

Return to Work in the Gastric Cancer Survivors

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Abstract

Returning to work (RTW) is an often used outcome in work research to describe employee fully recovering from disease. Several factors are suggested as barriers for workers returning to work. The goal of this study was to investigate the role of RTW in workers with gastric cancer and identify its impact on their survival outcomes during 11 years of follow-up. A total of 4467 workers who with newly diagnosis of gastric cancer were included in this retrospective cohort study with a follow-up period ranging from 2004 to 2015. Relationships between work, treatment, and disease-related variables and RTW were analyzed by Cox regression. The impact of RTW on survival outcomes was analyzed by Kaplan-Meier survival curves. Old age, males, comorbidities, chemotherapy, radiotherapy, and manual jobs were inversely associated with RTW. Operation and early stage of gastric cancer were associated with increased likelihood of RTW. After adjusting for variables, workers with stage 1 gastric cancer were more likely return to work than other stages with HR of 4.67 (95%CI: 2.99~7.31) and 7.44 (95%CI: 4.12~13.43) in the 2nd and 5th year. In terms of effect of RTW on survival rate, reemployed workers had better survival than those without employment in all gastric cancer survivors. Furthermore, RTW had significant association with reduced risk of all-cause mortality (HR: 0.49, 95%CI: 0.38~0.65). Improving these identified barriers and strengthening facilitators of RTW can provide employers and government to conduct comprehensive employment plans for increasing the percentage of RTW in the gastric cancer survivors.

Introduction

Despite a substantial decline in both incidence and mortality over the past decades, gastric cancer still remains an important public health burden worldwide. The incidence of gastric cancer is particularly higher in Eastern Asia than other districts in the world¹. In Taiwan, gastric cancer was the sixth most common cancer in 1996 and the ranking dropped to ninth in 2016². Gastric cancer is distinguished by the high variability of non-specific symptoms such as dyspepsia, weight loss and anemia, which makes early diagnosis difficult. Patients with gastric cancer have poor overall prognosis and quality of life³. As one of the leading causes of cancer-related mortality in worldwide⁴, gastric cancer was reported to exert a significant economic burden in Taiwan⁵.

After recovering from cancer, returning to work (RTW) is important to the survivors and their family and social roles as well as to their finances. Being employed is can reduce psychological distress and improve confidence and self-esteem⁶⁻⁸. However, most of cancer patients have suffered from physical and emotional problems such as pain, fatigue, anxiety, and depression after treatment which may lower their willingness of RTW⁹⁻¹¹. Older age, education, comorbidity, advanced cancer stage, and treatment options are suggested as barriers for workers to return to work¹². In a Korean study, patients with gastric cancer suffered from more difficulties in doing employment and housework than general population¹³. The goal of our cohort study was to explore relationships between RTW and disease, treatment, and work-related factors in workers with gastric cancer. Furthermore, we attempted to figure out whether the RTW had beneficial effect on survival outcomes on gastric cancer survivors or not.

Results

Characteristics of study sample

Table 1 displayed work-, treatment-, and disease-related information of gastric cancer workers in RTW and non-RTW groups. A total of 1530 eligible workers (34.2%) returned to work 5 years after the cancer diagnosis. The mean age of these two groups was 50.8 ± 8.9 and 52.9 ± 10.2 years at the 5th year, respectively. The most common comorbidity was hypertension with 264 (17.2%) and 589 (20.0%) workers of the RTW group and non-RTW group. Most RTW workers received surgical treatment (37.7%) after diagnosing with gastric cancer. In terms of work-related factors, the majority of businesses were located in the north Taiwan (51.7%) for cancer survivors who returned to work. Most workers had income level less than 28800 New Taiwan Dollars (62.2%). A large proportion of workers engaged in manufacturing jobs in both RTW (33.1%) and non-RTW groups (30.6%). Compared to the non-RTW group, most workers returning to work had early cancer stages in TNM staging system. There were 205 workers (13.4%) who had stage 1 of gastric cancer returning to work.

Table1. Demographic data of RTW group and non-RTW group				
Characteristic	RTW (N=1530)	%	Non-RTW (N=2937)	%
Age				
Mean age	50.8±8.9		52.9±10.2	
<45	383	25.0	632	21.5
45-52	468	30.6	773	26.3
>52	679	44.4	1532	52.2
Gender				
Male	773	50.5	1749	59.5
Comorbidities				
Disorders of lipid metabolism	156	10.2	296	10.1
Alcohol abuse	15	0.9	35	1.2
Hypertension	264	17.2	589	20.0
Myocardial infarction	7	0.4	12	0.4
Congestive heart failure	23	1.5	57	1.9
Peripheral vascular disease	12	0.8	22	0.7
Cerebrovascular disease	36	2.3	76	2.6
Dementia	5	0.3	9	0.3
Chronic pulmonary disease	63	4.1	159	5.4
Rheumatologic disease	13	0.8	23	0.8
Mild liver disease	173	11.3	331	11.3
Renal disease	20	1.3	67	2.3
Metastatic solid tumor	12	0.8	106	3.6
Psychoses	8	0.5	20	0.7
Depression	34	2.2	56	1.9
Treatment				
Operation	577	37.7	829	28.2
Radiation therapy	51	3.3	167	5.7

Chemotherapy	230	15.0	834	28.4
Living area when diagnosed of cancer				
Central	300	19.6	540	18.4
North	791	51.7	1634	55.6
East	30	1.9	61	2.1
South + Islands	409	26.7	702	23.9
Income range (TWD)				
<28800	952	62.2	1707	58.1
28800-38200	265	17.3	452	15.4
>38200	313	20.4	778	26.5
Type of job				
Agriculture, Forestry, and Animal Husbandry	153	10.0	236	8.0
Manufacturing	506	33.1	899	30.6
Electricity and Gas Supply	8	0.5	11	0.4
Water Supply and Remediation Activities	5	0.3	28	0.9
Construction	175	11.4	341	11.6
Wholesale and Retail Trade	184	12.0	345	11.7
Transportation and Storage	97	6.3	211	7.2
Accommodation and Food Service Activities	44	2.9	123	4.2
Information and Communication	14	0.9	42	1.4
Financial and Insurance Activities	37	2.4	77	2.6
Real Estate Activities	14	0.9	25	0.8
Professional, Scientific and Technical Activities	30	1.9	75	2.5
Support Service Activities	40	2.6	103	3.5
Public Administration and Defense	37	2.4	68	2.3
Education	17	1.1	40	1.4
Human Health and Social Work Activities	31	2.0	59	2.0
Amusement and Recreation Activities	22	1.4	29	0.9
Other Service Activities	116	7.6	225	7.7

Company size				
Shut down	132	8.6	305	10.4
Small	128	8.4	217	7.4
Small and medium	337	22.0	658	22.4
Large	933	60.9	1757	59.8
Pathological T stage				
1	141	9.2	91	3.1
2	106	6.9	116	3.9
3	65	4.2	194	6.6
4	27	1.8	145	4.9
Pathological N stage				
0	233	15.2	178	6.1
1	61	3.9	111	3.8
2	27	1.8	119	4.0
3	18	1.2	141	4.8
Pathological M stage				
0	194	12.7	246	8.4
1	7	0.4	139	4.7
Pathological stage				
1	205	13.4	123	4.2
2	62	4.0	101	3.4
3	61	3.9	161	5.5
4	16	1.0	211	7.2

Univariate analysis

The unadjusted models of hazard ratios (HR) for RTW in 2nd and 5th year were listed in Fig. 1. Older workers who aged over 52 years were unlikely to return to work with HR of 0.79 (95%CI: 0.69 ~ 0.89). Males had less likelihood of RTW than females with HR of 0.85 (95%CI: 0.78 ~ 0.92) and 0.77 (95%CI: 0.69 ~ 0.85) in the 2nd and 5th year. Cancer survivors with comorbidities such as hypertension and

metastatic solid tumor were unlikely to return to work with HR of 0.87 (95%CI: 0.76 ~ 0.99) and 0.30 (95%CI: 0.17 ~ 0.53) in the 5th year. Patients who received surgical intervention had more likelihood to return to work with HR of 1.74 (95%CI: 1.50 ~ 2.02). In contrast, radiotherapy and chemotherapy were associated with decreased likelihood of RTW with HR of 0.68 (95%CI: 0.51 ~ 0.90) and 0.51 (95%CI: 0.44 ~ 0.59), respectively. The high-income group with salary over 38,800 New Taiwan Dollars was unlikely to return to work with HR of 0.74 (95%CI: 0.65 ~ 0.84) in the 5th year. In terms of the pathological stages of gastric cancer, workers who had earlier stage were more likely to return to work. T1 had higher likelihood of RTW than other stages with HR of 2.59 (95%CI: 1.88 ~ 3.55) and 3.92 (95%CI: 2.59 ~ 5.92) in the 2nd and 5th year. N1 had higher likelihood of RTW than other stages with HR of 2.37 (95%CI: 1.74 ~ 3.25) and 5.08 (95%CI: 3.14 ~ 8.21) in the 2nd and 5th year. Workers with M0 were more likely to return to work with HR of 5.55 (95%CI: 3.35 ~ 9.21) and 8.76 (95%CI: 4.12 ~ 18.63) in the 2nd and 5th year. Workers diagnosed of stage 1 gastric cancer had higher likelihood of RTW than other stages with HR of 4.71 (95%CI: 3.33 ~ 6.66) and 9.05 (95%CI: 5.44 ~ 15.05) in the 2nd and 5th year.

Multivariate analysis

After fully adjusting for variables in Fig. 2, the relationships between cancer stages and RTW were remained significant. T1 had higher likelihood of RTW than other stages with HR of 2.16 (95%CI: 1.18 ~ 3.94) and 2.77 (95%CI: 1.27 ~ 6.06) in the 2nd and 5th year. N1 staging cancers had higher likelihood of RTW than other stages with HR of 2.24 (95%CI: 1.25 ~ 4.01) and 3.53 (95%CI: 1.53 ~ 8.14) in the 2nd and 5th year. M0 staging cancers were associated with an increased RTW with HR of 2.29 (95%CI: 1.29 ~ 4.08) and 2.31 (95%CI: 1.01 ~ 5.28) in the 2nd and 5th year. Workers diagnosed of stage 1 gastric cancer had higher likelihood of RTW than other stages with HR of 4.71 (95%CI: 3.33 ~ 6.66) and 9.05 (95%CI: 5.44 ~ 15.05) in the 2nd and 5th year. Like the same result of univariate analysis, stage 1 gastric cancer survivors were more likely to return to work with HR of 4.67 (95%CI: 2.99 ~ 7.31) and 7.44 (95%CI: 4.12 ~ 13.43) in the 2nd and 5th year.

Survival outcome gastric cancer survivors

Figure 3 displayed the survival rate of gastric cancer survivors in RTW and non-RTW group. In all gastric cancer survivors, reemployed workers had higher survival rate than those unemployed ($p < 0.001$). This relationship remained significant in workers with stage 3 and stage 4 gastric cancers ($p < 0.001$). In Table 2, the full adjustment model demonstrated that the likelihood of RTW was related to decreased risk of all-cause mortality with HR of 0.49 (95%CI: 0.38 ~ 0.65). Collectively, our findings indicated that RTW might have benefits on survival outcomes of gastric cancer survivors.

Table 2
Associations between the return to work and all-cause mortality

	Unadjusted HR (95% CI)	P Value	Fully adjusted HR (95% CI)	P Value
Return to work	0.25 (0.23, 0.27)	< 0.001	0.49 (0.38, 0.65)	< 0.001
Adjusted covariates: age, treatment, income range, industrial classification, company size, cancer stage				

Discussion

RTW can be considered as a crucial determinant of the quality of life for cancer survivors, especially because it is associated with a feeling of self-esteem, return to normal activity and sense of identity^{11,14}. Most previous studies regarding employment status of cancer survivors focused on prostate and breast cancer, which are common in Europe^{15,16}. To date, our study was the first to investigate the relationship between work, treatment, and disease-related factors and RTW in workers who are diagnosed of gastric cancers. Furthermore, we found the effects of RTW on survival outcomes of these cancer survivors.

Numerous studies have examined the association between employment status and cancer survivors. Bradley et al. demonstrated that patients with prostate cancer were less likely return to work than those without cancer¹⁶. Most head and neck cancer survivors returned to work within 6 months after treatment¹⁷. Compared to cancer free controls of similar age, breast cancer survivors show reduced work ability and higher unemployment¹⁸. Patients with a history of malignant brain tumors, colorectal, testicular and other cancers are reported lower work productivity, impaired physical activity and distressed mental status^{19,20}. However, relationship between employment and RTW after treatment in workers with gastric cancer is rarely discussed in previous studies and still unknown. In a cross-sectional study, Lee et al. demonstrated that patients with gastric cancers had difficulties at work because they experienced more fatigue and had lower work capacity than general population¹³. The prevalence of depression was high in gastric cancer survivors and was related to increased risk of psychiatric morbidity^{21,22}. According to previous studies, fatigue, exhaustion, anxiety, and depression are the potential barriers for cancer survivors making decision of RTW²³⁻²⁵.

Sociodemographic factors, treatment related factors, and work-related factors are reported to influence work ability and RTW decision of cancer survivors^{12,26,27}. Older people are more likely to have sick leave and unemployment that lead to decreased likelihood of RTW^{28,29}. In this cohort study, we observed that higher income was associated with decreased likelihood of RTW, which was differed from previous studies^{30,31}. Muijen et al. demonstrated that higher education and wage was associated with increased risk of work disability²⁵. The result was consistent with our finding, however, the mechanism of high educated workers having less work participation should be investigated in future studies. In the present study, we observed that workers who underwent surgical treatment were more likely to return to work. In

contrast, those who receive chemotherapy and radiotherapy are associated with reduced likelihood of RTW. The surgical intervention for tumor is the only possibility to cure a patient with early gastric cancer³². In addition, most early stage cancer patients have less symptoms and better quality of life after operation that can return to work earlier³³. Chemotherapy and radiotherapy are reported to be risk factors for cancer survivors not having RTW^{23,34}. Side effects of chemotherapy such as depression, fatigue, and cognitive deficits contribute to the incapacity to work³⁵.

In this study, we represented that RTW might increase the survival rate of gastric cancer survivors compared those unemployed. Lee et al. displayed that Eastern Cooperation Oncology Group (ECOG) performance status was positively associated with work disability in gastric cancer survivors¹³. Performance status, which is a quantification of cancer patients' general well-being and activities of daily life, has been used to evaluate survival outcome in many cancer types³⁶. Several studies have reported that increased physical activity is significantly associated with reduced mortality^{37,38}. Taken together, reemployed cancer survivors might have better survival rate than those without RTW because they had higher physical activity and lower fatigue that could maintain their quality of life.

There are several limitations in the study. First, we couldn't distinguish from the types of gastric cancer surgery which patients had in the present study. A previous study indicated that total gastrectomy was associated with increased risk of nonworking among gastric cancer survivors¹³. The prognosis may differ from different surgical procedures that influence patients' willingness of RTW. Second, educational level is considered as an important factor in employment³⁹. However, the information of education was unavailable from the databases. Last, we couldn't collect the information about the motivation of RTW and job satisfaction in the study.

Conclusion

The decision of RTW is influenced by several aspects included treatment, work, and disease factors in gastric cancer survivors. Reemployed workers might have better survival than those unemployed due to improved mental status and increased physical activity. Better knowledge on barriers of RTW that cause physical and psychological impact on cancer survivors will promote the development of necessary interventions, incorporating shared health care, and occupational rehabilitation. Moreover, the effort can enhance and motivate the rate of RTW to a great extent.

Methods

Data collection

In this longitudinal study, we included 4467 Taiwanese workers who aged over 20 years with newly diagnosis of gastric cancer during the period 2004–2015. All characteristics were derived from three national population databases including the Labor Insurance Database (LID), the Taiwan Cancer Registry,

and the National Health Insurance Research Database (NHIRD) from 2004 to 2015. Workers who met the exclusion criterias as follows were excluded from our study: diagnosed with more than 2 cancers, with metastatic solid tumors, ever diagnosed with gastric cancer before 2004, and younger than 20 years old. All of analytic procedures were conducted in accordance with the guidelines of Tri-Service General Hospital (TSGH).

Diagnosis of gastric cancer

The diagnosis of gastric cancer was based on the NHI catastrophic illness registry files the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes. The ICD-9 CM codes of gastric cancers were listed in Supplementary Table 1. Patients who are newly diagnosed with gastric cancer must apply for catastrophic illness certification. After a strict verification which includes image reviews, pathological reports, and medical records by a panel of experts and specialists on the disease, the government would issue the certification.

Study variables

We collected employment-related data of gastric cancer survivors from the LID including age, gender, working district, company size, and income range. Clinical comorbidities were obtained from the NHIRD based on the corresponding ICD-9-CM codes and they were shown in Supplementary Table 2. Primary treatment such as operation, radiotherapy, chemotherapy, and pathological TNM stages of gastric cancer were also included in the analysis.

Outcomes

The 2nd and 5th year RTW of gastric cancer survivors were identified as the main outcome for this cohort study. Full RTW, which is defined as the time from sick leave to complete work resumption, was applied in the present study⁴⁰. Because RTW was a pivotal indicator of recovery for oral cancer survivors, it was regarded as the primary endpoint in this cohort. To date, no previous studies have compared the survival rate between gastric cancer survivors in RTW and non-RTW group. We attempted to determine the survival outcome in different stages of gastric cancer as secondary endpoint to identify the effect of RTW on gastric cancer survivors. Moreover, the risk of all-cause mortality after workers returning to work within the follow-up was also analyzed in this cohort study.

Statistical analysis

All analyses in our study were applied by Statistical Package for the Social Sciences, version 22.0 (SPSS Inc., Chicago, IL, USA) for Windows. The period between the first day of sick-leave and complete reemployment was regarded as RTW. The period between diagnosis of gastric cancer and death was recorded as survival time from 2004 to 2015. Cox regression analysis was conducted to predict the occurrence of RTW from a model including relevant variables. Hazard ratios (HR) produced by Cox regression analysis displaying the impacts of variables on the hazard of the RTW. The survival rates of

gastric cancer survivors with or without RTW were analyzed using Kaplan-Meier survival curves categorized by different cancer stages.

References

1. Fitzmaurice, C. *et al.* Global, Regional, and National Cancer Incidence, Mortality, Years of Life Lost, Years Lived With Disability, and Disability-Adjusted Life-years for 32 Cancer Groups, 1990 to 2015: A Systematic Analysis for the Global Burden of Disease Study. *JAMA oncology*. **3**, 524–548 <https://doi.org/10.1001/jamaoncol.2016.5688> (2017).
2. Chang, J. S. *et al.* The Epidemiology of Gastric Cancers in the Era of Helicobacter pylori Eradication: A Nationwide Cancer Registry-Based Study in Taiwan. *Cancer epidemiology, biomarkers & prevention: a publication of the American Association for Cancer Research. cosponsored by the American Society of Preventive Oncology*. **28**, 1694–1703 <https://doi.org/10.1158/1055-9965.Epi-19-0355> (2019).
3. Kaptein, A. A., Morita, S. & Sakamoto, J. Quality of life in gastric cancer. *World journal of gastroenterology*. **11**, 3189–3196 <https://doi.org/10.3748/wjg.v11.i21.3189> (2005).
4. Bray, F. *et al.* Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. **68**, 394–424 <https://doi.org/10.3322/caac.21492> (2018).
5. Hong, J. *et al.* The economic burden of advanced gastric cancer in Taiwan. *BMC Health Serv Res*. **17**, 663–663 <https://doi.org/10.1186/s12913-017-2609-1> (2017).
6. Slade, M. Mental illness and well-being: the central importance of positive psychology and recovery approaches. *BMC Health Serv Res*. **10**, 26–26 <https://doi.org/10.1186/1472-6963-10-26> (2010).
7. Chu, P. C., Chin, W. S., Guo, Y. L. & Shiao, J. S. C. Long-Term Effects of Psychological Symptoms after Occupational Injury on Return to Work: A 6-Year Follow-Up. *Int J Environ Res Public Health*. **16**, 235 <https://doi.org/10.3390/ijerph16020235> (2019).
8. Black, C. Work, health and wellbeing. *Saf Health Work*. **3**, 241–242 <https://doi.org/10.5491/SHAW.2012.3.4.241> (2012).
9. Smith, T. *et al.* The rationale, design, and implementation of the American Cancer Society's studies of cancer survivors. *Cancer*. **109**, 1–12 <https://doi.org/10.1002/cncr.22387> (2007).
10. Bower, J. E. *et al.* Fatigue in long-term breast carcinoma survivors: a longitudinal investigation. *Cancer*. **106**, 751–758 <https://doi.org/10.1002/cncr.21671> (2006).
11. de Boer, A. G. E. M. *et al.* Work ability and return-to-work in cancer patients. *Br J Cancer*. **98**, 1342–1347 <https://doi.org/10.1038/sj.bjc.6604302> (2008).
12. Islam, T. *et al.* Factors associated with return to work of breast cancer survivors: a systematic review. *BMC public health*. **14 Suppl (3)**, <https://doi.org/10.1186/1471-2458-14-s3-s8> (2014).
13. Lee, M. K. *et al.* Employment status and work-related difficulties in stomach cancer survivors compared with the general population. *Br J Cancer*. **98**, 708–715

- <https://doi.org/10.1038/sj.bjc.6604236> (2008).
14. Mehnert, A., de Boer, A. & Feuerstein, M. Employment challenges for cancer survivors. *Cancer*. **119 Suppl** (11), 2151–2159 <https://doi.org/10.1002/cncr.28067> (2013).
 15. Ullrich, A. *et al.* Return to work in prostate cancer survivors - findings from a prospective study on occupational reintegration following a cancer rehabilitation program. *BMC cancer*. **18**, 751–751 <https://doi.org/10.1186/s12885-018-4614-0> (2018).
 16. Bradley, C. J., Neumark, D., Luo, Z., Bednarek, H. & Schenk, M. Employment outcomes of men treated for prostate cancer. *Journal of the National Cancer Institute*. **97**, 958–965 <https://doi.org/10.1093/jnci/dji171> (2005).
 17. Verdonck-de Leeuw, I. M., van Bleek, W. J., Leemans, C. R. & de Bree, R. Employment and return to work in head and neck cancer survivors. *Oral oncology*. **46**, 56–60 <https://doi.org/10.1016/j.oraloncology.2009.11.001> (2010).
 18. Cocchiara, R. A. *et al.* Returning to work after breast cancer: A systematic review of reviews. *Work (Reading, Mass.)*. **61**, 463–476 <https://doi.org/10.3233/wor-182810> (2018).
 19. Feuerstein, M., Hansen, J. A., Calvio, L. C., Johnson, L. & Ronquillo, J. G. Work productivity in brain tumor survivors. *Journal of occupational and environmental medicine*. **49**, 803–811 <https://doi.org/10.1097/JOM.0b013e318095a458> (2007).
 20. Yabroff, K. R., Lawrence, W. F., Clauser, S., Davis, W. W. & Brown, M. L. Burden of illness in cancer survivors: findings from a population-based national sample. *Journal of the National Cancer Institute*. **96**, 1322–1330 <https://doi.org/10.1093/jnci/djh255> (2004).
 21. *et al.* Factors Associated With Depression in Disease-Free Stomach Cancer Survivors. *Journal of Pain and Symptom Management* **46**, 511–522, doi:10.1016/j.jpainsymman.2012.10.234 (2013).
 22. Tavoli, A. *et al.* Anxiety and depression in patients with gastrointestinal cancer: does knowledge of cancer diagnosis matter?. *BMC Gastroenterol*. **7**, 28–28 <https://doi.org/10.1186/1471-230X-7-28> (2007).
 23. Fantoni, S. Q. *et al.* Factors related to return to work by women with breast cancer in northern France. *Journal of occupational rehabilitation*. **20**, 49–58 <https://doi.org/10.1007/s10926-009-9215-y> (2010).
 24. Tiedtke, C., de Rijk, A., Donceel, P., Christiaens, M. R. & de Casterle, B. D. Survived but feeling vulnerable and insecure: a qualitative study of the mental preparation for RTW after breast cancer treatment. *BMC public health*. **12**, 538 <https://doi.org/10.1186/1471-2458-12-538> (2012).
 25. van Muijen, P., Duijts, S. F., Bonefaas-Groenewoud, K., van der Beek, A. J. & Anema, J. R. Factors associated with work disability in employed cancer survivors at 24-month sick leave. *BMC cancer*. **14**, 236 <https://doi.org/10.1186/1471-2407-14-236> (2014).
 26. Tan, F. L., Loh, S. Y., Su, T. T., Veloo, V. W. & Ng, L. L. Return to work in multi-ethnic breast cancer survivors—a qualitative inquiry. *Asian Pacific journal of cancer prevention: APJCP*. **13**, 5791–5797 <https://doi.org/10.7314/apjcp.2012.13.11.5791> (2012).

27. Mehnert, A. Employment and work-related issues in cancer survivors. *Critical reviews in oncology/hematology* **77**, 109–130, doi:10.1016/j.critrevonc.2010.01.004 (2011).
28. Carlsen, K., Oksbjerg Dalton, S., Frederiksen, K., Diderichsen, F. & Johansen, C. Cancer and the risk for taking early retirement pension: a Danish cohort study. *Scandinavian journal of public health*. **36**, 117–125 <https://doi.org/10.1177/1403494807085192> (2008).
29. Drolet, M. *et al.* Not working 3 years after breast cancer: predictors in a population-based study. *Journal of clinical oncology: official journal of the American Society of Clinical Oncology*. **23**, 8305–8312 <https://doi.org/10.1200/jco.2005.09.500> (2005).
30. Ahn, E. *et al.* Impact of breast cancer diagnosis and treatment on work-related life and factors affecting them. *Breast cancer research and treatment*. **116**, 609–616 <https://doi.org/10.1007/s10549-008-0209-9> (2009).
31. Tamminga, S. J., de Boer, A. G., Verbeek, J. H. & Frings-Dresen, M. H. Breast cancer survivors' views of factors that influence the return-to-work process—a qualitative study. *Scandinavian journal of work, environment & health*. **38**, 144–154 <https://doi.org/10.5271/sjweh.3199> (2012).
32. Bollschweiler, E., Berlth, F., Baltin, C., Mönig, S. & Hölscher, A. H. Treatment of early gastric cancer in the Western World. *World journal of gastroenterology*. **20**, 5672–5678 <https://doi.org/10.3748/wjg.v20.i19.5672> (2014).
33. Fan, H. G. *et al.* Fatigue, menopausal symptoms, and cognitive function in women after adjuvant chemotherapy for breast cancer: 1- and 2-year follow-up of a prospective controlled study. *Journal of clinical oncology: official journal of the American Society of Clinical Oncology*. **23**, 8025–8032 <https://doi.org/10.1200/jco.2005.01.6550> (2005).
34. Mols, F. & van de Poll-Franse, L. V. Employment status among cancer survivors. *Jama* **302**, 32–33; author reply 34–35, doi:10.1001/jama.2009.903 (2009).
35. Johnsson, A., Fornander, T., Rutqvist, L. E. & Olsson, M. Factors influencing return to work: a narrative study of women treated for breast cancer. *European journal of cancer care*. **19**, 317–323 <https://doi.org/10.1111/j.1365-2354.2008.01043.x> (2010).
36. Garcia, D. O. & Thomson, C. A. Physical activity and cancer survivorship. *Nutr Clin Pract*. **29**, 768–779 <https://doi.org/10.1177/0884533614551969> (2014).
37. Ammitzbøll, G. *et al.* Physical activity and survival in breast cancer. *European Journal of Cancer*. **66**, 67–74 <https://doi.org/10.1016/j.ejca.2016.07.010> (2016).
38. Barbaric, M., Brooks, E., Moore, L. & Cheifetz, O. Effects of physical activity on cancer survival: a systematic review. *Physiother Can*. **62**, 25–34 <https://doi.org/10.3138/physio.62.1.25> (2010).
39. Godges, J. J., Anger, M. A., Zimmerman, G. & Delitto, A. Effects of education on return-to-work status for people with fear-avoidance beliefs and acute low back pain. *Physical therapy*. **88**, 231–239 <https://doi.org/10.2522/ptj.20050121> (2008).
40. Hoefsmit, N. *et al.* The Effectiveness of an Intervention to Enhance Cooperation Between Sick-Listed Employees and Their Supervisors (COSS). *Journal of occupational rehabilitation*. **26**, 229–236 <https://doi.org/10.1007/s10926-015-9606-1> (2016).

Figures

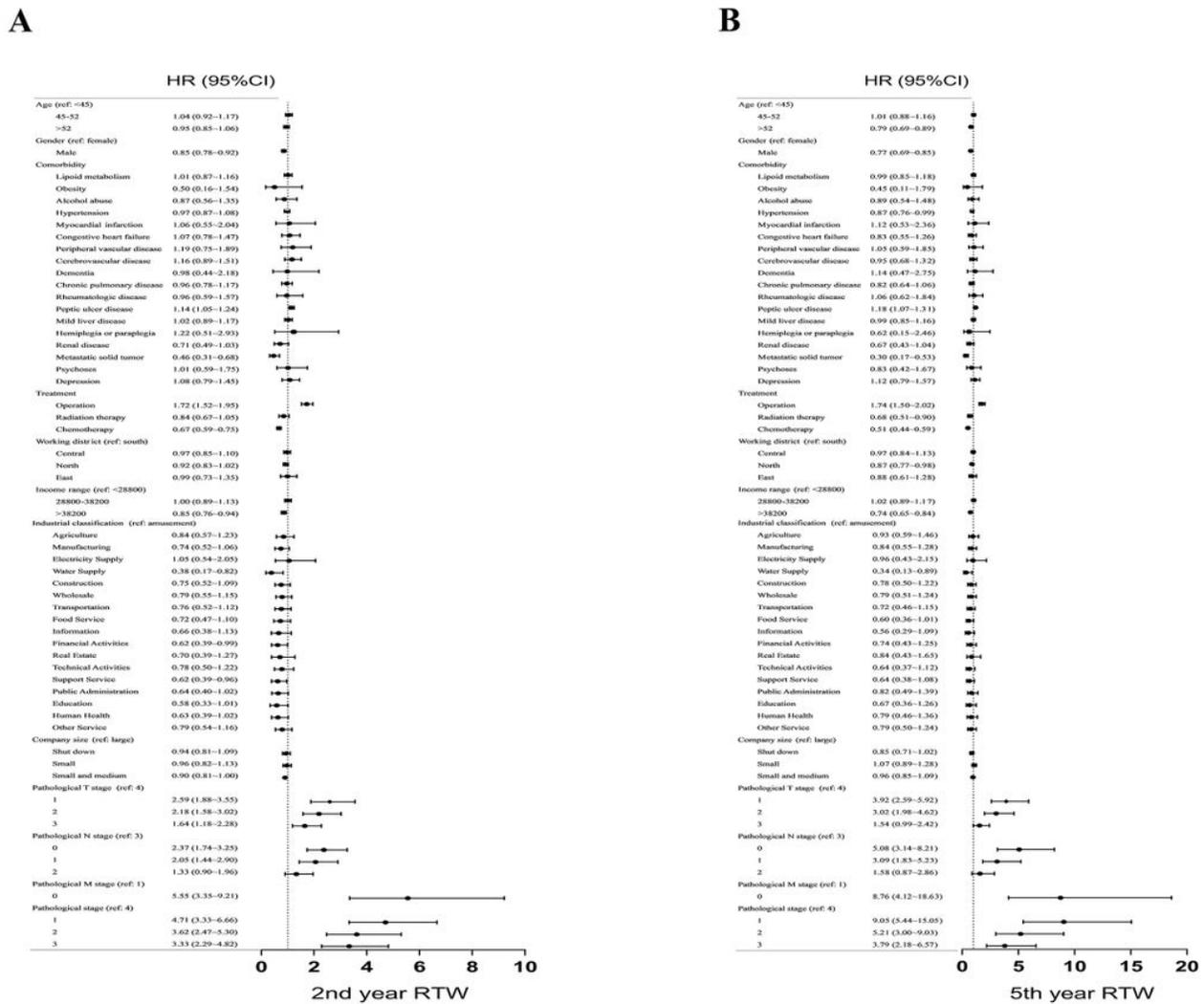


Figure 1

Univariate association between independent variables and RTW in the 2nd and 5th year

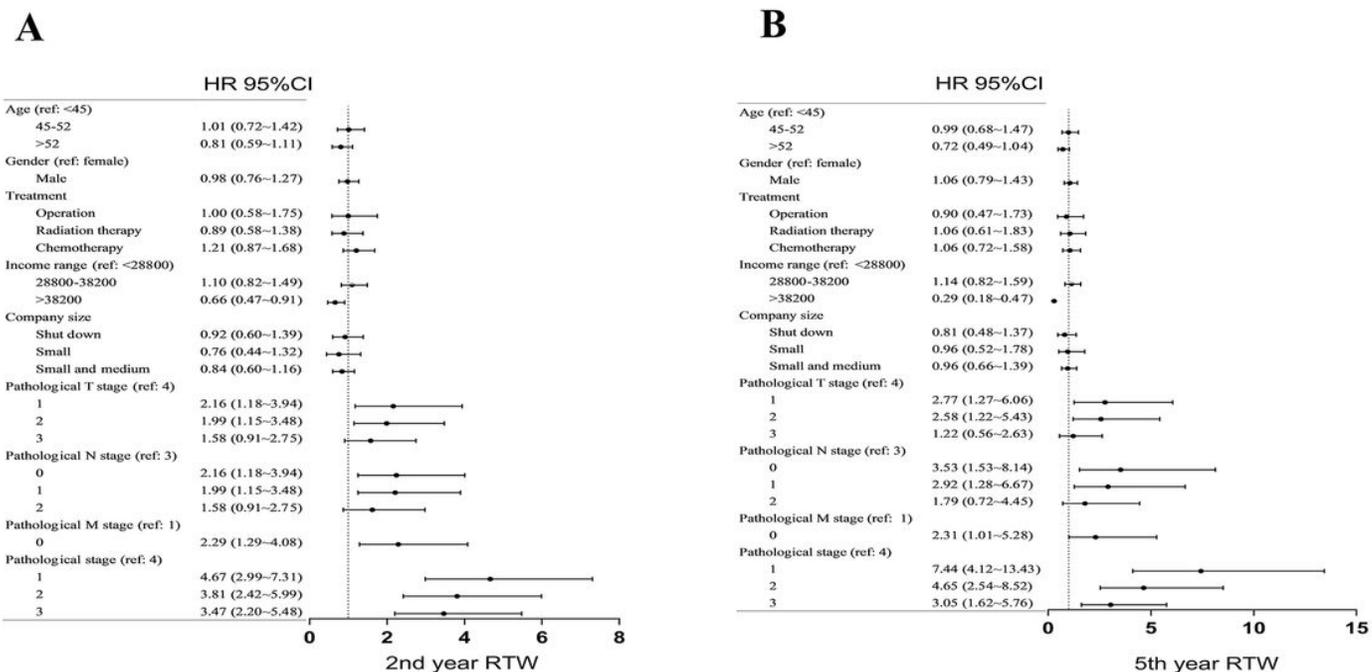


Figure 2

Multivariate association between independent variables and RTW in the 2nd and 5th year

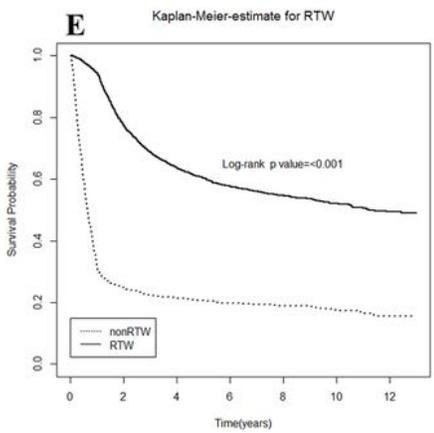
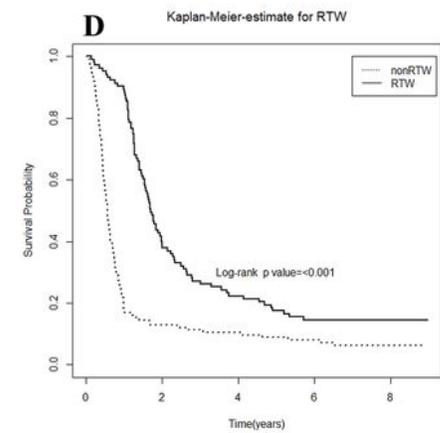
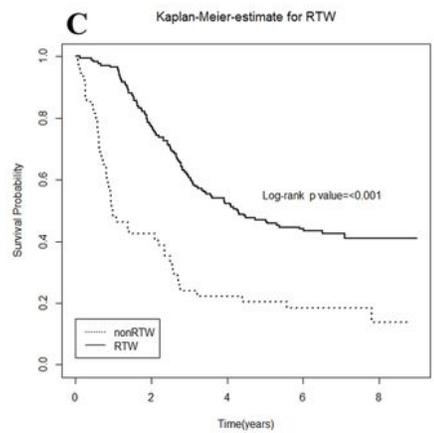
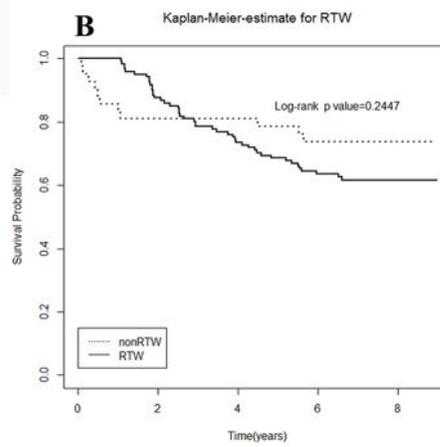
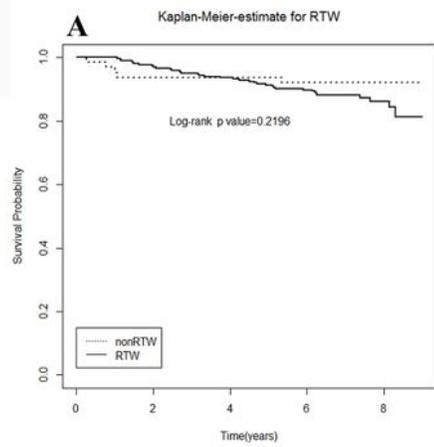


Figure 3

Kaplan-Meier curve for all-cause mortality categorized by different stages of gastric cancer (A) all stages; (B) stage 1; (C) stage 2; (D) stage 3; (E) stage 4

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