

# A randomized controlled trial of a Return-to-Work Coordinator model of care in a general hospital to facilitate return to work of injured workers

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## Abstract.

**BACKGROUND:** Return-to-work (RTW) programmes for injured workers have been prevalent in Western countries with established work injury management policies for decades. In recent years, more Asian countries have started to develop RTW programmes in the absence of work injury management policies. However, few studies have evaluated the effectiveness of RTW programmes in Asia.

**OBJECTIVE:** Return-to-work coordination has been found to be an important facilitator in RTW programmes. This study seeks to determine the effectiveness of a Return-to-work coordinator (RTWC) model of care in facilitating early RTW for injured workers in Singapore.

**METHODS:** A randomized controlled trial was used. 160 injured workers in a general hospital were randomly allocated to either control (receive usual hospital standard care) or intervention (assigned a RTWC) group. The RTWC closely supported RTW arrangements and proactively liaised with employers and healthcare professionals on RTW solutions for the injured workers.

**RESULTS:** At three months post injury, workers in the intervention group RTW 10 days earlier than the control group, with a higher proportion of workers in the intervention group returning to modified jobs. There were no significant differences in the quality of life measures between the two groups.

**CONCLUSION:** The addition of a RTWC into the hospital model of care is effective in facilitating early RTW for injured workers. This could be a potential model of care for injured workers in Asian countries where work injury management policies are not yet established.

Keywords: Return to work, occupational rehabilitation, occupational therapy, worker's compensation

## 1. Introduction

In Singapore, workplace safety and health is largely governed by two legislations under the

Ministry of Manpower: 1) Workplace Safety and Health (WSH) Act, which seeks to prevent work injuries through managing risks at work, and 2) Work Injury Compensation Act (WICA), which provides injured workers with a low cost and expeditious process to settle compensation claims after a work injury [1]. From 2007 to 2013, Singapore has made good progress in reducing the accident frequency rate from

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1.9 to 1.7 per million man-hours and workplace fatality rate from 2.9 to 2.1 per 100,000 employed persons. However work injury incidences and injury compensation award have increased by 10% (from 13,298 to 14,733 cases) and 28% (from \$76.7 to \$98.1 million) respectively over the past three years [2]. There are no available data on the RTW rates of the workers after work injury.

Singapore has not yet established occupational rehabilitation programs nor case management services to facilitate injured workers to RTW. The current standard care for injured workers is primarily hospital or clinic based, involving medical and rehabilitation treatment and is predominantly guided by the biomedical model of care. RTW decision is frequently based upon the physician's evaluation, treatment and recommendations regarding the injury [3]. However, physicians often have limited understanding of the worker's work demands and work environment to determine the impact of the injury on the worker's ability to work. Conversely, employers have little knowledge of injury healing process and lack the skills and resources to manage the workers' RTW process effectively post injury. While physicians are mostly concerned with reducing bodily impairment, employers are mainly interested in minimizing the monetary cost of work absences and worker's timely return to productivity [4]. As a result, many injured workers end up navigating through the healthcare, workplace and insurance systems themselves, trying to balance their own needs of medical recovery and job security. Their final RTW outcome is dependent on the medical opinion of physicians and goodwill of employers rather than a systematic process of evaluation.

Successful RTW outcomes require active planning and sensitivity to the complexities related to work organization and the beliefs, roles and perceptions of many stakeholders, including the injured worker, employer and healthcare professionals [5]. Systematic reviews of workplace-based RTW and disability management interventions found moderate to strong evidence for five factors which can significantly reduce work disability duration and costs [6, 7]. These included work accommodation offers, contact between healthcare provider and workplace, workplace making early contact with worker, ergonomic worksite visits and presence of a RTWC. Internationally, many western countries have long included the role of RTWC (otherwise known as case manager or disability management specialist) as a key element in its occupational rehabilitation systems [3, 8, 9,

10]. These systems usually arise from the legislative framework existing in a state or country [11]. In recent years, Asian countries have also started to place greater emphasis on developing and evaluating the effectiveness of occupational rehabilitation programs that are contextualized within their societies, in the absence of work injury management policies [12, 13, 14]. In Hong Kong, a pilot case management system implemented by an independent service provider for injured workers at one company found that the use of a case manager, who worked closely with a group of injured workers, was more effective in reducing sick leave and compensation costs, compared to just conventional rehabilitation [15]. In China, a retrospective cohort study found a high proportion of injured workers who received case management program at a work injury rehabilitation center successfully returned to work and sustained work for at least three months [16].

The Ministry of Manpower's Occupational Safety and Health Division initiated and funded this research to study the practicality and effectiveness of a RTWC model of care in facilitating the RTW of injured workers in Singapore. It is hypothesized that the addition of a RTWC with workplace-based interventions will be more effective in facilitating early RTW of injured workers compared to current standard care involving medical and rehabilitation treatment in a hospital. The RTWC model of care was trialed in a general hospital to 1) facilitate early RTW intervention and 2) ease coordination of services within the healthcare system as most workers are sent to an emergency department after a work injury and continue with the medical and rehabilitation services at the same hospital. The findings would provide valuable insights for developing a model of care for occupational rehabilitation and work injury management program that can be implemented in Singapore and possibly in other countries in Asia which do not have work injury management policies and legislations.

## 2. Methods

### 2.1. Study design

A randomized controlled trial design was chosen for the purpose of this quantitative research study. Potential subjects were shortlisted for recruitment into the study via a public general hospital, Tan Tock Seng Hospital's Emergency Department (TTSH ED) database.

## 2.2. Subjects

A total of 160 subjects (Singaporeans and Permanent Residents) who sustained injuries due to a work-related accident were recruited between September 2010 and February 2012 to participate in the randomized controlled trial. 7 subjects were withdrawn from the study during the data collection period due to uncertainty in job status and personal reasons. The total number of subjects included in the data analysis was 153, with 79 in the control group and 74 in the intervention group.

Inclusion criteria for this study were workers who sustained injuries at work, which affected their RTW status. This was defined by workers who were:

- Admitted as inpatients in general wards or given specialist outpatients appointments for further follow up, and
- Given more than 14 days of medical-certified leave or light duty from the date of attendance at Emergency Department.

Workers who were admitted to Intensive Care Units or High Dependency wards were excluded. In addition, workers with repetitive strain or non-workplace accidental injuries, more than 62 years of age, unable to converse either in English or Mandarin, self-employed, foreign workers, or those under a contract for service employment were excluded from the research.

## 2.3. Procedure

Prior the start of the research study, a random set of numbers was computer generated and equally allocated to the control and intervention groups by the statistician. The grouping is kept in sealed envelopes, which were numbered and kept by the research assistant. After the subjects consented to participate in the study, the research assistant listed them in sequence and opened the corresponding envelope to confirm the randomized allocation of the subject into the control or intervention groups. The research study workflow is illustrated in Fig. 1.

### 2.3.1. Control group

In the control group, subjects received standard care in the hospital. This included routine medical and rehabilitation treatment and did not include any established protocol or standard clinical practice to coordinate the RTW process. The doctors, being the

main care provider, made the RTW decisions, based on the biomedical recovery process of the injury. Employers were typically not involved in the care or in the RTW decision-making process.

### 2.3.2. Intervention group

In addition to receiving standard care, subjects randomized to the intervention group were assigned a RTWC to facilitate and manage their RTW process. The RTWC model of care incorporated four of the five interventions known to be effective in reducing work disability – work accommodation offers, contact between healthcare provider and workplace, ergonomic worksite visits and presence of a RTWC [4, 5]. Early contact with worker by workplace was not incorporated into the RTWC model of care, as it was not within the study team's influence of control to ensure employers contact the injured workers. The frequency and duration of the RTWC intervention varied, depending on the complexity of the RTW process of each subject. The RTWC intervention typically involved the following activities at the various stages of the subject's recovery.

At initial contact with the subject, the RTWC conducted a biopsychosocial assessment of the subject's physical, cognitive and psychosocial functions, interviewed the subject for his/her job demands and identified potential challenges the subject may encounter upon RTW post injury. The RTWC then established early contact with the employer to verify the job demands described by the subject and find out if alternative work duties were available, should the subject not be able to resume full work duties. The RTWC also educated the subject and their employer on the work injury notification and compensation process to encourage compliance with their obligations as stated in the Work Injury Compensation Act (WICA).

After a clearer understanding of the subject's functional abilities and job demands, the RTWC attended the first outpatient medical review with the subject to update the treating doctor on the workplace demands, and discussed with the doctor and subject on the rehabilitation and RTW plans. This may include suggestions for referrals to rehabilitation services, and estimated timeframe for subject to return to either pre-injury full or modified work duties. Subsequently, the RTWC maintained active communication with other healthcare and rehabilitation professionals in the care of the subject via face-to-face, telephone and written communications involved to monitor the functional progress of the

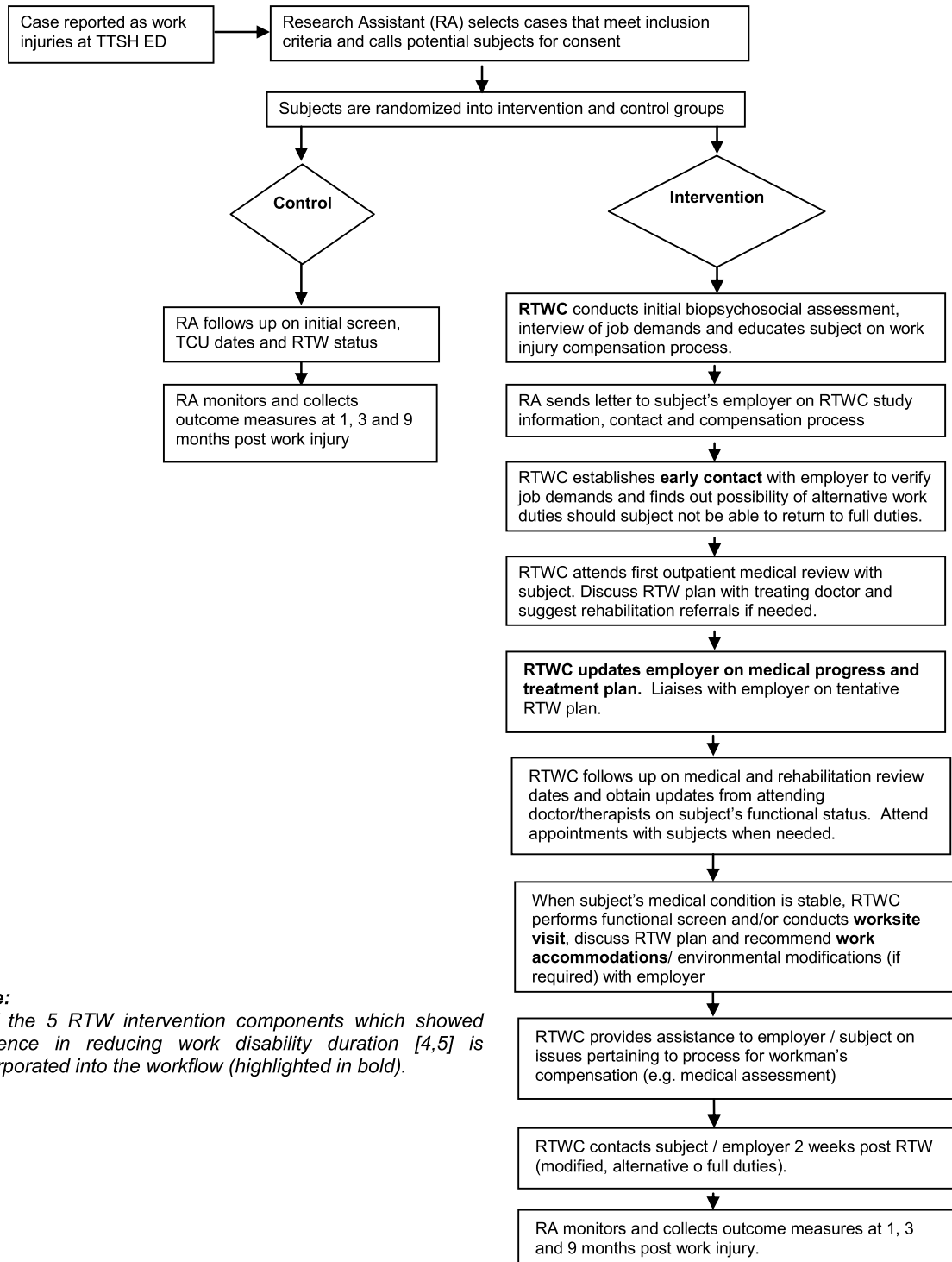


Fig. 1. Workflow of the research study.

subjects. Concurrently, the RTWC provided regular updates of the subject's recovery to the employers throughout the period the subject received medical

treatment, while reviewing the RTW plan with the employer based on the subject's functional readiness to RTW.

When the subject's medical condition was no longer acute, the RTWC performed a brief functional capacity evaluation to determine if the subject's work ability matched the full job demands. If the work ability and job demands matched, the RTWC would recommend to the treating doctor for the subject to RTW to the pre-injury duties with the necessary precautions to protect the injury. If the job demands were higher than the subject's work ability, the RTWC would explore and negotiate with employers on modifying pre-injury work duties or arranging suitable temporary work assignments to encourage early RTW while the subject recovered from the injury. If more detailed workplace information was required, the RTWC may conduct workplace assessments to determine the suitability of the work environment for the subject to resume work and gave recommendations for accommodations where necessary.

After the subject returned to some form of work, either modified, alternative or full work duties, the RTWC then contacted the subject and/or employer within two weeks time. The case was then closed when the subject remained at work two weeks after RTW.

### 2.3.3. Return-to-Work Coordinators (RTWCs)

A total of four RTWCs provided the intervention in this research study. The RTWCs in this research study were occupational therapists (OTs) with at least three years of clinical experience (including occupational rehabilitation experience) and had specialized training in occupational assessment. None of the OTs involved were full time RTWCs. Two of them worked concurrently in the inpatient ward and outpatient clinic providing medical rehabilitation while the other two held managerial positions.

The main roles of the RTWC in this study included communication between stakeholders, assessment of worker's function and job demands, recommendations on RTW readiness and education on work injury compensation process. To prepare for the role as RTWC, a three-day training was developed and conducted by one of the senior OTs within the group based on best practices from international publications and studies and learning about local regulations related to work injury. The four modules included in the training included 1) Effective disability management programs, 2) Legislation and Disability management, 3) Sharpening the OT's skills in Occupational Rehabilitation, and 4) Case management. All the RTWCs were then involved in the develop-

ment of the study workflow before the intervention began. During the intervention period, the RTWCs held regular meetings to modify the workflow according to each individual subject while standardizing the processes to minimize variations. Solutions to overcome challenges and ways to improve communication between different stakeholders related to RTW issues were frequently discussed among the RTWCs.

The research assistant in this research study took on the administrative and coordination activities to facilitate the RTWC intervention. This included screening of cases, monitoring and scheduling of appointments, checking on injury reporting status and collecting of outcome measures at 1, 3 and 9 months post injury. The research assistant also attended the three-day RTWC training to be familiar with the RTWC interventions and helped to reinforce the RTWC's education and instructions to the subjects.

### 2.4. Outcome measures

The variables collected for this study are demographics information (including personal, social, education and occupational data), injury-related variables and utilization of rehabilitation services. Effectiveness of the intervention was evaluated by comparing the outcomes of subjects recruited into the intervention group with those in the control group.

Outcome measures included RTW status, work injury notification and quality of life. RTW status at 3 months and 9 months post work injury included the work status, RTW categories (whether subject returned to work with same/different employer, same/different job) and time taken to first RTW after the injury. Work injury notification included incident notification rate and length of time from injury to notification. Quality of life outcomes were measured using the Short Form 36 (SF36) questionnaire at 1, 3 and 9 months post injury. The SF-36 is a multi-purpose, short-form health survey with 36 questions that gives a profile of functional health and well-being scores. The SF-36v2 Standard, Singapore (English) and SF-36v2 Standard, Singapore (Chinese) versions were used in the study.

### 2.5. Statistical analysis

STATA 10 and SPSS 17 were the two statistical programs used for the data analysis of this study. Fisher's exact test was used to analyze any significant differences in the demographics and injury-related

variables between the two groups to ensure that the two groups were similar in characteristics without any bias in randomization. Independent sample student *t*-test was used to compare the means across the two groups. In the event of non-normality, the non-parametric Mann-Whitney U test was used to compare the median between the two groups. The level of significance was set at 5%.

The SF-36 scores at 1, 3 and 9 months were analyzed using repeated measure ANOVA. Regression analysis was used to test for possible significant associations between the demographic variables and the outcome measures to rule out any possible interaction effects that can influence the outcome measures of the study.

### 2.6. Ethical considerations

This research study commenced on 14 May 2010 after receiving ethics approval from the Institutional Review Board of the National Healthcare Group (DSRB ref: D/10/213). All subjects were reimbursed for transportation costs to hospital for data collection purposes up to S\$90 as well as presented with a S\$20 voucher upon completion of the 9-month participation in the study. Subjects in the intervention group were also reimbursed for transportation costs incurred for any workplace visit up to S\$30. Standard care intervention was not funded for both groups in this study and the RTWC intervention was provided at no charge to subjects in the intervention group.

## 3. Results

### 3.1. Demographic variables

Comparisons of the demographics, social, educational variables, pre-injury occupational types and duration with pre-injury employer showed no significant differences in the subjects between the two groups (Table 1). Majority of the 153 subjects recruited were Chinese (73%), males (81%), with a mean age of 48, ranging from 24 to 63 years of age. A high percentage of the subjects (73.8%) were married and living with their family/relatives (91.5%). Slightly less than half of the subjects (47.7%) were main breadwinners. Most of them (86.9%) received secondary/technical and below education and mainly (69.9%) worked in the manual forms of work, such as craftsmen, operators, cleaners, laborers and tech-

nicians. The average length of time they worked with their current organization was 6.5 years and ranged from 0.5 months to 40 years.

### 3.2. Injury-related variables

The main common causes of workplace injury were falls (35%), followed by blunt (32%) and cuts (18%). The main principal diagnoses that the subjects suffered from were fractures (49%), wounds (27%) and contusion (8%) mostly on their upper and lower limbs (Fig. 2). The Injury Severity Score (ISS), an anatomical scoring system, was used to provide a score to estimate the level of severity of the traumatic injuries that the subjects sustained. ISS has been widely used in trauma care research to stratify subjects into different groups [17]. Most of the ISS of subjects fall within minor (52%) or moderate (43%) severity (Fig. 3). There were no significant differences between the ISS of the intervention and control groups.

### 3.3. Rehabilitation services utilization

Fisher's exact test indicated that there was significant difference between the two groups of subjects that utilized different types of rehabilitation services ( $p = 0.009$ ). The rehabilitation sessions utilized were mostly occupational therapy and physiotherapy services. Further sub-level analysis showed that a significantly higher number of subjects in the intervention group received only outpatient rehabilitation therapy services ( $p = 0.002$ ). There was a significantly higher number of subjects in the control group who did not receive any form of rehabilitation services than the subjects in the intervention group, ( $p = 0.004$ ) (Table 2).

### 3.4. Status of subjects receiving medical services at end of data collection

The status of whether the subjects were still receiving medical services by the end of the data collection on 31 July 2012 was found to be statistically different between the two groups ( $p = 0.029$ ). Sub-level analysis indicated that more subjects in the intervention group were discharged from specialist outpatient clinics (75.8% compared to 55.7%) while more subjects in the control group self defaulted the medical services (25.3% compared to 12.1%) (Table 2).

Table 1  
Demographics of subjects

	Control (n = 79)	Intervention (n = 74)	Total (N = 153)	Significance
Gender				<i>p</i> = 0.062
Male	69 (87.3%)	55 (74.3%)	124 (81.1%)	
Female	10 (12.7%)	19 (25.7%)	29 (18.9%)	
Race				<i>p</i> = 0.215
Chinese	63 (79.8%)	49 (66.2%)	112 (73.2%)	
Malay	8 (10.1%)	11 (14.9%)	19 (12.4%)	
Indian	7 (8.9%)	13 (17.6%)	20 (13.1%)	
Others	1 (1.2%)	1 (1.3%)	2 (1.3%)	
Age at injury (yrs)				<i>p</i> = 0.73
Mean (SD)	47.7 (9.2)	48.3 (10.4)	48.0 (9.8)	
Min – Max	26–61	24–63	24 – 63	
Nationality				<i>p</i> = 0.39
Singaporean	64 (81%)	64 (86.5%)	128 (83.7%)	
Permanent residents	15 (19%)	10 (13.5%)	25 (16.3%)	
Marital status				<i>p</i> = 0.201
Married	62 (78.5%)	51 (68.9%)	113 (73.8%)	
Non-married	17 (21.5%)	23 (31.1%)	40 (26.2%)	
Living situation				<i>p</i> = 0.215
Family/relatives	74 (93.7%)	66 (89.2%)	140 (91.5%)	
Friends/fellow workers	1 (1.3%)	5 (6.8%)	6 (3.9%)	
Alone	4 (5%)	3 (4%)	7 (4.6%)	
Main breadwinner of household				<i>p</i> = 0.73
Yes	35 (44.3%)	38 (51.4%)	73 (47.7%)	
No	44 (55.7%)	36 (48.6%)	80 (52.3%)	
Education				<i>p</i> = 0.53
No formal education	0	1 (1.4%)	1 (0.7%)	
Primary and below	23 (29.1%)	26 (35.1%)	49 (32%)	
Secondary/Technical	47 (59.5%)	37 (50%)	84 (54.9%)	
Tertiary (Diploma & higher)	9 (11.4%)	10 (13.5%)	19 (12.4%)	
Duration of education (years)				<i>p</i> = 0.81
Mean (SD)	9.1 (3.6)	9.0 (3.4)	9.1 (3.5)	
Min – Max	2–20	3–20	2–20	
Pre-injury occupation*				<i>p</i> = 0.48
Non manual	26 (32.9%)	20 (27%)	46 (30.1%)	
Manual	53 (67.1%)	54 (73%)	107 (69.9%)	
Duration with pre-injury employer (years)				<i>p</i> = 0.95
Mean (SD)	6.6 (8.9)	6.5 (8.9)	6.5 (8.9)	
Min – Max	0– 39	0–40	0–40	

\*Examples of non-manual occupations include managers, professionals, technicians and clerical workers. Examples of manual occupations include service workers, production workers, machine operators, cleaners & labourers.

### 3.5. Outcome measures

#### 3.5.1. RTW status at 3 and 9 months post work injury

A total of 104 subjects (68%) returned back to work at 3 months post work injury. Most of them returned back to their same occupation with the same employer post injury (57.2%). There were no significant difference found in the work status and the category of work between the subjects in the control and intervention groups. However, sub-level analysis found significant difference between the two groups who returned back to work with same employer, modified job category of RTW ( $p = 0.04$ ), with 13.7% of subjects in

the intervention group compared to 4.1% of subjects in the control group (Table 2). It was noted that a higher proportion of subjects (54%) in the intervention group were prescribed light duty by their doctors as compared to the control group (16%).

Independent-sample *t*-test was conducted to compare the number of days the subjects took to first return back to work. On the whole, the subjects in the intervention group took a significantly less number of days to return back to work as compared to the control group ( $M = 37.8$ ,  $SD = 22.9$ ,  $M = 47.9$ ,  $SD = 26.7$ ;  $t_{115} = 2.21$ ,  $p = .029$ ). Subjects in the intervention group first RTW about 10 days earlier to subjects in the control group (Table 2).

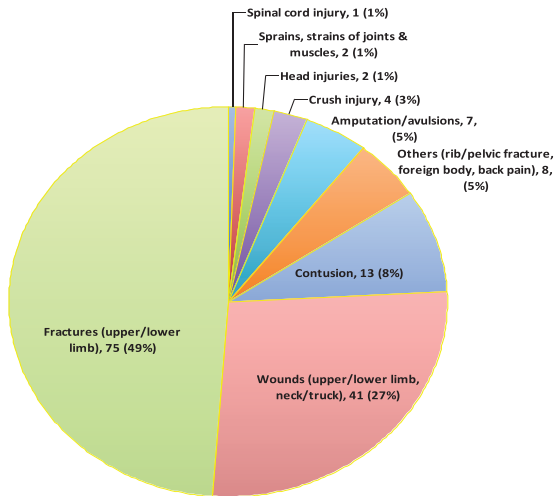


Fig. 2. Diagnosis description of work injuries sustained by subjects.

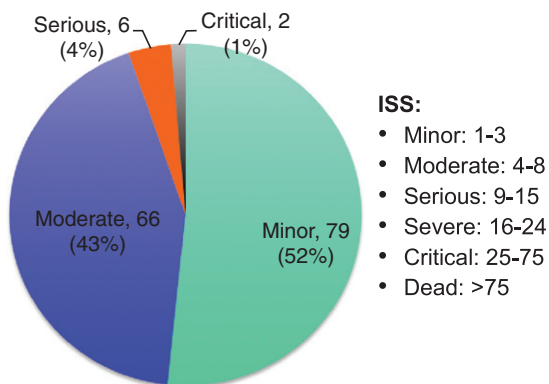


Fig. 3. Distribution of injury severity of subjects using Injury Severity Score (ISS).

In terms of the RTW rate of subjects at 3 months and 9 months post work injury, there were no significant differences between the control and intervention groups (3 month: 67% and 69%; 9 month: 75% and 78% respectively).

### 3.5.2. Work injury notification

Out of the 153 subjects, 123 (80.4%) of the cases were notified to MOM. Among which, there is a significantly higher notification rate in the intervention group (89.2%) compared to the control group (72.2%) ( $p = 0.009$ ) (Table 2).

### 3.5.3. Quality of life

The SF 36 scores for subjects in both groups improved over time. However, there were no signifi-

cant differences between the two groups. However, it was noted that the 9-month SF36 score for subjects in the intervention group were slightly higher than subjects in the control group in 6 out of the 8 dimensions (Table 3).

### 3.6. Variables associated with earlier RTW

From the statistical analysis, it was found that the average length of time taken to first RTW at 3 months was found to be significantly different between the intervention and control groups ( $p = 0.029$ ) with subjects in the intervention group returning to work about 10 days earlier than subjects in the control group. Linear regression analysis was used to find if there were other variables, other than the RTWC intervention, which were significantly associated with time taken to return to work. The univariate analysis showed that ISS category, outcome at Emergency Department, length of inpatient stay, total number of medical outpatient sessions and utilization of rehabilitation sessions were found to be associated with length of time to first RTW ( $p < 0.05$ ).

Forced entry multivariate line regression on the associated variables identified in the univariate analysis was conducted to determine if these were confounding factors to the effect of the intervention. After removing the effects of these variables, multivariate analyses showed that only the RTWC intervention was found to have a significant correlation with the earlier RTW outcome in the intervention group (Table 4).

## 4. Discussion

This is the first local study to explore the effectiveness of a RTWC model of care implemented in a general hospital in Singapore. The study found that the RTWC intervention enabled earlier RTW, increased utilization of rehabilitation services, improved compliance to medical reviews as well as increased work incident notification rate. There were no differences in the RTW rates at 3 or 9 months post injury and no impact on the quality of life measures.

### 4.1. RTWC intervention enabled earlier RTW

This study had similar results to other studies that the presence of a RTWC to coordinate the RTW process, early contact between RTWC and the workplace



Table 2  
Medical and rehabilitation services utilized by the subjects and work-related outcomes of subjects in control and intervention groups

	Control (n = 79)	Intervention (n = 74)	Total (N = 153)	Significance
Rehabilitation services utilized				
Inpatient only	6 (7.6%)	4 (5.4%)	9 (5.9%)	p = 0.009*
Outpatient only	25 (31.7%)	42 (56.8%)	68 (44.4%)	p = 0.42
Both inpatient and outpatient	12 (15.2%)	11 (14.9%)	19 (12.4%)	p = 0.002*
No rehab services	36 (45.5%)	17 (22.9%)	57 (37.3%)	p = 0.57
Status of medical review by end of data collection				
Discharge from SOC	44 (55.7%)	56 (75.8%)	100 (65.4%)	p = 0.004*
Still on follow up	15 (19%)	9 (12.1%)	24 (15.6%)	p = 0.029*
Defaulted	20 (25.3%)	9 (12.1%)	29 (19%)	p = 0.01*
Work status 3 months post work injury				
Yes	53 (67%)	51 (69%)	104 (68%)	p = 0.17
No	21 (26.6%)	22 (29.7%)	43 (28.1%)	p = 0.04*
Unknown	5 (6.4%)	1 (1.3%)	6 (3.9%)	p = 0.48
Category of RTW				
Same employer, same job	46 (62.2%)	38 (52.1%)	84 (57.2%)	p = 0.27
Same employer, modified job	3 (4.1%)	10 (13.7%)	13 (8.8%)	p = 0.142
Different employer, same job	1 (1.3%)	2 (2.7%)	2 (1.4%)	p = 0.04*
Different employer, modified job	3 (4.1%)	2 (2.7%)	5 (3.4%)	p = 0.52
Average length of time taken to RTW (days)				
Mean (SD)	47.9 (26.7)	37.8 (22.9)	42.8 (24.8)	p = 0.31
Median (IQR)	42 (51.5)	36 (39)	39 (45.2)	p = 0.029*
Min – Max	7–100	3–84	3–100	
Work injury notified to MOM?				
Yes	57 (72.2%)	66 (89.2%)	123 (80.4%)	p = 0.009*
No	22 (27.8%)	8 (10.8%)	30 (19.6%)	

Table 3  
SF 36 scores of subjects

SF 36	Control (Mean) (n = 79)			Intervention (Mean) (n = 74)			Significance
	1 month	3 month	9 month	1 month	3 month	9 month	
Physical Functioning	61.9	66.6	73.7	60.2	72.1	76.7	0.57
Role Physical	50.5	60.8	61.8	42.4	61.0	69.6	0.99
Bodily Pain	51.9	60.7	64.7	50.4	61.3	69.7	0.73
General Health	63.7	58.8	58.6	61.7	61	61.7	0.72
Vitality	56.9	58.9	56.9	52.1	55.4	55.8	0.27
Social Functioning	61.8	71.2	72.6	60.8	61.5	73.5	0.37
Role Emotional	57.4	62.6	63.8	50.7	63.3	72.5	0.83
Mental Health	59.2	64.7	64.2	59.7	62.3	64.2	0.40

Table 4  
Results of multivariate analysis of factors associated with earlier return to work

	Coefficient (SE)	95% CI	Significance
Intervention (compared to Control)	-7.94 (3.61)	-15.25 to -0.62	p = 0.034*
ISS category (Moderate compared to Minor)	4.70 (3.93)	-3.28 to 12.68	p = 0.240
Outcome at ED (Referred to SOC compared to admitted)	-8.42 (6.22)	-21.05 to 4.20	p = 0.184
Length of inpatient stay	1.04 (0.72)	-0.42 to 2.51	p = 0.158
Total number of medical outpatient sessions	-1.62 (0.89)	-3.42 to 0.18	p = 0.076

SE: Standard Error, CI: Confidence Interval.

and work accommodation offers by employers can enable earlier RTW of workers [6, 7, 15]. On average, injured workers in the intervention group returned earlier to work by about 10 days compared to the control group. The RTWC intervention was found to be strongly associated with earlier RTW, even

after other confounding factors such as demographics or injury severity, were taken into account. Early RTW meets both the needs of employers to achieve financial and production goals and the needs of workers to maintain psychological health and well-being [4, 18].

Some doctors do not ascribe to the principles and goals of occupational rehabilitation by encouraging injured workers to remain off work until their injury had completely recovered [19]. Locally, doctors in public hospitals tend to issue longer medical certificates if they are not confident that companies will assign suitable duties for workers on “light duty” [20]. The presence of a RTWC attending medical appointments with injured workers to provide information on possible workplace accommodations appeared to have increased the likelihood of doctors certifying injured workers fit for modified work duties. Doctors prescribed “light duty” to 40 (54%) workers in the intervention group compared to only 13 (16%) in the control group. At 3 months post work injury, the proportion of workers on modified job in the intervention group was also significantly higher than those in the control group.

The injured workers’ perception of the time required to RTW and their attitude towards working when not (yet) feeling healthy can affect when they actually RTW [21, 22]. Their belief that RTW is influenced by the timeliness and adequacy of professional support [23] supports the early entry of the RTWC intervention after a work injury in this study. The RTWC’s active role in maintaining communication and facilitating cooperation between the injured workers, healthcare professionals and employers for arrangement of suitable work modifications, had enabled injured workers to RTW earlier.

#### *4.2. RTWC intervention increased utilization of rehabilitation services and improved compliance to medical reviews*

This study found that the addition of a RTWC in the healthcare system increased the utilization of outpatient rehabilitation services. This was appropriate as most of the work injuries sustained were musculoskeletal in nature and workers would benefit from rehabilitation services to improve the range, strength and function of their injured limbs. The RTWC often recommended to the treating doctors to refer injured workers for physiotherapy and occupational therapy rehabilitation services. The increase in contact with rehabilitation professionals may have increased the injured workers’ readiness to RTW as workers with musculoskeletal health complaints have opined that contact with physical therapists (which includes physiotherapists, occupational therapists, podiatrists) were more effective than medical professionals in limiting sickness absence duration [24].

In addition, the RTWC improved the compliance of injured workers to medical reviews. More workers in the intervention group completed their medical reviews and were discharged from the outpatient clinics with less self default compared to the control group. This was likely due to the RTWC’s close monitoring of the injured workers’ attendance at medical and rehabilitation appointments. The RTWC also repeatedly reinforced to injured workers the importance of compliance to treatment as they may have an inadequate understanding of their own responsibilities to rehabilitation in the RTW process [25].

#### *4.3. RTWC intervention increased work incident notification*

Under the Work Injury Compensation Act (WICA), any incident of worker injured in a work-related accident and granted more than 3 days of medical leave must be notified to Ministry of Manpower (MOM) within 10 days of accident [26]. This study found that the RTWC intervention increased the work incident notification rate of work injury cases. This was likely attributed to the proactive written and verbal reminders from the RTWC to the employer to educate on WICA and the need for incident notification. In some cases, the RTWC also provided guidance to the employer submitting the notification. Conversely, there was no such reminder or assistance to the employer from the hospital in the control group.

The RTWC also educated the injured workers on their rights under WICA and updated them on the RTW processes. Injured workers’ understanding of their rights and their perceived ability to exercise their rights could affect their experiences of injuries and problems of chronic disability [27]. It could also meet the workers’ concerns of gaining information about the timeliness of their claim management and determining whether all parties in the RTW process were “following the laws” [4].

#### *4.4. Overcoming obstacles in provision of occupational rehabilitation services*

Results from this research study show that the RTWC model can be a promising model of care to be implemented in Singapore, and also likely in Asian countries where work injury management policies are still absent. In the article “Occupational rehabilitation in twenty-first century Asia Pacific: Facilitating health and work” [28], the authors identified the

common obstacles in the provision of occupational rehabilitation services in the Asia Pacific countries:

- (i) Legislation and policy awareness of stakeholders,
- (ii) Coordination and synergy of services, and
- (iii) Competence building of professionals.

#### 4.4.1. *Legislation and policy awareness of stakeholders*

At present, the current legislations governing workplace safety and health in Singapore are focused on accident rates, work injury incidences and claim amounts [1, 2]. Though RTW is a primary measure of the effectiveness of workers' compensation system [11], there is an absence of a work injury management framework to guide various stakeholders on achieving positive RTW outcomes in Singapore [29]. Thus stakeholders tend to focus more on the process of compensation, rather than rehabilitation back to work, after a work injury.

Though the RTWC intervention in this study was found to be effective in facilitating earlier RTW despite the lack of established work injury management policies and legislations in Singapore, the RTWCs faced challenges which could have been more easily overcome, if supporting policies were in place. These included poor level of employer involvement in the RTW process, early termination of workers post work injury and lack of recognition of RTWC's role. Developing a local legislative framework which focuses on the systemic context of the injured worker and the multi-level decisions of various stakeholders involved, can better address facilitators and barriers in the worker's RTW process and facilitate safe and early RTW [30, 31].

#### 4.4.2. *Coordination and synergy of services*

It is important that injured workers receive efficient healthcare in order to remain fully or partially productive [24]. Singapore, being a young country enjoys one of the most efficient healthcare systems worldwide [32]. Basing RTWC intervention in a hospital setting where injured workers receive their medical services facilitates efficient and early referrals for RTW services, which has been found to be a significant determinant in achieving positive RTW outcomes [33]. RTW interventions aim to help injured workers RTW during their medical recovery, based on the underlying notion that individuals with impaired body functions and limitations in activities can still work [34]. Conversely, early RTW often

supports the injured workers' medical recovery and enhances their wellbeing [23].

The RTWC intervention trialed in this study is currently not part of the standard care received by injured workers in Singapore. There are some occupational rehabilitation services in a few general hospitals, led by occupational therapists that have training and exposure in RTW process. These services include work conditioning, functional capacity evaluation, recommendations for suitable work duties, work site visits, and ergonomic interventions. However referral to these services are low, as occupational rehabilitation is not considered as part of the continuum of care after medical stabilization or surgical treatments. Thus, referrals for RTW services are dependent on the individual primary physician's level of knowledge and awareness of occupational rehabilitation. For injured workers with more severe disabilities, they may be referred to community rehabilitation agencies for vocational assessment, training and placements [29]. There is a potential for the hospital-based RTWC model of care to coordinate and synergise the existing range of occupational rehabilitation services available in the hospital and community settings and to establish more comprehensive care for injured workers.

#### 4.4.3. *Competence building of professionals*

A literature review of 22 international studies on the role of RTWCs in programs designed to prevent work disability found considerable variations in the professional background and training of RTWCs, ranging from occupational therapy, nursing, case management and psychology. They were clinic or hospital based, employer based, independent or affiliated with a health authority or managed care organization [8]. The professional background of RTWCs is dependent on the service model selected. If the RTW coordination is based within the workplace, the RTWC can be co-workers appointed by the employers, with sufficient level of seniority to make RTW related decisions for the employer and competence to perform their role [35]. Co-workers nominated by employers could better appreciate the concerns of the injured workers in RTW, as the domains and priorities of RTW activities are similar between employers and injured workers [36]. If the RTW coordination is based in the healthcare setting, it would be more ideal to engage healthcare professionals as RTWCs as an understanding of medical conditions will enable RTWCs to have realistic expectations for recovery, respond more effectively to

workers' questions and concerns and maintain credibility with stakeholders [8]. Employers and injured workers were also more likely to implement changes or attempt RTW when healthcare providers gave the RTW recommendations [37]. Regardless of the professional background of the RTWC, it is crucial for the RTWC to develop competencies required for the success of this role in facilitating RTW. Some of these key competencies include active listening and communication skills, ability to relate well to a wide range of personalities, maintain respect and confidentiality, demonstrate good organizational skills and effective problem solving of RTW issues [38].

The RTWCs who provided the RTW intervention in this research study were occupational therapists with occupational assessment and rehabilitation experience. Occupational therapists with their focus on client-centred management and skills in functional assessments, job analysis, job and environmental modifications and ergonomics can take on a prominent role in programming for RTW both as case managers and as workplace-based rehabilitation providers [39, 40]. In addition, since this study is conducted in a hospital setting where occupational therapists had traditionally been providing work rehabilitation services, the readiness for them to take on an extended role of RTWC was greater compared to other healthcare professionals in the hospital.

Future implementation of the RTWC model will need to consider the professional training, demand and supply for RTWCs and develop a strategy to build competence and professional expertise in RTW coordination in the context of the service model provision.

#### 4.5. Limitations of study

Firstly, the results of this randomised controlled study were limited to injured workers that met the specified inclusion criteria. It excluded workers who have difficulty at work due to occupational diseases or medical conditions. The study only included workers who are Singaporeans and permanent residents, and excluded foreign workers who make up a significant proportion of the workforce in Singapore. The results from this study may not generalizable to foreign workers as they face different employment issues at work. Secondly, as the RTWC intervention was only carried out in one hospital, it is uncertain if the outcomes would be similar if it was carried out in other hospitals. Thirdly, the study only focused on the interaction of the RTWC with the injured worker, healthcare provider and employer. It does not take into

account interactions of the injured worker with other stakeholders such the employer, peers and co-workers [6, 41]. Future studies of the RTWC intervention to a more diverse group of workers or implemented in different hospitals are recommended to generalize the study findings to a broader context in Singapore.

## 5. Conclusion

This is the first local randomized controlled trial conducted to determine the effectiveness of a RTWC model of care in facilitating RTW for injured workers in Singapore. Results showed that the addition of a RTWC into a hospital model of care is effective in facilitating earlier RTW of injured workers as well as improving the workers' compliance to healthcare treatment and employers' compliance to legislative requirements of work injury notification. This could be a potential model of care for injured workers in Asian countries where work injury management policies are not yet established. Future implementation of the RTWC model of care will need to consider overcoming the current obstacles and development of an occupational rehabilitation and work injury management framework for successful RTW [9, 10, 28, 42, 43, 44].

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## Conflict of interest

The authors were employees of Tan Tock Seng Hospital during the conduct of this study. These authors and organisation have no financial interests that may be affected by the content of the manuscript.

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