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REVIEW ARTICLE

MULTIDISCIPLINARY REHABILITATION IN PERSONS WITH MULTIPLE TRAUMA: A SYSTEMATIC REVIEW

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Objective: **To determine the effectiveness of multidisciplinary rehabilitation in improving functional and psychological outcomes in person with multiple trauma.**

Date sources: **A comprehensive literature review was conducted using medical and health science electronic databases up to February 2019.**

Data extraction: **Two independent reviewers selected studies, extracted data and assessed study quality using the Critical Appraisal Skills Programme (CASP) checklists and Grading of Recommendations, Assessment, Development and Evaluations (GRADE).**

Data synthesis: **One randomized controlled trial, 1 clinical controlled trial and 4 observational studies (1 with 2 reports) were included. Qualitative analysis was used to synthesize the evidence due to the heterogeneity of included trials. The quality of the studies varied (CASP approach); the majority were of "low quality". The findings suggest "very low to moderate" evidence (GRADE) for the effectiveness of multidisciplinary rehabilitation in improving functional ability and participation. The majority of studies ($n = 6$) reported functional improvements after multidisciplinary rehabilitation in the short-term.**

Conclusion: **The lack of "high-quality" evidence for multidisciplinary rehabilitation in improving outcomes following trauma highlights gaps in the available evidence, signifying the need for more robust studies.**

Key words: multiple trauma; multidisciplinary; rehabilitation; disability.

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LAY ABSTRACT

Trauma is major cause of death and disability worldwide. An increasing number of people survive multiple traumatic injuries due to improvements in emergency, surgical and trauma services. Rehabilitation is therefore necessary to maximize patients' function and successful societal reintegration. This study assessed the evidence from published clinical studies to determine the effectiveness of multidisciplinary rehabilitation in improving function in persons with multiple traumatic injuries. The findings suggest limited high-quality evidence to support multidisciplinary rehabilitation for improved function and quality of life. Further research with better study design is needed to justify multidisciplinary rehabilitation in the management of survivors of multiple trauma.

Multiple trauma is defined as "the presence of 2 or more injuries to physical regions or organ systems, 1 of which may be life threatening, resulting in physical, cognitive, psychological or psychosocial impairments or disability" (1). Trauma is a major public health issue and a leading cause of mortality, morbidity and long-term disability. The World Health Organization (WHO), estimates trauma contributes to ~10% of mortalities and an annual death rate of >5.8 million people worldwide (2, 3). Trauma is associated with moderate-to-severe disability for >45 million people, mainly in adults <45 years, causing a substantial loss of economically productive years (4–6). Furthermore, major trauma is increasing in the elderly population (7, 8). The cost of trauma is estimated at USD 671 billion/year and AUD 21 billion/year in the USA and Australia, respectively (4, 5, 9), with rehabilitation as the greatest cost contributor (10, 11).

Recent advances in acute trauma care have resulted in a greater survival rate. This may result in long-term psychological distress and/or physical impairment often associated with work disability (12). In Australia, 10% of trauma survivors had severe, and 28% had mild, limitations in core activities (e.g. mobility) and 45% had schooling/employment restrictions (5). This highlights the need for multidisciplinary rehabilitation (MDR) services within existing trauma care systems to minimize the burden of surviving injuries and improve functional outcomes and quality of life (QoL) of persons with multiple trauma (pwMT).

Rehabilitation assists pwMT to return to their home/community, live independently and participate in education, and the workforce (13). MDR is defined as "an inpatient, outpatient, home or community-based coordinated intervention, delivered by 2 or more disciplines in conjunction with medical input (rehabilitation medicine physician) that aims to limit patient symptoms, enhance functional independence and participation" (14). These disciplines may include

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nursing, physiotherapy, occupational therapy, speech pathology, social work or psychology.

Similar to the UK, Australia does not have a universal guideline for rehabilitation management in pwMT. However, in the UK, the National Institute for Health and Care Excellence (NICE) is developing a guideline for people with complex rehabilitation requirements after traumatic injury (15). Other countries (e.g. USA, Canada and New Zealand) also lack rehabilitation guidelines, highlighting the absence of an internationally agreed framework for the assessment of disability and function and an inconsistency in the rehabilitation management of pwMT (6).

Previous systematic reviews have highlighted the lack of "high-quality" evidence for MDR effectiveness in improving functionality and QoL of pwMT (6), as well as effective collaborative care rehabilitation for traumatic injury survivors (16). The gaps identified included the types of rehabilitation settings, modalities and duration of therapy, lack of effective care pathways and long-term neuropsychological or functional outcomes. These findings were akin to issues identified in interventions for people with complex neurological conditions, spinal cord injury and brain tumours (6, 17–19). To the authors' knowledge only 1 review evaluated the effectiveness of MDR in pwMT (6). Thus, the purpose of this study is to provide a comprehensive and updated systematic review on this topic.

The objective of this review is to determine the effectiveness of MDR in improving functional and psychological outcomes in pwMT.

METHODS

Data sources

A literature search was conducted using Cochrane Central Register of Controlled Trials (CENTRAL), Allied and Complimentary Medicine (AMED), Embase, MEDLINE, Latin American and Caribbean Literature on Health Sciences (LILACS), PUBMED, INFORMIT and CINAHL up to February 2019. A manual search of reference lists of potential articles, governmental and nongovernmental healthcare institutions' websites was also conducted. The grey literature search included: System for Information on Grey Literature in Europe (SIGLE), New York Academy of Medicine Grey Literature Collection, National Quality Measures Clearinghouse and Google Scholar.

The search was constructed in Ovid MEDLINE using a combination of multiple search items for 2 themes: multiple/poly trauma and rehabilitation (multidisciplinary). A combination of MeSH terms and keywords were used and translated to other databases. A full description of the search strategy can be found in Appendix 1 and Appendix 2.

Inclusion and exclusion criteria

Randomized controlled trials (RCTs), clinical controlled trials (CCTs) and observational studies ($n > 10$) in pwMT were included if: (*i*) patients were >18 years old; and (*ii*) MDR involved >1 intervention or discipline. No date, setting or interventions dosage restrictions were applied. Studies were excluded if: (*i*) focusing on isolated trauma (e.g. burns only), (*ii*) single discipline intervention/modality (e.g. physical exercise only), (*iii*) design other than RCT, CCT or observational studies ($n < 10$) (e.g. case reports), and (*iv*) non-English language.

Study selection

All studies identified through the search process and other sources were exported to an EndNote X9 (Clarivate, London, UK) database for removal of duplicates. Titles and abstracts were screened by RA and BA. Selected articles' full text was then screened independently by RA and BA using in/exclusion criteria. Any disagreements were resolved by consensus with FK.

Data extraction

Data extraction was performed independently by RA and BA using a standard pro forma, which included: design, date, country, sample size, demographics, outcome measures and intervention (type, intensity, domains, setting, delivery mode and duration).

Quality assessment

Due to the heterogeneity of the studies, a qualitative analysis was performed by RA and BA for best-evidence synthesis using Critical Appraisal Skills Programme (CASP) appraisal tools. Any disagreements were resolved through consensus (20, 21). The CASP tools for Cohort Studies and RCTs were used to assess the observational studies and clinical trials respectively (20, 21). One item from the CASP RCT and Cohort checklists "Can the results be applied to the local population?" and a second item from CASP Cohort Studies checklist "'Do the results fit with other available evidence?" were not included because the focus of this review was not tied to a specific local population and the purpose was to compare results across studies (20, 21). Risk of bias for each of the items from the checklists were scored as follows: yes (low = 1), no (high = 0), or cannot tell (unclear or unknown = 0). Total scores were used to grade the methodologic quality of each study and categorized as: "poor" (<5/10), "moderate" (6–8/10) and "high" (9–10/10).

The quality of evidence for each study outcome was independently assessed by RA and EC using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) tool and graded as "high", "moderate", "low" or "very low" (22, 23). Any disagreements were resolved through a consensus-based discussion.

RESULTS

Data synthesis

A total of 3,025 titles and abstracts were retrieved (Appendix 2); electronic database searches ($n = 2{,}982$) and other sources ($n = 43$). Forty-one abstracts met the preliminary eligibility criteria; however, 34 were excluded due to inappropriate study design ($n = 8$), no intervention ($n = 18$), uni-disciplinary intervention

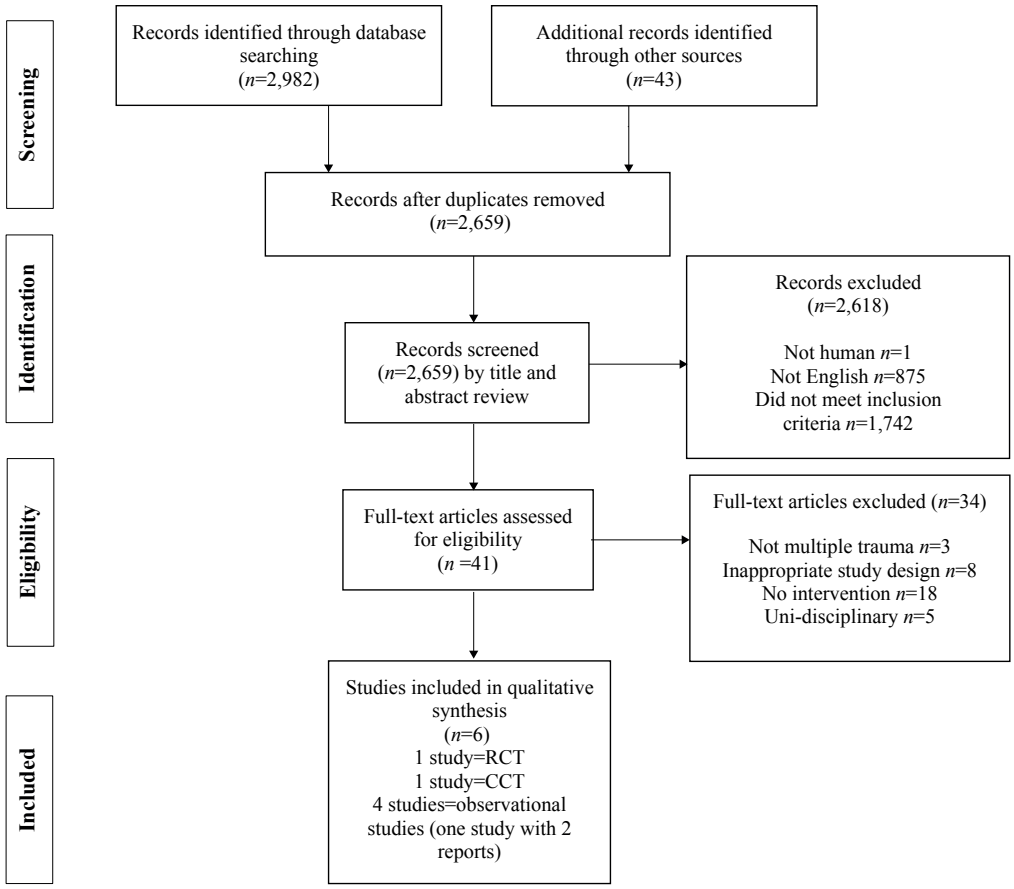

Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (*PRISMA*) flow diagram showing selection of article review. CCT: clinical controlled trial; RCT: randomized controlled trial.

($n=5$) or not multiple trauma ($n=3$). A total of 6 studies (1 with 2 reports) were finally included (1, 12, 24–28). A PRISMA flow diagram is presented in Fig. 1.

Characteristics of included studies

The characteristics of the included studies are summarized in Table I (1, 12, 24–28), which included 1 single-blinded RCT, 1 CCT and 4 observational studies (1 with 2 reports). Only 2 studies (1 with 2 reports) mentioned the total duration and intensity of the MDR programme, however, fail to specify modalities (24, 25, 28). Four studies (1 with 2 reports) included the type of allied health disciplines involved in the patients' care (24–28). No study provided information regarding "optimal dose" or type of modality. One study included follow-up assessment at 3 months and 8 years following discharge including the long-term sustainability of gains and participation related community re-integration (1). In addition, 2 studies evaluated psychological outcomes and QoL (26, 27).

Quality assessment of included studies

The mean CASP score (CASPs) was 4.3 (range 2 to 9/10). Only the RCT was rated as "high" quality (CASPs=9/10) (26), the CCT as "moderate" quality (CASPs=6/10) (27) and the four observational studies (1 with 2 reports) were rated as "low" quality (CASPs=2 to 5/10) (1, 12, 24, 25, 28). Detailed CASP scores are shown in Table II.

Quality of evidence

Four observational studies (1 with 2 reports) (1, 12, 24, 25, 28) and the CCT (27) were graded "low", as a higher risk of bias due to the study design. The 4 observational studies (1 with 2 reports) were further downgraded to "very low", suggesting high risk of bias, mainly driven by selection bias, lack of effect estimates and study power (1, 12, 24, 25, 28). The CCT was upgraded to "moderate" for demonstrating a large consistent effect and the absence of imprecision (27). The RCT was initially graded "high" as *a priori*

Table I. Characteristics of included studies

Study, author, year, country	Bouman et al., 2017 (27), The Netherlands	Czyrny et al., 1998 (28), USA	Gray et al., 2018 (1), USA	Sayer et al., 2008 (24), USA	Sayer et al., 2009 (25), USA	Siddharthan et al., 2008 (12), USA	Wu et al., 2017 (26), Australia
Study type, number of participants	Prospective multi-centre non randomised controlled study ($n=132$)	Retrospective cohort study ($n=33$)	Retrospective and prospective study (repeated measures of an inception cohort) ($n=44$)	Retrospective study; (total $n=188$; pwMT $n=169$)	Retrospective descriptive analysis ($n=188$)	Prospective cohort study ($n=116$)	Prospective single blinded RCT ($n=214$)
Participants demographics characteristics	All MT patients Male FT/CAU=65/67	Patients with MLT 19 males: 14 females	Military service members and veterans admitted to 1 of 4 national PRC inpatient sites. Mean age 27 years (19–48years); 91% males	Service members admitted to PRC during first 4 years of GWOT. 56% blast injuries with unique patterns of injuries (soft tissue, eye, oral, maxillofacial, otologic, penetrating brain injuries).	Acutely combat-injured service members with polytraumatic injuries.	Polytrauma patients with service-connected injuries	Pts sustained injuries related to road trauma and admitted to a major metropolitan trauma service in NSW 68% males 2 groups: minor/moderate injury (ISS 1–15) or serious/severe injury (ISS>15)
Study objective	To assess effects of health-related outcomes of FT multi-trauma rehabilitation service c/w conventional trauma rehabilitation service.	To assess the effects of acute care hospital-based rehabilitation in patients with MLT To determine if distribution of limbs involved has an effect on FIM or LOS.	To determine the effect of established polytrauma/TBI infrastructure on immediate post treatment functional gains, the long-term sustainability of any gains and participation-related community re-integration outcomes.	Describe characteristics and rehabilitation outcomes in patients who received IPR for blast and other injuries sustained in Iraq and Afghanistan during GWOT.	To describe the rehabilitation course after polytraumatic injuries during wars in and around Iraq and Afghanistan.	Effect of rehabilitation on improvement in function and cognitive abilities in pwMT.	To investigate the impact of an in-reach rehabilitation team for patients admitted after road trauma. To assess the effect of acute rehabilitation teams on patients' physical function and psychological status at (D) from hospital and at FU.
Interventions and setting	FT vs CAU FT=early rehabilitation physician treatment within 2 days from hospital admission, early start with specific non-weight bearing rehabilitation training, earlier MDT (SW and CP from week 1 of rehabilitation, monthly visit from trauma surgeon to rehabilitation centre)	MDR programme 3h/day of PT and OT (inpatient)	Inpatient MDR, outpatient therapies	MDR programme (inpatient) 3+hrs/day, 6–7 days/week acute rehab; PT, OT, RT, SandLP, psychology including NP, RN, SW and CM	MDR programme (inpatient) 3+hrs/day, 6–7 days/week acute rehab; PT, OT, RT, SandLP, psychology including NP, RN, SW and CM.	Interdisciplinary rehabilitation programme (inpatient)	Provision of rehabilitation services in parallel with ward-based therapy using an in-reach team for the intervention group vs control group=access to ward-based therapy (usual care).
Outcome measures	FIM(C) and FIM(M) QoL (SF-36) HADS MMSE Measured at baseline, 3, 6, 9 and12 months post trauma	FIM(M) at (A) and (D) LOS	FIM(C) and FIM(M) at (A) and (D), 3 months and 8 years post (D).	FIM(C) and FIM(M) LOS	Level of pain on (D). Assistive devices used during inpatient stay.	FIM Healthcare costs LOS	Acute LOS, % of patients requiring inpatient rehabilitation, FIM Times Up and Go, DASS-21 Barthel Index SF-12 v2 Measured prior to randomization. Above outcomes and OMSKQ measured at (D) form acute care, (D) from inpatient rehabilitation (if admitted). At 3 months post (D) for mild/moderate injuries and at 6 months for serious/severe injuries
Main findings	Significant FIM score gains between 0 and 3 months for both groups with ongoing improvement between 3– 6 months for FT and 3–9 months for CAU Significant improvement in SF-36 scores in both groups between 3 and 6 months FIM and SF-36 differed little between groups at any time point	Significant functional gains made between FIM(A) and FIM(D) Distribution of limbs no effect on outcome or LOS. 32 of 33 (D) home.	Mean LOS 52 days. Functional gains statistically significant increase from FIM(A) to FIM(D). Improvements maintained at 3 months. Participation-related outcomes collected for 23 patients during 8 year FU. 100% living in private residence. 48% retired or on disability. 17% employed and 35%=students or in special employment.	PTSD symptoms, auditory impairments more common. Mechanism of injury did not predict outcomes. LOS variable (blast injuries). Patients with low independence on admission made most progress but remained more dependent on (D). Shorter time from (A) a/w greater functional improvement.	$n=119$ discharged home or military base. Specific type of pain identified in $n=153$. All patients required at least 1 form of assisted device. Commonest requirement is the use of mobility devices with 122 needing at least 1.	Intensive rehabilitation treatment increased functional ability (selfcare domains). Inpatient costs >$4 million in 3 years, median cost per person $25000	Median acute care LOS=13 days Intervention group received more PT and OT sessions (median 16.0 vs 11.5 for control group) No differences in % of patients requiring inpatient rehabilitation, FIM, Times Up and Go, DASS-21, SF-12 v2 and OMSKPQ at hospital (D) and FU

(A): admission; a/w: associated with; (D): discharge; (C): cognitive; CAU: Care as Usual; FIM: functional independence measurement; c/w: compared with; FT: Fast Track; FU: follow-up; GWOT: Global War on Terror; HADS: Hospital Anxiety and Depression Scale; ISS: Injury Severity Score; LOS: length of stay; MMSE: Mini Mental State Examination; (M): motor; MT: multiple trauma; MLT: multiple limb trauma; NP: neuropsychology; OMSKPQ: Orbero MSK Pain Questionnaire; PT: physical therapy; PTSD: Post-Traumatic Stress Disorder; QoL: quality of life; OT: occupational therapy; PRC: Polytrauma Rehabilitation Centre; SandLP: speech and language therapy; RCT: randomised control trial; RN: rehabilitation nursing; RT: recreational therapy; SF-12v2: 12 Item Short-form Survey version 2; SF-36: Short-form 36 Health Survey; SW: social work; CM: case management; >: more than.

Table II. Quality assessments of individual studies (CASP[a] approach)

Clinical trials

Study	Clear focused issue	Adequate randomi-sation procedure	Participants properly accounted	Blinding of participants/ assessors	Groups similar at start	Groups treated equally	Large treatment effect	Precise treatment effect	Clinically important outcomes considered	Benefits worth harms and costs	CASP grade[b]
Wu et al., 2017 (26)	+	+	+	–	+	+	+	+	+	+	9/10
Bowman et al., 2017 (27)	+	–	+	_	?	?	+	+	+	+	6/10

Observational studies

Study	Clear focused issue	Appropriate cohort recruitment	Exposure accurately measured	Outcome accurately measured	Important Confounding factors accounted	Adequate follow-up	Strong exposure and outcome relation	Precise results	Believe the results	Implications for practice	CASP grade[b]
Czyrny et al., 1998 (28)	+	?	?	?	?	?	?		?	+	2/10
Gray et al., 2018 (1)	+	?	+	?	–	+	?	–	+	+	5/10
Sayer et al., 2008 (24)	+	+	?	?	?	–	?	–	+	?	3/10
Sayer et al., 2009 (25)	+	+	?	?	?	–	?	–	+	?	3/10
Siddhartan et al., 2008 (12)	+	?	?	?	–	–	–	?	+	?	2/10

[a]Critical Appraisal Skills Program's (CASP) critical appraisal tool for cohort studies. [b]The judgement of value given for each study is specifically based on the data related to this review. **One item from the CASP RCT and Cohort checklists "Can the results be applied to the local population?" and a second item from CASP Cohort Studies checklist "Do the results fit with other available evidence?" were not included because the focus of this review was not tied to a specific local population and the purpose was to compare results across studies. +: yes; –: no; ?: cannot tell.

ranking for study design, then downgraded to "very low" for single blinding and imprecision, and finally upgraded to "moderate" quality for demonstrating large consistent affect and dose response (26). The detailed GRADE assessments are shown in Table III.

Key findings

Four studies reported statistically significant functional gains in motor FIM at discharge after an inpatient MDR programme (p-value range =<0.01–0.05) (1, 12, 24, 28), of which 3 studies also showed cognitive FIM improvements (p-value =<0.01–0.5) (1, 12, 24). In addition, one study showed that both Fast Track and Care and Usual rehabilitation programmes were effective in improving functional status (total FIM score) ($p<0.0001$) and QoL (27). However, an earlier improvement was reported in the Fast Track group for functional gains between 3 and 6 months compared with Fast Track between 3 and 9 months, with no differential effects between both groups at 1 year (27). Only 2 studies (1 with 2 reports) mentioned the duration and intensity of MDR provided in an inpatient setting (24, 25, 28). Four studies (1 with 2 reports) included the type of allied health disciplines involved in the patients' care (24–28), of which one study included

Table III. Levels of quality of studies (GRADE approach[a])

	Bouman et al., 2017 (27)	Czyrny et al., 1998 (28)	Gray et al., 2018 (1)	Sayer et al., 2008 (24)	Sayer et al., 2009 (25)	Siddhartan et al., 2008 (12)	Wu et al., 2017 (26)
Bias risk	(–2); S and SD bias	(–2); S and SD bias	(–2); S and SD bias	(–2); S and SD bias	(–2); S and SD bias	(–2); S and SD bias	(–1); SD bias
Inconsistency	NS	NS	NS	NS	NS	NS	N
Indirectness	NS	NS	NS	NS	NS	NS	N
Imprecision	N	Y (–2); no EE or CI	Y (–2); No EE or CI	Y (–2); No EE or CI	Y (–2); No EE or CI	Y (–2); No EE or CI	Y (–2); No EE or CI
Publication bias	U	U	U	U	U	U	U
Upgrading							
Large consistent effect	Y	NA	NA	NA	NA	NA	Y
Dose response	NA	NA	NA	NA	NA	NA	Y
Confounders only reducing size effect	N	NA	NA	NA	NA	NA	NS
GRADE[b]	⊗⊗⊗○ Moderate	⊗○○○ Very low	⊗○○○ Very low	⊗○○○ Very low	⊗○○○ Very low	⊗○○○ Very low	⊗⊗⊗○ Moderate

N: no; Y: yes; NS: not serious; U: undetected; (–1): serious; (–2): very serious; NA: not available; CI: confidence interval; EE: effect estimate; S: selection; SD: selection design. [a]GRADE: Grading of Recommendations Assessment, Development and Evaluation. [b]The judgement of value given for each study is specifically based on the data related to this review.

the corresponding median number of sessions (70 vs 42.5 sessions for in-reach MDR vs usual care) (26). This study demonstrated a mean FIM improvement in both the intervention and control groups, but found no significant differences in in-reach MDR vs usual care in functional, psychosocial or pain outcomes at time of discharge or follow-up (26).

DISCUSSION

This review included both experimental and observational studies. The findings demonstrated a small number of methodologically rigorous clinical trials in this population. This is probably due to the clinical complexity, heterogeneity, diverse clinical presentation and disability of pwMT, which affects standardization of intervention characteristics, and the clinical outcomes used (18). This review examined the effectiveness of MDR in improving functional and psychological outcomes in pwMT.

Despite the recognition of the integral role of MDR in pwMT, the findings suggest a number of limitations in existing literature. Consistent with a similar review by Khan et al. conducted in 2012 (6), there is still a paucity of evidence to support the beneficial effect of the MDR in pwMT (1, 12, 24–28).

The included studies showed a marked heterogeneity in terms of characteristics, type and mode of delivery, treatment intensity and length of follow-up (1, 12, 24–28). The findings suggest that there is "very low to moderate" evidence for MDR in producing functional gains at both activity and participation levels (1, 12, 24, 26–28). Two clinical trials compared in-reach (26) and fast track (27) MDR to usual care of pwMT found no significant differences between the groups in functional or psychological outcomes at time of follow-up.

The existing outcome measures do not thoroughly describe the impact of major trauma on function, health and disability (6, 29). The FIM tool is used as an outcome measure in the 6 included studies (1, 12, 24, 26–28), is an indicator of a patient's level of disability dominated by physical disability and a basic assessment of cognitive and psychosocial disability (30). The FIM has also "floor" and "ceiling" effects, which impedes determining the real impact of MDR in pwMT (30). In this regard, the UK FAM extends the 18-item FIM by adding items for extended activities of daily living, physical, cognitive and psychosocial function, and may potentially be more sensitive in determining functional improvements (31). Other complementary tools may include the Trauma Outcome Profile (Germany) and Trauma QoL Measure (USA) (32–34) and WHO Disability Assessment Schedule II – 12 Item. However, these outcome measures require further validation in pwMT.

Similar to studies of in-reach stroke MDR programme (35), the included RCT (26) did not find benefit for in-reach rehabilitation for pwMT. This was attributed to methodological challenges and, possibly, the lack of resources on the surgical ward (26). Stratification of pwMT based on their initial motor and cognitive impairment, type, nature and pattern of injury should be considered in future research. There is also a need to determine optimal MDR approaches in different settings (acute, sub-acute and community), and effect on long-term outcomes (return to work, community re-integration). Future studies would benefit from greater clarity regarding the types, intensity and duration of therapy.

This review has some limitations. Due to the dominance of male participants in included studies, it was not possible to assess effects of sex (1, 12, 24–27). Limiting the search to English language articles may have introduced a risk of selection bias. The search identified a limited number of robust clinical trials (RCT and CCT); however, there are many challenges conducting such trials due to heterogeneity and diverse clinical presentation in this patient cohort. Furthermore, the "black box of rehabilitation" makes it difficult to determine the effectiveness of active components of MDR (e.g. type, modality, intensity or duration of intervention) (36). Furthermore, 3 included studies (1 with 2 reports) assessed MDR in veterans or war service members (1, 12, 24, 25). These are difficult to extrapolate to civilian trauma survivors, particularly in middle-to-low-income countries where there is a lack of funding and rehabilitation resources. We strengthened this review by placing no date restrictions, including a grey literature search, and by utilizing a comprehensive list of search terms.

CONCLUSION

There is "very low to moderate" evidence for the effectiveness of MDR in improving function and participation in pwMT. Robust studies are required using responsive appropriate outcome measures, and description of modality, intensity, frequency and duration of rehabilitation interventions; and models of care.

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Appendix 1. Key words and search terms for the search strategy

Key terms
- Multiple trauma
- Rehabilitation

Search Terms

Theme 1. Multiple Trauma

multiple traumas; traumas, multiple; wounds, multiple; multiple wound; multiple wounds; wound, multiple; polytrauma; polytraumas; trauma, multiple; injuries, multiple; injury, multiple; multiple injury; multiple injuries

Theme 2. Rehabilitation

rehabilitation, rehabilitation care, physical activity, exercise therapy, physiotherapy, home care, occupational therapy, dietetics, dietary services, nutritional services, counselling, educational activities, patient education, health education, social work, cognitive therapy, behaviour therapy, speech therapy, orthotics/brace/orthoses, cold treatment/cooling, assistive technology device, hydro/pool therapy, electromagnetic therapy, nerve stimulation, vibration therapy, vocational rehabilitation, telerehabilitation, multidisciplinary rehabilitation, interdisciplinary care, patient care team, multiprofessional team

Appendix 2. Search strategies

Embase (Ovid)

1974 to 13 February 2019

1	multiple trauma/
2	(multiple adj2 (trauma* or wound* or injur*)).ab,ti.
3	polytrauma*.ab,ti.
4	or/1–3
5	rehabilitation/
6	exp exercise/
7	dietetics/
8	exp counseling/
9	patient education/
10	social work/
11	cognitive therapy/
12	behavior therapy/
13	orthosis/
14	magnetotherapy/
15	electrotherapy/
16	patient care/
17	(((exercise or occupational or cognitive or behavi* or speech or electromagnetic or vibration or cold) adj2 therap*) or social work or patient educat*).ab,ti.
18	(((rehabilit* or physical activit* or physiotherap* or home care or dietetics or (dietary or nutrition*)) adj2 service*) or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*).ab,ti.
19	((interdisciplinary or multiprofessional or patient) adj2 team*).ab,ti.
20	or/5–19
21	4 and 20
22	limit 21 to (conference abstract status or embase status)

MEDLINE (Ovid)

1946 to 31 January 2019

1	Multiple Trauma/
2	(multiple adj2 (trauma* or wound* or injur*)).ab,ti.
3	polytrauma*.ab,ti.
4	or/1–3
5	exp Rehabilitation/
6	exp Exercise/
7	Dietetics/
8	exp Counseling/
9	Patient Education as Topic/
10	Social Work/
11	exp Cognitive Therapy/
12	Behavior Therapy/
13	exp Orthotic Devices/
14	exp Magnetic Field Therapy/
15	exp Electric Stimulation Therapy/
16	exp Patient Care Team/
17	(((exercise or occupational or cognitive or behavi* or speech or electromagnetic or vibration or cold) adj2 therap*) or social work or patient educat*).ab,ti.
18	(((rehabilit* or physical activit* or physiotherap* or home care or dietetics or (dietary or nutrition*)) adj2 service*) or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*).ab,ti.
19	((interdisciplinary or multiprofessional or patient) adj2 team*).ab,ti.
20	or/5–19
21	4 and 20

INFORMIT

1937 to 13 February 2019

(multiple !2 trauma*) OR (multiple !2 wound*) OR (multiple !2injur*) OR polytrauma*

PUBMED

1946 to 9 February 2019

1. ("multiple trauma"[MeSH Terms]) OR (multiple trauma*[Title/Abstract] OR multiple wound*[Title/Abstract] OR multiple injur*[Title/Abstract] OR polytrauma*[Title/Abstract])
2. (((((("rehabilitation"[MeSH Terms]) OR "exercise"[MeSH Terms]) OR "counseling"[MeSH Terms]) OR "patient education as topic"[MeSH Terms]) OR "social work"[MeSH Terms]) OR "cognitive behavioral therapy"[MeSH Terms]
3. ((((("behavior therapy"[mh:noexp]) OR "orthotic devices"[MeSH Terms]) OR "magnetic field therapy"[MeSH Terms]) OR "electric stimulation therapy"[MeSH Terms]) OR "patient care team"[MeSH Terms]
4. (((((((exercise therap*[Title/Abstract]) OR occupational therap*[Title/Abstract]) OR cognitive therap*[Title/Abstract]) OR behavio* therap*[Title/Abstract]) OR speech therap*[Title/Abstract]) OR electromagnetic therap*[Title/Abstract]) OR vibration therap*[Title/Abstract]) OR cold therap*[Title/Abstract]

5. ((((((((social work[Title/Abstract]) OR patient educat*[Title/Abstract]) OR counsel*[Title/Abstract]) OR orthotics[Title/Abstract]) OR brace orthoses[Title/Abstract]) OR cold treatment*[Title/Abstract]) OR cooling[Title/Abstract]) OR nerve stimulation[Title/Abstract]) OR telerehabilit*[Title/Abstract]
6. ((((((rehabilit*[Title/Abstract]) OR physical activit*[Title/Abstract]) OR physiotherap*[Title/Abstract]) OR home care[Title/Abstract]) OR dietetics[Title/Abstract]) OR dietary service*[Title/Abstract]) OR nutrition* service*[Title/Abstract]
7. ((interdisciplinary team*[Title/Abstract]) OR multiprofessional team*[Title/Abstract]) OR patient team*[Title/Abstract]
8. (#2 or #3 or #4 or #5 or #6 or #7)
9. #1 #8
10. publisher[sb] or "in process"[sb]
11. ("2018/12/31"[Date - Entrez] : "3000"[Date - Entrez])
12. medline[sb]
13. #11 #12
14. (#10 or #13)
15. #9 #14

AMED (Ovid)

1986 to January 2019

1. (multiple adj2 (trauma* or wound* or injur*)).ab,ti
2. (polytrauma* or polytrauma*).ab,ti
3. 1 or 2
4. (((exercise or occupational or cognitive or behavi* or speech or electromagnetic or vibration or cold) adj2 therap*) or social work or patient educat*).ab,ti
5. (((rehabilit* or physical activit* or physiotherap* or home care or dietetics or (dietary or nutrition*)) adj2 service*) or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*).ab,ti
6. ((interdisciplinary or multiprofessional or patient) adj2 team*).ab,ti
7. 4 or 5 or 6
8. 3 and 7

LILACS

No limits

(tw:(mulitple trauma* or multiple wound* or multiple injur*)) OR (tw:(polytrauma*)) AND (tw:(exercise or occupational therap* or cognitive therap* or behavi* therap* or speech therap* or electromagnetic therap* or vibration therap* or cold therap* or social work or patient educat*)) OR (tw:(rehabilit* or physical activit* or physiotherap* or home care or dietetics or dietary service* or nutrition* service* or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*)) OR (tw:(interdisciplinary or multiprofessional or patient care team*))

CINAHL

1 January 1937 to 31 January 2019

1. "Multiple Trauma/"
2. AB (multiple N1 (trauma* or wound* or injur*))
3. TI (multiple N1 (trauma* or wound* or injur*))
4. AB polytrauma*
5. TI polytrauma*
6. S1 OR S2 OR S3 OR S4 OR S5
7. (MM "Rehabilitation+")
8. Exercise
9. Dietetics
10. Counseling
11. Patient Education
12. (MM "Social Work+")
13. (MM "Cognitive Therapy+")
14. (MM "Behavior Therapy+")
15. Orthotic Devices
16. Magnetic Field Therapy
17. (MM "Electric Stimulation, Neuromuscular") OR (MM "Electric Stimulation+")
18. Patient Care Team
19. AB (((exercise or occupational or cognitive or behavi* or speech or electromagnetic or vibration or cold) N1 therap*) or social work or patient educat*)
20. TI (((exercise or occupational or cognitive or behavi* or speech or electromagnetic or vibration or cold) N1 therap*) or social work or patient educat*)
21. AB (((rehabilit* or physical activit* or physiotherap* or home care or dietetics or (dietary or nutrition*)) N1 service*) or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*)
22. TI (((rehabilit* or physical activit* or physiotherap* or home care or dietetics or (dietary or nutrition*)) N1 service*) or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*)
23. AB ((interdisciplinary or multiprofessional or patient) N1 team*)
24. TI ((interdisciplinary or multiprofessional or patient) N1 team*)
25. S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24
26. S6 and S25

CENTRAL

1980 to 2019

#1 ((multiple NEXT/1 (trauma* or wound* or injur*))):ti,ab,kw

#2 (polytrauma*): ti, ab, kw

#3 #1 or #2

#4 ((((exercise or occupational or cognitive or behavi* or speech or electromagnetic or vibration or cold) NEAR/1 therap*) or social work or patient educat*)):ti,ab,kw

#5 ((((rehabilit* or physical activit* or physiotherapy* or home care or dietetics or (dietary or nutrition *)) NEXT/1 service*) or counsel* or orthotics or brace orthoses or cold treatment* or cooling or nerve stimulation or telerehabilit*)):ti,ab,kw

#6 (((interdisciplinary or multiprofessional or patient) NEXT/1 team)):ti,ab,kw

#7 #4 or #5 or #6

#8 #3 or #7