of those younger than 35 years, 50% of those aged 35–74 years and 60% of those older than 75 years. Thus CTS is a very common condition and carpal tunnel release surgery appears to be a frequently utilized treatment option in CTS [8]. When carpal tunnel release is necessary patients are informed that the prognosis is good and that they will be able to return to work within 2 weeks (nonmanual labor) or 6–8 weeks (heavy manual labor) [9]. Thus CTS is considered to be a treatable condition with a good prognosis.

Studies suggest long-term effects of CTS on various health and financial parameters, including reduced income and increased sickness absence days [10–12]. In a large American follow-up study from 2007, Foley and colleagues compared the earnings of patients with CTS to those of patients with upper extremity fractures or dermatitis over a 6-year follow-up period [10]. CTS patients recovered to only half of their pre-injury earnings after 6 years compared to the patients with upper extremity fractures and dermatitis, who on average gained almost the same income in the years following treatment. Furthermore, CTS patients received public benefits three times longer than patients with upper extremity fractures. In a systematic review from 2018 [11], Newington and colleagues reported extremely variable return-to-work spans of 4–168 days following carpal tunnel release surgery. Median return-to-work was 21 days for nonmanual and 39 days for manual workers. In only one of the included studies did all participants return to work within 6 months follow-up [13].

In 2022 a large Swedish register-based study examined sickness absence and disability pension days for patients diagnosed with CTS and matched healthy references during 3 years of follow-up [12]. They concluded that CTS patients had significantly more sickness absence/disability pension days than matched references, particularly for younger patients. Rate ratio of sickness absence/disability pension days was higher for women than for men.

We have not located any studies examining long-term labor market attachment after suspected work-related CTS.

In Denmark general practitioners and trade unions can refer patients or trade union members to hospital departments of occupational medicine if they suspect a work-related disease. At departments of occupational medicine patients an assessment by a medical doctor includes diagnostics and evaluation of whether the disease was caused by work exposures. Diagnostics includes objective assessment and potentially nerve conduction examination at a department of clinical neurophysiology. Medical treatment for the condition is not offered at departments of occupational medicine but patients are advised on potential additional hospital examination and treatment for the disease (e.g., at neurologic departments, orthopaedic departments). Patients are advised on optimal return to work practises including physical exercises and physiotherapy. Additionally, the disease may be reported to the public labor market insurance.

The purpose of this study is to describe long-term labor market attachment for patients referred to Danish departments of occupational medicine due to suspected work-related CTS or contact dermatitis. Contact dermatitis was chosen as a relevant control group [14]. We present work status 5 years before and after assessment. Furthermore, we examine risk of low work participation one and 5 years after assessment and risk of receiving disability pension during follow-up by comparing patients with CTS to patients with contact dermatitis.

2 | Methods

2.1 | Study Design and Participants

This register-based nation-wide longitudinal follow-up study included all working patients aged 18–67 years assessed with CTS or contact dermatitis at Danish departments of occupational medicine from 2000 to 2013. The study is part of a larger cohort of all patients seen in the departments [14]. Patients were identified using registrations of hospital contacts in the Danish National Patient Registry. The registry holds information from all Danish hospitals and uses unique identifier codes for every department and patient allowing linkage to other registries [15].

Patients were included if their primary ICD-10 (International Classification of Diseases) diagnosis was G56.0 (CTS). For comparison we included patients with contact dermatitis within subgroups L23 (allergic contact dermatitis), L24 (irritant contact dermatitis), and L25 (unspecified contact dermatitis). Patients with CTS and contact dermatitis share the characteristics of high work participation before assessment and furthermore, the diagnoses are considered treatable with good prognosis. If patients had been assessed for both contact dermatitis and CTS, they were included in the group matching their first contact.

Our population consisted of patients aged 18–67 years who were not receiving public retirement pension or early public retirement pension at assessment time, resulting in 1760 patients with CTS and 3158 patients with dermatitis (Figure 1). The study population used for analyses was further reduced to patients not receiving permanent health related public benefits at assessment and patients younger than 62 years of age, to allow for a 5-year follow-up before usual retirement age at 67 years in Denmark, resulting in 1670 patients with CTS and 3070 patients with contact dermatitis. In the follow-up period patients were censored from the week they changed status to public retirement pension, early public retirement pension, emigrated, or deceased.

2.2 | Variables and Data Sources

We used low work participation score (WPS) as the primary outcome. In case of unemployment or illness all Danish citizens

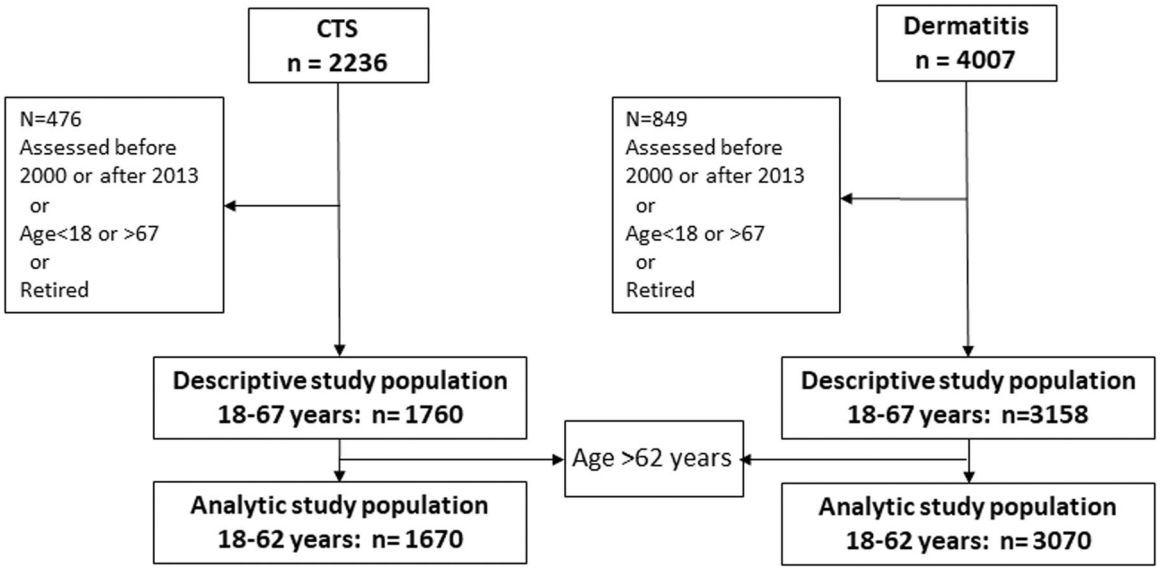

FIGURE 1 | Flowchart.

are entitled to compensation from the authorities. Information about public transfer incomes from the Danish authorities was obtained from the DREAM-register [16] which comprises weekly codes for public compensation. The DREAM-register codes were grouped as follows; (1) no transfer-income (most likely due to income from working but in rare cases due to spousal maintenance), (2) education, maternity or parental leave, (3) public benefits due to temporary unemployment or sick leave, (4) permanent health related public benefits, (5) retirement due to age or voluntary early retirement, (6) death, (7) emigration. WPS was defined as weeks where the patient is employed, on maternity or parental leave, or under education, divided by the total number of potential work weeks [17]. We calculated one WPS per patient per follow-up year. The first year of follow-up consisted of the week after the patient was assessed and the following 51 weeks. The following years were defined as the subsequent 52 weeks. We censored patients from the week of retirement (early or due to old age), emigration or death so that these weeks were not included in the calculation of WPS. We defined low work participation as a WPS below 75% during the period, meaning that the patient was working, on parental leave or in education for less than 75% of the total number of potential work weeks.

Other nondependent variables were age, sex, marital status, educational level, occupation (DISCO-88 group—the Danish version of the International Standard Classification of Occupations 1988), type of occupation (white/blue collar), comorbidity (Charlson Index [18]), geographical region, carpal tunnel release surgery, sick leave at assessment, and previous WPS (third year before assessment). Data were obtained through registers in Statistics Denmark, described in detail in Dalgaard et al. [14]. Data were collected from Statistics Denmark 5 years before and after assessment at departments of occupational medicine.

The original 10 DISCO-88 major occupations were reduced to six DISCO-88 major groups: 1–4, 5, 6 + 0, 7, 8, 9.

The DISCO-88 groups 1–4 were combined and consisted of 1: "Legislators, senior officials, and managers," 2: "Professionals," 3: "Technicians and associate professionals" and 4: "Clerks." DISCO-88 major group 5 were kept unchanged and consisted of "Service, shop, market, and sales workers." DISCO-88 major group 6 were "Skilled agricultural and fishery workers" which was combined with DISCO-88 major group 0 "Armed forces." The last 3 groups were kept unchanged in DISCO-88 major group 7: "Craft and related trades workers," DISCO-88 major group 8: "Plant and machine operators and assemblers" and DISCO-88 major group 9: "Elementary occupations."

White collar workers were defined as DISCO-88 1–5 categories. The remaining DISCO-88 categories 6–9 and 0 were assigned as blue collar workers. Carpal tunnel release surgery was counted as positive if performed 1 year before or after assessment date at a department of occupational medicine.

We dichotomized the outcome of receipt of permanent health-related benefits into patients who received permanent health-related benefits for the first time during the follow-up period and patients who had not yet received permanent health-related benefits. Those who had received permanent health-related benefits before assessment were excluded from the analyses.

We did not impute missing data as the variables had missing data in the range of 0%–3.2% (primarily related to occupation), which we considered acceptable.

2.3 | Statistical Analyses

We described the demographic characteristics of the population for analysis with counts and proportions. Due to regulations on confidentiality from Statistics Denmark, cells with less than three observations could not be reported. We illustrated the proportions of transfer income types in six diagrams (by diagnosis group and sex) with weekly registrations 5 years before and after assessment at a department of occupational medicine.

Analyses were performed using Stata 16 (STATA Corp, College Station, Texas, USA).

We estimated the association between the diagnosis of CTS and low work participation as well as receiving permanent health-related benefits using logistic regression analysis. We compared the odds of having low WPS in the first and fifth year following assessment. Analyses were stratified by sex under the assumption that sex could modify the association. We compared the risk of receiving permanent health-related public benefits for the first time in the follow-up period for the CTS patients compared to the contact dermatitis patients. We adjusted the analyses for the following *a priori* defined potential confounders; age, co-morbidity, WPS third year before assessment, date of assessment, and educational level. Age and comorbidity was chosen as possible confounder due to their association to low work participation, and the previous work participation follow the same argument, but may capture vulnerability not related to the more severe diagnoses included in Charlson Index. We adjusted for date of assessment as rules and regulations changing over time during the long study period, may affect the possibilities for being on sick leave and receiving permanent health-related benefits. Finally, we adjusted for educational level, as this could be related to occupation and thus exposures that may increase the risk of both dermatitis and CTS, and is also related to health in general. We did not adjust for occupation, although we could use the same argument as for educational level, first of all because some educational groups were small but also to avoid overadjustment as educational level and occupation are often closely related.

Information was available on whether the patient was on sick leave at assessment. We considered adjusting for this at first. However, we chose not to include it in the analyses, as it might be an intermediary step in the causal pathway. Instead, we included the variable previous work participation (WPS third year before assessment) minimizing the risk of overlap with the current sick leave period.

2.4 | Institution and Ethics Approval and Informed Consent

Since this study was register based, approval from the Danish National Committee on Health Research Ethics was not required. The Danish Data Protection Agency approved the study (j. no.: 1-16-02-263-19). Consent to participate and publish was not required as the study was register-based.

3 | Results

Around 80%–85% of patients with CTS and contact dermatitis were either working or on maternity leave, parental leave or in education (henceforth referred to as working) 5 years before assessment at a Danish department of occupational medicine (Figure 2). By the time of assessment, around 50% of patients with CTS and around 70% of patients with contact dermatitis were working. Likewise, the percentage on temporary public benefits had increased. In the following 5 years practically no increase in the percentage working was observed in any of the two disease groups. At 5 years of follow-up the percentage of patients who were retired due to age, had emigrated or deceased had increased to around 8%–10% for both groups. Notably, the percentage of patients on permanent health-related public benefits had increased to approximately 20% among patients with CTS as compared to a little less than 10% among patients with contact dermatitis.

By the time of assessment notably more women than men were on temporary health-related public benefits in the group of patients with CTS but not among patients with contact dermatitis. For both patient groups, however, a higher proportion of women were on permanent health-related public benefits after 5 years of follow-up (Figure 2).

Both patient groups were almost equally distributed with respect to sex (Table 1). Patients with contact dermatitis were younger than patients with CTS (mean age 39 years vs. 44 years). In the contact dermatitis group, the educational level was slightly higher, especially for women of which 20.6% had a medium-long further education as compared to 6.9% of women with CTS. The female contact dermatitis patients worked primarily in white collar jobs and the female CTS patients worked mostly in blue collar jobs. Both the male contact dermatitis patients and the male CTS patients worked primarily as craftsmen (35.1% and 43.0%, respectively).

The results of the logistic regression analyses are depicted in Tables 2 and 3. One year after assessment the odds of low WPS for a male patient with CTS was 2.05 (1.72–2.45) compared to a male patient with contact dermatitis. After 5 years the ratio had decreased to 1.56 (1.29–1.88). Among female patients, higher odds ratios were seen as compared to males. One year after assessment female CTS patients had OR 2.66 (2.24–3.17) of low WPS compared to contact dermatitis patients. After 5 years the OR was 2.11 (1.77–2.52). All associations were statistically significant and there was effect modification of sex ($p = 0.05$ and $p = 0.04$, respectively). Hence, we stratified for sex. Adjusting for confounders slightly lowered the estimates (Table 2).

In the 5 years following assessment the odds of receiving permanent health-related public benefits for the first time was two to three times higher both among male and female patients with CTS as compared to patients with contact dermatitis (Table 3). We did not find any effect modification of sex on this outcome. When adjusting for age, comorbidity, WPS third year before assessment, date of assessment and educational level, the association remained statistically significant.

4 | Discussion

In the years before assessment at a department of occupational medicine, a high percentage of both patients with CTS and patients with contact dermatitis were working, indicating two healthy working populations. In both patient groups and for both sexes a notable decrease in the proportion working was seen around the time of assessment and afterwards practically no increase was observed. Most contact dermatitis patients remained in employment whereas around 20% of patients with

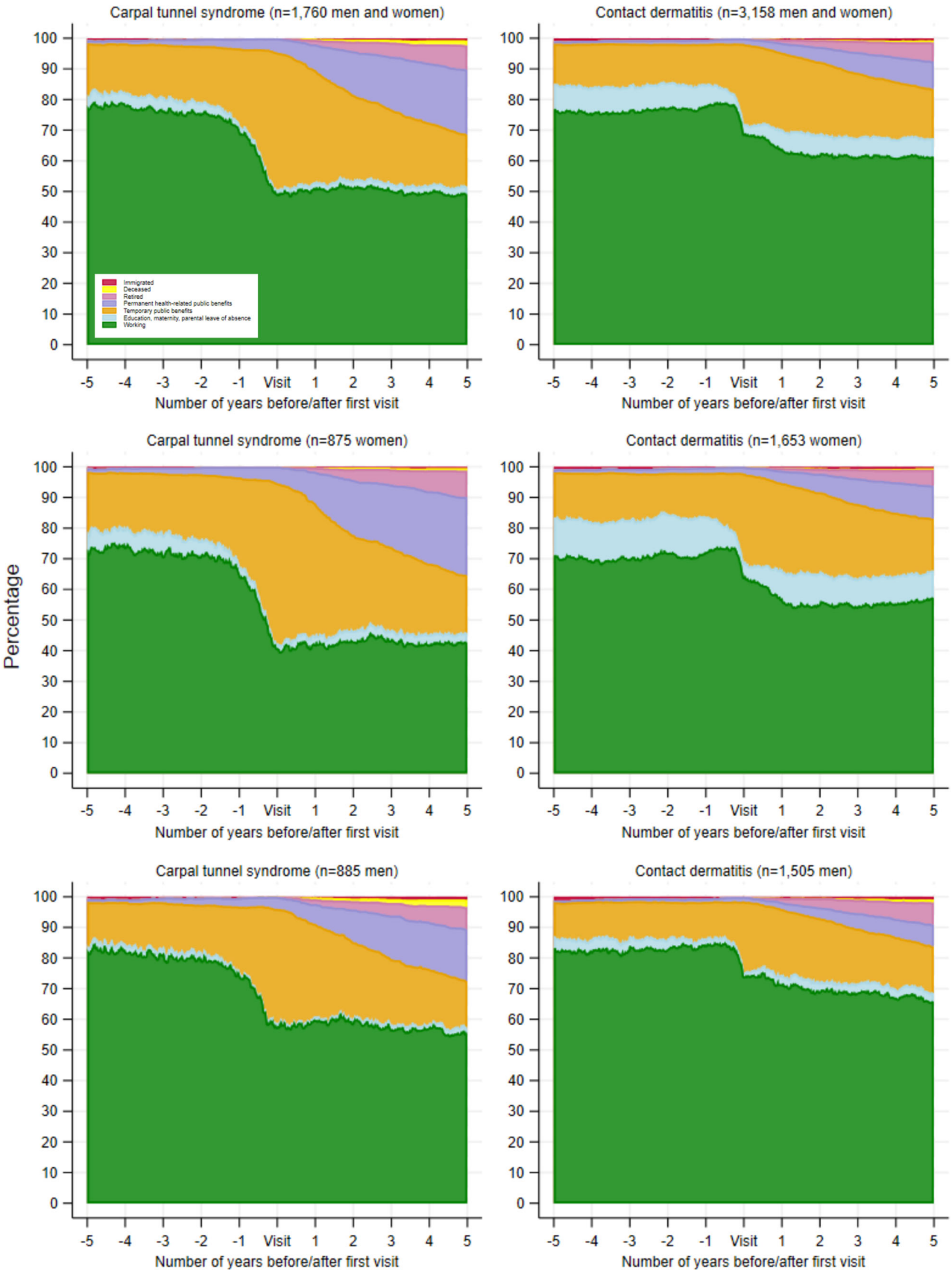

FIGURE 2 | Distribution of work and public benefits before and after visit at departments of occupational medicine.

TABLE 1 | Characteristics of patients 18–62 years of age by patient group and sex, 2000–2013, Denmark.

		CTS ($N = 1670$)		Contact dermatitis ($N = 3070$)	
		Male	**Female**	**Male**	**Female**
		$N = 845$	$N = 825$	$N = 1460$	$N = 1610$
Age	< 30	84 (9.9%)	69 (8.4%)	363 (24.9%)	460 (28.6%)
	30–39	230 (27.2%)	220 (26.7%)	399 (27.3%)	469 (29.1%)
	40–49	273 (32.3%)	265 (32.1%)	383 (26.2%)	394 (24.5%)
	≥ 50	258 (30.5%)	271 (32.8%)	315 (21.6%)	287 (17.8%)
Marital status	Unmarried	239 (28.3%)	161 (19.5%)	662 (45.3%)	637 (39.6%)
	Married/partnership	501 (59.3%)	535 (64.8%)	668 (45.8%)	796 (49.4%)
	Divorced/widowed	105 (12.4%)	129 (15.6%)	127 (8.7%)	174 (10.8%)
	Missing	0 (0.0%)	0 (0.0%)	3 (0.2%)	3 (0.2%)
Educational level	Public school or gymnasium	285 (33.7%)	425 (51.5%)	529 (36.2%)	578 (35.9%)
	Shorter education	529 (62.6%)	317 (38.4%)	839 (57.5%)	682 (42.4%)
	Medium-long education	15 (1.8%)	57 (6.9%)	62 (4.2%)	331 (20.6%)
	Missing	16 (1.9%)	26 (3.2%)	30 (2.1%)	19 (1.2%)
Occupation	Graduates, undergraduates, and desk based professions	38 (4.5%)	142 (17.2%)	148 (10.1%)	520 (32.3%)
	Services and sales workers	16 (1.9%)	127 (15.4%)	63 (4.3%)	452 (28.1%)
	Skilled agricultural and fishery workers and armed forces	20 (2.4%)	11 (1.3%)	25 (1.7%)	16 (1.0%)
	Craftsmen and related trades workers	363 (43.0%)	98 (11.9%)	513 (35.1%)	97 (6.0%)
	Plant and machine operators and assemblers	185 (21.9%)	239 (29.0%)	333 (22.8%)	224 (13.9%)
	Elementary occupations	210 (24.9%)	195 (23.6%)	365 (25.0%)	253 (15.7%)
	Missing	13 (1.5%)	13 (1.6%)	13 (0.9%)	48 (3.0%)
Sick leave at assessment	No	515 (60.9%)	367 (44.5%)	1,112 (76.2%)	1,128 (70.1%)
	Yes	330 (39.1%)	458 (55.5%)	348 (23.8%)	482 (29.9%)
Hospital or region	Capital city region	164 (19.4%)	123 (14.9%)	227 (15.5%)	310 (19.3%)
	Region Zealand	200 (23.7%)	150 (18.2%)	201 (13.8%)	317 (19.7%)
	Odense University Hospital	123 (14.6%)	159 (19.3%)	234 (16.0%)	314 (19.5%)
	Hospital of Southwestern Denmark	48 (5.7%)	68 (8.2%)	135 (9.2%)	149 (9.3%)
	Hospital of Western Jutland	106 (12.5%)	127 (15.4%)	406 (27.8%)	250 (15.5%)

(Continues)

TABLE 1 | (Continued)

		CTS ($N = 1670$)		Contact dermatitis ($N = 3070$)	
		Male	Female	Male	Female
	Aarhus University Hospital	100 (11.8%)	85 (10.3%)	115 (7.9%)	191 (11.9%)
	Aalborg University Hospital	104 (12.3%)	113 (13.7%)	142 (9.7%)	79 (4.9%)
Work participation score third year before assessment	Low	181 (21.4%)	217 (26.3%)	238 (16.3%)	309 (19.2%)
	High	664 (78.6%)	608 (73.7%)	1217 (83.4%)	1296 (80.5%)
	Missing	0 (0.0%)	0 (0.0%)	5 (0.3%)	5 (0.3%)
Carpal tunnel release	No	521 (61.7%)	502 (60.8%)	1,457 (99.8%)	1,604 (99.6%)
	Yes	324 (38.3%)	323 (39.2%)	3 (0.2%)	6 (0.4%)
Type of profession	White collar	54 (6.4%)	269 (32.6%)	211 (14.5%)	972 (60.4%)
	Blue collar	778 (92.1%)	543 (65.8%)	1,236 (84.7%)	590 (36.6%)
	Missing	13 (1.5%)	13 (1.6%)	13 (0.9%)	48 (3.0%)

Note: Missing groups of < 3 observations for each variable were included in the largest group in Table 1 only.

CTS received permanent health-related public benefits after 5 years of follow-up. Logistic regression analyses showed that patients with CTS had a significantly higher risk of low WPS both one and 5 years after assessment as compared to patients with contact dermatitis. The risk was more pronounced for women than for men. The risk of receiving permanent health-related public benefits during follow-up was also significantly higher for CTS patients than for contact dermatitis patients.

A major strength of this study is the large national sample consisting of all patients with CTS assessed at departments of occupational medicine in 2000–2013 in Denmark. Another strength is the wide range of available register data on demographic, health, and work-related variables with few missing data. We present data on work participation preceding assessment and during a long follow-up period. Moreover, we believe that the use of two designs to present the data, both descriptive figures in which all data is presented as well as a calculated WPS, which accounts for the patients that retire due to age or who die or emigrate during the follow-up period, is a particular strength of this study.

We compared two groups who were similar in both having had a hospital assessment at a department of occupational medicine, having a generally high work participation before referral, and with a medical condition for which we in general consider the prognosis to be good. The two patient groups were similar but not matched. Therefore, there were some demographic discrepancies for example, contact dermatitis patients were younger, had a higher educational level, and more patients from this group were on maternity leave or enrolled in education. We tried to account for these differences by adjusting for age and educational level, which we believed was the main explanation of the differences between the patient groups. Another possible difference between the two groups are the reason and timing of referral, where we could suspect that those with dermatitis might be referred early after onset of the symptoms, whereas the CTS patients may be referred later, even after decompression surgery may not have reduced the symptoms. We did not have information about decompression surgery and timing of this, nor timing of the onset of symptoms.

Sickness absence is only registered if it exceeds 6 weeks and then only if the employer applies for it. Hence patients who need less than 6 weeks of sickness absence were perceived as working. This may cause misclassification, but is most likely nondifferential.

There are limitations associated with using work participation as an outcome as it is highly susceptible to changes in the legal and political systems. Attempts and reforms to improve work participation and delay retirement were issued on a regular basis during this period in Denmark. Work participation in different time periods will also be susceptible to financial fluctuations in society for example, the global financial crisis of 2007–2009 [19]. We tried to account for this by adjusting for confounding by date of assessment as a continuous variable. We used a cut-point at 75% of full work participation as this has been used in other similar studies of patient groups. However, we also conducted sensitivity analyses, where we changed the cut-point to 60% and 90%, respectively. We found slightly higher

TABLE 2 | The associations to low work participation during the first and the fifth year of follow-up after assessment in patients with carpal tunnel syndrome compared to patients with contact dermatitis by sex, 2000–2013, Denmark.

	1 year[a]		5 years	
Women	Unadjusted OR (95% CI) ($n = 2434$)	Adjusted OR (95% CI)[b] ($n = 2386$)	Unadjusted OR (95% CI) ($n = 2290$)	Adjusted OR (95% CI)[b] ($n = 2248$)
	2.66 (2.24–3.17)	2.56 (2.11–3.11)	2.11 (1.77–2.52)	1.68 (1.38–2.05)
Men	Unadjusted OR (95% CI) ($n = 2303$)	Adjusted OR (95% CI)[b] ($n = 2251$)	Unadjusted OR (95% CI) ($n = 2143$)	Adjusted OR (95% CI)[b] ($n = 2099$)
	2.05 (1.72–2.45)	2.01 (1.67–2.44)	1.56 (1.29–1.88)	1.27 (1.04–1.56)

Note: Three persons were not included in the analysis of the first year, as they leave the workforce permanently at the time of assessment. Leaving the workforce does also reduce the sample for fifth year follow-up.
[a]The first year consists of the week following assessment and the subsequent 51 weeks.
[b]Adjusted for age group, comorbidity, work participation score 3 years before assessment, date of assessment, and educational level.

TABLE 3 | The associations to receiving first time permanent health related benefits during 5 year follow-up for patients with carpal tunnel syndrome compared to patients with contact dermatitis by sex, 2000–2013, Denmark.

Women	Unadjusted OR (95% CI) ($n = 2435$)	Adjusted OR (95% CI)[a] ($n = 2387$)
	2.93 (2.32–3.69)	1.97 (1.54–2.54)
Men	Unadjusted OR (95% CI) ($n = 2305$)	Adjusted OR (95% CI)[a] ($n = 2253$)
	2.52 (1.91–3.32)	2.10 (1.56–2.83)

[a]Adjusted for age, comorbidity, work participation score 3 years before assessment, date of assessment, and educational level.

estimates when using 60% as cut-off and slightly lower when using a cut point of 90%, but all estimates within the 95% CI of the estimates in Table 2 using 75% as cut-off.

As depicted in Table 1, a large proportion of CTS patients worked in highly physically demanding jobs which increases the risk of other musculoskeletal disorders which in turn increase the risk of low work participation [3].

We did not have self-reported data from questionnaires on lifestyle characteristics for this population, and have therefore not accounted for smoking, although it has been reported that smoking prolongs post-surgical recovery [20] and thus could affect recovery after carpal tunnel release. However, lifestyle is related to educational level and occupation and thus perhaps taken into account by adjusting for this.

Our findings were in line with a range of previous studies. However, most studies examining effects of CTS on work have focused on duration of sick leave and not long-term attachment to the labor-market. In 2018 Newington et al. [11] reviewed the literature on return to work time after carpal tunnel release. They reported highly variable return to work times that were dependent on some occupational factors for example, type of work (manual/nonmanual), though reporting of occupational factors was of erratic quality. Only one of the studies included in the review reported that all patients had returned to work at follow-up. Newington and colleagues assessed this study to have high risk of bias because of selective reporting, selection bias, and confounding [13]. The results are not directly comparable to our results as the outcomes differ. But the results of Newington and colleagues also imply that for some patients CTS affects work-ability for a prolonged period of time after surgery.

The precipitous and permanent decrease in work participation that we observed after CTS corresponds well with findings from other studies [10, 12]. In a study from the United States, Foley and colleagues also concluded that contact dermatitis patients did significantly better than CTS patients following their diagnosis on both duration of sick leave and on income. A Swedish study by Lallukka and colleagues examined 3-year follow-up in a large cohort of CTS-patients and compared them to matched healthy references [12]. They found that CTS-patients had more days of sickness absence or disability pension than their matched references.

The difference in work participation between the CTS patients and the contact dermatitis patients was more pronounced among women than men. It is generally known that women have higher incidence of CTS than men [1] as well as reported that women have lower work participation than men [21]. However, we have not identified literature suggesting that women spend more time returning to work after CTS as compared to men. The difference in work status presented in our population could be caused by the fact that women in the CTS group had a lower educational level and were more likely employed in elementary jobs whereas the men more frequently may have had the opportunity to improve their skills with further education and to vary and schedule their tasks to a higher degree than the women, making it easier for the men to return to work.

The results of this study suggest that contrary to the generally good prognosis of CTS, those cases referred to the Danish departments of occupational medicine show a drop in long-term work-ability. Hence future research should focus on identifying individuals with early signs and symptoms of CTS and examine if any preventive actions can be taken to organize their work assignments to improve future labor market attachment. Our results may only be replicable to the more severely affected chronic cases of CTS and patients with manual work. The results are generalizable to other industrialized countries with labor market structures similar to Denmark.

5 | Conclusion

This study showed that CTS patients assessed at Danish departments of occupational medicine, were at higher risk of reduced labor-market attachment than contact dermatitis patients 1 and 5 years after their assessment. The risk of receiving permanent health-related public benefits during the following 5 years after assessment was also higher for CTS patients than for contact dermatitis patients.

Future research in this area should focus on identifying the patients that will be most severely affected on their work-ability before they are referred to departments of occupational medicine and assist with preventive actions before their disease becomes chronic.

Author Contributions

Marianne Kyndi and Morten Vejs Willert contributed to the design of the cohort. Marianne Kyndi, Morten Vejs Willert, and Jesper Medom Vestergaard conducted the data management of the cohort, coded important variables, and performed the descriptive analyses. Karin Biering and Tine Hoffmann Aagaard performed statistical logistic regression analyses. All authors contributed to designing this study, discussing results, writing the manuscript, and approving the final draft.

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Disclosure by AJIM Editor of Record

John Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

Ethics Statement

Since this study was register based, approval from the Danish National Committee on Health Research Ethics was not required. The Danish Data Protection Agency approved the study (j. no.: 1-16-02-263-19).

Consent

Not relevant, the study is based on register data.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from Statistics Denmark, but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available. Patient anonymity is ensured following the strict guidelines of Statistics Denmark.

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