

Assessment of long-term functional outcome in patients who sustained moderate or major trauma: a 4-year prospective cohort study

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KEY MESSAGES

1. In patients who sustained moderate or major trauma, 45% had an excellent recovery after 4 years, and $\leq 40\%$ and $\leq 70\%$ had achieved a physical and mental health status above or equal to the Hong Kong norm, respectively.
2. The 4-year post-trauma return-to-work rate for patients who survived the initial insult was 52.3%.

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Introduction

The current trauma system aims to improve survival, quality of life, and functional outcome of patients.¹ Patient-centred, health-related outcomes are increasingly recognised as a benchmark of the quality of care received,² and quality of survival ranks as a high priority.³ Evaluation of functional recovery and quantification of the burden of non-fatal trauma allow comparison with other settings, help evaluate the impact and effectiveness of the trauma system as a whole, and may provide some prognostic information for healthcare workers and patients. Although there are studies of the health status of the normal population in Hong Kong,^{4,5} studies of post-trauma health status and function in Chinese with moderate or severe trauma are scarce.

This study aimed to evaluate (1) the overall functional outcome of patients who sustained moderate or major trauma using the extended Glasgow Outcome Scale (GOSE), (2) quality of life using the Short-Form 36 (SF-36) health survey, and (3) the return to work (RTW) status.

Methods

This was a 4-year, multi-centre, prospective, cohort study of adult patients who sustained moderate or major trauma (defined as Injury Severity Score [ISS] of ≥ 9) and were admitted to the Prince of Wales Hospital, Queen Elizabeth Hospital, or Tuen Mun Hospital in Hong Kong. Ethical approval was obtained from the local ethics review board. Patients were excluded if they were likely to leave Hong Kong, were unwilling to enter the study, had an ISS of < 9 ,

or sustained isolated hip or pathological fractures.

The physical and mental health status was evaluated using the SF-36 physical component summary (PCS) and mental component summary (MCS) and GOSE. The Hong Kong norm is 52.83 for the PCS and 47.18 for the MCS, whereas the US norm is 50 for both PCS and MCS.

The primary outcome was the SF-36 PCS and MCS scores at 4 years after injury. The secondary outcome was GOSE score at 4 years after injury. The third outcome was the number of patients with RTW status 1 and 4 years after injury.

Chi-square and Fisher exact tests were used for categorical data, and *t*-test was used to compare means of continuous variables. A P value of < 0.05 was considered statistically significant, and all tests were two tailed. Univariate and multivariate analyses were conducted. Kaplan-Meier curves were used to assess PCS, MCS, and GOSE changes over time.

Results

Between 1 January 2010 and 30 September 2014, 400 trauma patients (69.5% were male) aged 18 to 106 (mean, 53.3) years with moderate or major trauma were recruited from the three trauma centres. Baseline characteristics of the patients have been presented elsewhere.

From baseline to 4 years, the GOSE score increased by 12.75%, 17.98%, and 9.96% for patients with ISS of > 8 , 9-15, and > 15 , respectively (Fig 1), whereas the PCS score increased by 11.75% and the MCS score decreased by 27.25% for patients with ISS of > 8 (Fig 2).

In univariate analysis, long-term (4-year) poor

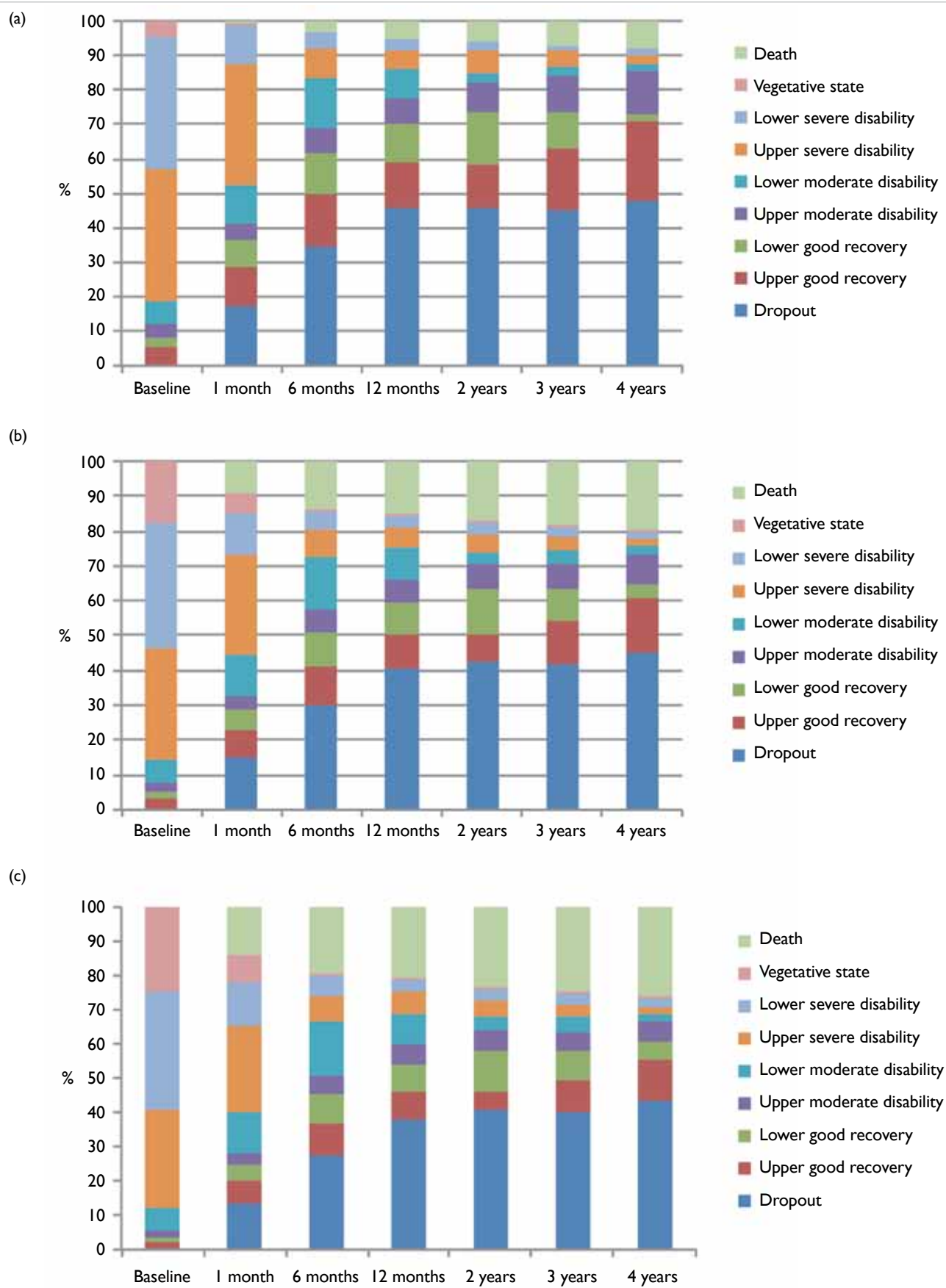
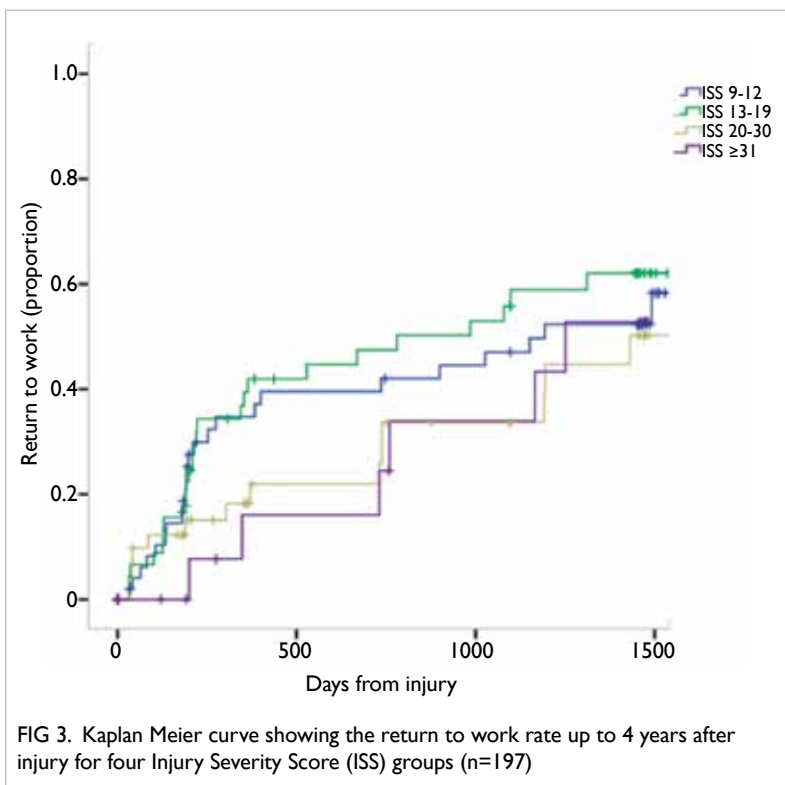
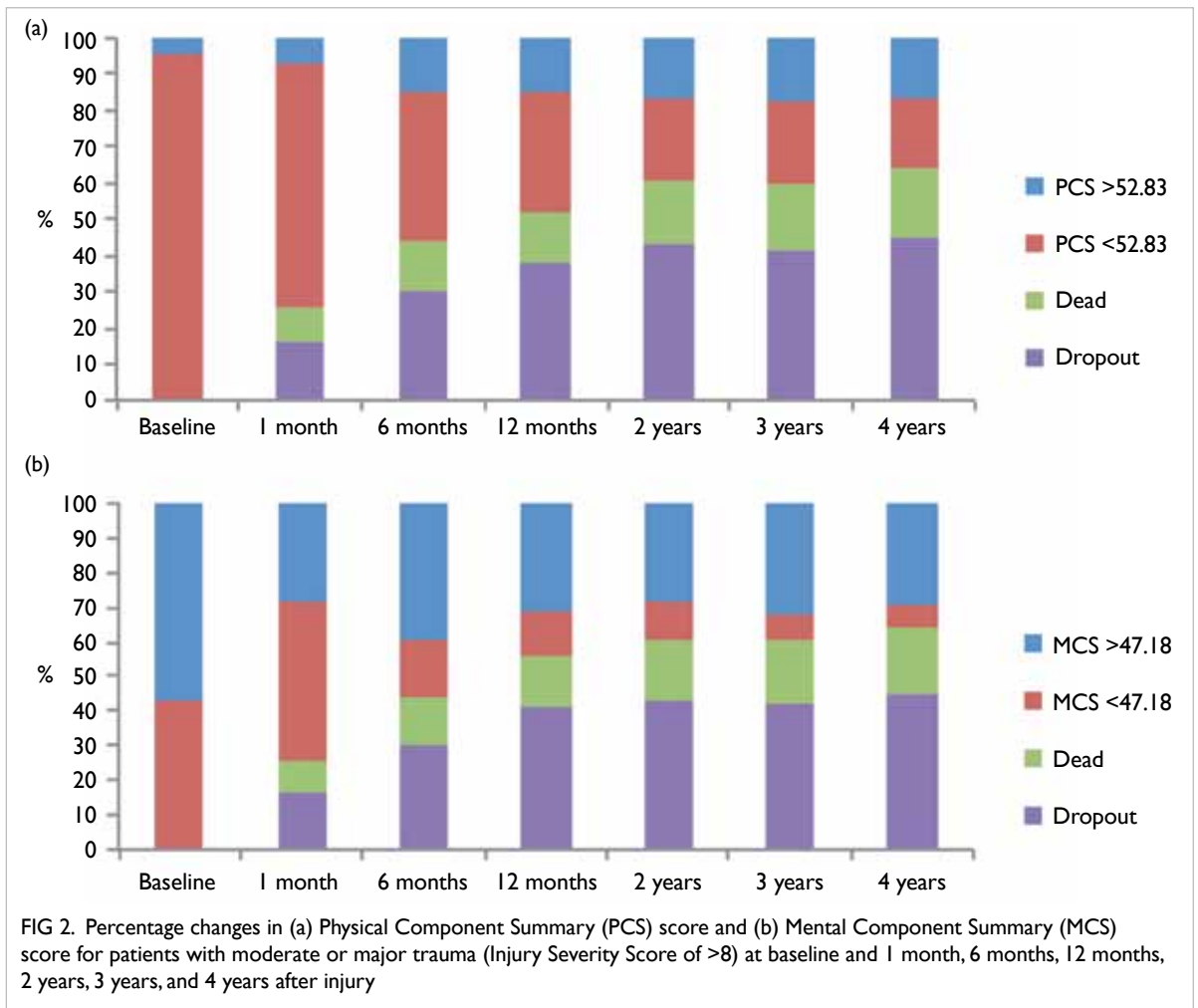


FIG 1. Percentage change in extended Glasgow Outcome Scale score for patients with (a) moderate or major trauma (Injury Severity Score [ISS] of >8), (b) moderate injury (ISS of 9-15), and (c) major injury (ISS of >15) at baseline and 1 month, 6 months, 12 months, 2 years, 3 years, and 4 years after injury



quality of life was associated with admission to the intensive care unit (odds ratio [OR]=2.267, 95% confidence interval [CI]=1.040-4.939, P=0.039), ISS of 26-40 (OR=3.231, 95% CI=1.208-8.643, P=0.020), baseline PCS (OR=0.940, 95% CI=0.894-0.988, P=0.016), 1-month PCS (OR=0.933, 95% CI=0.891-0.978, P=0.004), 6-month PCS (OR=0.904, 95% CI=0.861-0.949, P<0.0001), and 6-month MCS (OR=0.96, 95% CI=0.928-0.994, P=0.021).

The RTW status (at 4 years) was associated with total length of stay (OR=0.955, P=0.023), head injury with Abbreviated Injury Scale of <3 (OR=0.533, P=0.165), abdominal injury with Abbreviated Injury Scale of <3 (OR=2.910, P=0.0700), multiple injury sites (OR=0.481, P=0.100), normal Revised Trauma Score (OR=2.236, P=0.183), PCS at 1 month Q4 (OR=7.200, P=0.008), PCS at 1 month Q3 (OR=2.889, P=0.129), and MCS at 1 month (OR=2.571, P=0.158).

In the Kaplan-Meier curve for RTW status up to 4 years after injury, the RTW status for patients with ISS of 9-30 in the first 6 months was similar but then diverged. In patients with ISS of 13-19, 50% had RTW at 800 days, whereas those with ISS of 9-12 and 20-30 had RTW by 1250 days, and those with ISS of >30 had RTW at 1400 days (Fig 3).

Discussion

This study responds to the call that “efforts are needed to quantify the population burden of non-fatal injury and further our knowledge of the impact of trauma systems and trauma centre care on the quality of survival of trauma patients.” It provides important information about the effectiveness of the trauma system from three designated trauma centres in Hong Kong, giving patient-centred, health-related outcomes that allow comparison with trauma services globally.

In univariate analysis, predictors for long-term (4 years) poor quality of life were admission to the intensive care unit, ISS of 26-40, baseline PCS, 1-month PCS, and 6-month PCS and MCS. The rate of RTW increased from 21.1% at 1 month to 52.3% at 4 years. After adjusting for variable interaction, only 1-month PCS was predictive of 4-year RTW status. If a patient reaches a 1-month PCS of >50 (equivalent to the US norm), then the probability of RTW at 4 years is 75.0%. If a patient reaches a PCS of >52.8 (equivalent to the Hong Kong norm), then the probability of RTW at 4 years is 80%. A PCS of <50 at 1 month after injury gives a 50.7% chance of RTW at 4 years. A PCS of <52.83 at 1 month after injury gives 50.7% chance of RTW at 4 years as well. The combination of 1-month MCS and 1-month PCS cut-offs was associated with a differential probability of RTW at 4 years.

This study has several weaknesses. Only three of the five trauma centres were included so this may not reflect Hong Kong as a whole. The database was relatively small and the spread of data by injury severity and body region was limited. Nevertheless, data were of high quality. Our results do not allow us to comment on the role of rehabilitation and psychological services on RTW in Hong Kong, as many variables were not considered and may contribute to the final outcome.

It is important to note that improvement in

quality of survival did not appear to have reached a plateau at 4 years after injury. Further study is required for longer-term effects. Our results are representative of the long-term outcome of major trauma in most large geographical areas in Asia. More improved rehabilitation facilities would have improved the long-term outcome in this group of patients.

Conclusions

For patients in Hong Kong who sustained moderate or major trauma, 45% had an excellent recovery 4 years after injury, and ≤40% and ≤70% had achieved physical and mental health status above or equal to the Hong Kong norm, respectively. The 4-year post-trauma RTW rate for patients who survived the initial insult was 52.3%. Higher 1-month PCS was predictive of RTW within 4 years.

Acknowledgement

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