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## Early physical and functional rehabilitation of trauma patients in the Médecins Sans Frontières trauma centre in Kunduz, Afghanistan: luxury or necessity?

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**Background:** In Afghanistan, Médecins Sans Frontières provided specialised trauma care in Kunduz Trauma Centre (KTC), including physiotherapy. In this study, we describe the development of an adapted functional score for patient outcome monitoring, and document the rehabilitation care provided and patient outcomes in relation to this functional score.

**Methods:** A descriptive cohort study was done, including all patients admitted in the KTC inpatient department (IPD) between January and June 2015. The adapted functional score was collected at four points in time: admission and discharge from both IPD and outpatient department (OPD).

**Results:** Out of the 1528 admitted patients, 92.3% (n = 1410) received at least one physiotherapy session. A total of 1022 patients sustained either lower limb fracture, upper limb fracture, traumatic brain injury or multiple injury. Among them, 966 patients received physiotherapy in IPD, of whom 596 (61.7%) received IPD sessions within 2 days of admission; 696 patients received physiotherapy in OPD. Functional independence increased over time; among patients having a functional score taken at admission and discharge from IPD, 32.2% (172/535) were independent at discharge, and among patients having a functional score at OPD admission and discharge, 79% (75/95) were independent at discharge.

**Conclusions:** The provision of physiotherapy was feasible in this humanitarian setting, and the tailored functional score appeared to be relevant.

**Keywords:** Function, MSF, Operational Research, Outcome measure, Rehabilitation, Trauma

### Introduction

Trauma represents an important burden in low and middle income countries (LMIC).<sup>1</sup> Increased quality of care has led to a higher survival rate of severely injured patients, leaving more individuals with long term disabilities.<sup>2</sup> Functional recovery is critical in LMIC, as the individual's physical capacities

influence their ability to access essential services and support their family—particularly so in crisis contexts, where the environment is exceptionally challenging.<sup>3</sup> However, physiotherapy services are usually scarce in LMICs and not systematically implemented within trauma teams,<sup>4,5</sup> despite strong recommendations for early rehabilitation and continuum of care at community level.<sup>6,7</sup> Two recent literature reviews on 'injury

and rehabilitation in crisis contexts<sup>8,9</sup> outlined the lack of evidence-based literature in LMIC, and in particular, the tendency towards having studies focusing on one particular medical condition or body region (i.e., spinal cord injury,<sup>10</sup> amputation,<sup>11</sup> lower limb injury<sup>12</sup>), a lack of consensus on outcome measures,<sup>9</sup> and the strong focus on surgical and medical care (versus rehabilitation).<sup>8</sup>

Monitoring of trauma care programmes has traditionally focused on indicators such as mortality, complications (i.e., infection, mal-union), and length of hospital stay, with limited attention to functional recovery.<sup>13,14</sup> Over the past decades, and only more recently in the humanitarian field, there has been a progressive switch towards assessing patient functionality, both for management of individual patients and for monitoring and evaluation of surgical and rehabilitation programme performance.<sup>13-15</sup> Different tools have been validated for this purpose, including generic tools such as the Functional Independence Measure (FIM), the Barthel Index, the European Quality of Life 5D (EQ-5D) and the Short Musculoskeletal Function Assessment (SMFA); or body region/condition-specific tools such as the Disability Arm Shoulder and Hand score (DASH) and the Harris Hip Score (HHS). Limitations of their use in trauma care have been underlined: generic tools may not be sensitive enough for all conditions, while condition-specific tools may be challenging when dealing with various types of trauma and the multiple injured.<sup>16,17</sup> Moreover, none of those tools were designed for emergency humanitarian contexts,<sup>4</sup> and are seen as impractical in such contexts, due to either their lengthy administration time, requirement for trained staff, lack of intercultural validity, and inadequacy for largely illiterate populations in the case of self-reported tools (e.g., SMFA).<sup>18</sup> The lack of adapted tools represents a challenge to patient management and programme monitoring and evaluation. In response to this gap,<sup>4</sup> Handicap International has adapted existing measures to design a tailored, simplified tool, allowing assessment of functional recovery of complex trauma patients in humanitarian settings.

In the conflict context of Afghanistan, Médecins Sans Frontières (MSF) initiated a partnership with Handicap International in 2011 to integrate physiotherapy in the Kunduz Trauma Centre (KTC), where this adapted functional score was introduced.

This study was therefore conducted to describe the characteristics of trauma patients who received physiotherapy care in KTC and the feasibility of providing such care in a resource-limited setting, as well as describe the relevance of the adapted functional score and the evolution of functional recovery among patients at KTC.

## Materials and methods

### Study design and setting

This was a retrospective cohort study, using routinely collected program data.

MSF opened KTC in 2011 in the Kunduz province of Northern Afghanistan. The province has about one million inhabitants and is an area of active conflict, particularly following the withdrawal of foreign troops from 2012. In KTC, care was provided to all trauma cases presenting within 30 days of injury,

regardless of the cause of injury (violent trauma, road traffic accidents, domestic injuries) and the type of trauma, with the exception of patients with burns or spinal cord injuries, who were referred to other health centres. The package of care comprised an emergency department, operating department providing bone fixation (internal and external), intensive care unit, inpatient department (IPD) and outpatient department (OPD), as well as mental health and physiotherapy services, provided both in IPD and OPD. KTC was the only specialised trauma centre functioning in Northern Afghanistan; however, the US bombing of the hospital on 3 October 2015, during which 42 people lost their lives, destroyed essential parts of the hospital and brought an end to these services, denying the population access to quality trauma care.

### Physiotherapy programme

The physiotherapy department was set up in KTC in October 2011, in a country where, even though physiotherapy is a growing field,<sup>19</sup> physical and functional rehabilitation services are still not widely available at hospital or community level. By 2015, the department was managed by a team of eight national physiotherapists, providing rehabilitation care in IPD (including intensive care unit) and OPD, to trauma patients with reduced mobility (of one or several limbs), post-surgery and/or breathing difficulties. Their objective was to allow patients to regain function and to prevent secondary complications, through the provision of physical and functional rehabilitation, including education of caregivers. Patients were discharged from OPD physiotherapy care once the functional goals set by the multidisciplinary team were reached.

### Physiotherapy indicators

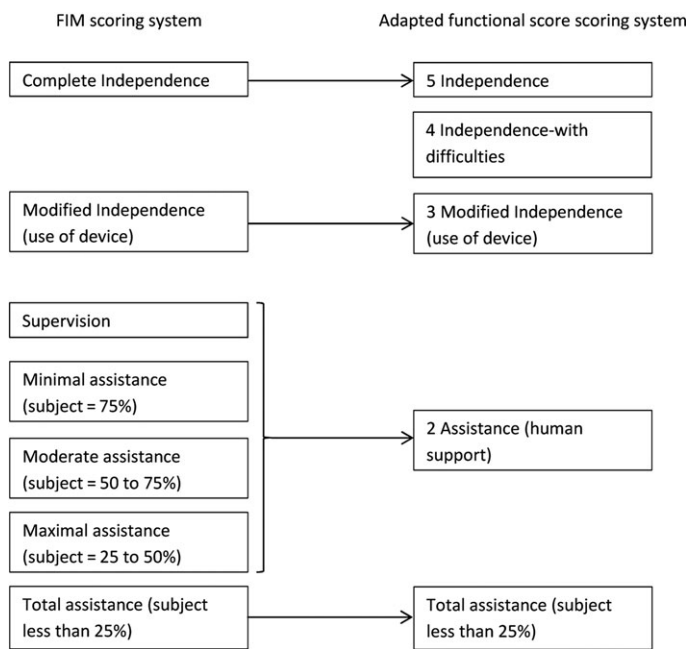
Physiotherapists were trained on performing a full physiotherapy assessment, assessing the patients' physical and functional limitations, in order to tailor the treatment plan.

Functional independence was measured by direct observation, assessing the affected limb function, and relied on a tool adapted from the FIM in order to be culturally adapted and sensitive to changes in trauma patients, as explained in Box 1 and Figure 1. The tool was first implemented in 2011, and underwent several iterations of evaluation and re-implementation since, in dialogue with the national physiotherapy team. However, it has not undergone a formal validation process as yet. In total, 20 items were included in the score, divided into two sub-scores for the upper and lower limb function, respectively; this allows more sensitivity in case only one limb was injured, while the total score allows assessment of the patient as a whole. The full score ranged from 10 to 100, where a low score indicated high dependence, stratified in four categories: high dependence (20 to 39), moderate dependence (40 to 59), mild dependence (60 to 79) and independence (80 to 100). The functional score is shown in Box 2. Both sub-scores were recorded for all patients at the first and last physiotherapy session in IPD and OPD.

Since pain can considerably influence function and recovery,<sup>20</sup> which is not reflected in the functional score, we chose to

**Box 1.** Adaptations done to the Functional Independence Measure (FIM), to obtain an adapted functional score for Afghan acute trauma patients

- (1) Simplification of scoring system (see Figure 1)
- (2) Addition/adaptation of items:
  - Cultural adaptation: addition of activities important to Afghan daily life: squatting (used in social life and self-care) and kneeling (used in social life and praying); and adaptation of items: eating with hands, washing body parts (the Afghans rarely use shower/tub)
  - Specificity of upper limb: addition of items to cover full functional range of motion (washing back, carry overhead), to assess fine motor tasks independently of elbow and shoulder (opposition of the fifth finger; grabbing a cup; grabbing a pen) and assess hand strength (opening a jar).
  - Specificity of lower limb: addition of items to cover the increased functional range of motion required in Asia/Middle east (i.e., squatting and kneeling); given the acute trauma settings and the context, items were split up to provide more precision (climb up and down stairs, bed mobility items); and one item was added (walking around over 50 meters).
- (3) Suppression of items (sphincter control and cognitive items): importance of those items are recognized, but were assessed only when appropriate, and in concertation with other team members.



**Figure 1.** Scoring system of the adapted functional score, adapted from the scoring system used in the Functional Independence Measure (FIM).

assess pain dynamically, asking the patient to score their pain while performing activities adjusted to their activity level. Pain was assessed using a simplified version of the pain sub-scale of the University of California, Los Angeles (UCLA) shoulder scale, an outcome measure designed initially for shoulder. This functional pain sub-scale was considered to be appropriate for trauma patients, regardless the site of trauma, and it was thus empirically taken in use; however such use of the sub-scale had not been previously reported. The sub-scale was simplified; the functional pain was graded in six categories according to frequency and intensity of pain in relationship with different

degrees of functional activities: no pain (0), occasional and slight pain (1), pain present during heavy activities (2), pain present during light activities (3), pain always present, but bearable (4), and pain always present, unbearable (5).

### Study population

This study included all patients admitted to KTC between January and June 2015. Patients were categorised by type/site of trauma: lower limb fracture (LLF; including pelvis fracture), upper limb fracture (ULF; including scapula and clavicular fracture), traumatic brain injury (i.e., patients diagnosed with traumatic brain injury, no matter their Glasgow Coma Scale [GCS] at admission), multiple injury (i.e., patients with either more than one fracture, or those having traumatic brain injury together with at least one fracture) and other trauma (e.g. open wound, sprain, dislocation, internal injury, and contusion). When assessing the evolution of functional recovery of patients, ‘other trauma’ cases were excluded, as the group was considered too heterogeneous. Functional recovery was assessed separately in IPD and OPD, and only in patients with the respective admission and discharge functional scores. We excluded patients with less than 2 days inpatient stay and patients with less than 6 days in the outpatient programme.

Since the data was anonymised and routinely-collected, consent was not required.

### Data analysis and statistics

Data was sourced from the existing standardized electronic registers used in the different departments (emergency department, operating department, IPD, intensive care unit, OPD, physiotherapy). The data was compiled from these sources into a designated Excel database (Microsoft Excel spreadsheet software, Microsoft Corp., Redmond, WA, USA). Frequencies and proportions, and where applicable means and SD or medians and IQRs, were generated. Comparison between proportions was

**Box 2.** Adapted Functional Independence Measure used with acute trauma patients, in the Médecins sans Frontières Kunduz Trauma Centre

Lower limb sub-score		Upper limb sub-score	
<b>Locomotion:</b>			
Walk around (less than 50 meters)	1 2 3 4 5		
Walk around (over 50 meters)	1 2 3 4 5		
Go up stairs	1 2 3 4 5		
Go down stairs	1 2 3 4 5		
<b>Transfers:</b>			
Sit up	1 2 3 4 5		
Stand up	1 2 3 4 5		
Sit down	1 2 3 4 5		
Lie down	1 2 3 4 5		
<b>Toilet:</b>			
Full squat	1 2 3 4 5		
<b>Pray:</b>			
Kneeling (sitting)	1 2 3 4 5		
TOTAL Lower limb sub-score	___/ 50		
		<b>Upper limb sub-score</b>	
		<b>Hygiene:</b>	
		Wash your back	1 2 3 4 5
		<b>Dexterity:</b>	
		Grab cup of tea	1 2 3 4 5
		Open a jar	1 2 3 4 5
		Opposition thumb-5th finger	1 2 3 4 5
		Grab pen	1 2 3 4 5
		Eating	1 2 3 4 5
		<b>Upper limb activities:</b>	
		Carry object overhead	1 2 3 4 5
		Comb hair	1 2 3 4 5
		Put on pants	1 2 3 4 5
		Put on shirt	1 2 3 4 5
		TOTAL Upper limb sub-score	___/ 50

performed using the  $\chi^2$  test;  $p < 0.05$  was considered significant. Analysis was performed using EpiData Analysis v.2.2.2. (EpiData Association, Odense, Denmark) and Stata v.12 (StatCorp, College Station, TX, USA).

## Results

### Socio-demographic and clinical characteristics

A total of 1528 patients were admitted to KTC during the study period, and 1410 (92.3%) received at least one physiotherapy session (Table 1). Among the patients receiving physiotherapy, the majority were male (82.1%; 1158/1410) and 42.6% (601/1410) were children aged <18 years. One thousand and eighty-one patients (76.7%; 1081/1410) were triaged in the emergency department as in need for immediate attention due to the severity of their injuries, using the South African Triage Scale (SATS).<sup>21</sup> The main cause of injury was accidental trauma (60.2%; 848/1410). The majority of patients (52.0%; 733/1410) had a single limb fracture, 30.3% (427/1410) had a lower limb fracture, 21.7% (306/1410) an upper limb fracture. Of all, 70.6% (996/1410) underwent at least one surgical intervention.

### Provision of physiotherapy care

Out of the 1528, most of the patients (49.4%; 755/1528) received physiotherapy in both the IPD and OPD, 38.7% (591/1528) only in the IPD and 4.2% (64/1528) only in the OPD. Patients with accidental trauma ( $p = 0.0006$ ), lower limb fractures ( $p < 0.0001$ ), and multiple surgeries ( $p < 0.0001$ ) were more likely to receive physiotherapy.

A total of 10 500 physiotherapy sessions were provided to the 1410 patients, with a majority in IPD (74.1%; 7781/10 500), followed by OPD (19.1%; 2003/10 500) and intensive care unit (6.8%; 716/10 500). Risk factors for not having any follow-up

sessions in OPD included being a more severe case (red or orange triage score;  $p < 0.0001$ ), being aged 18–45 ( $p = 0.02$ ), having a traumatic brain injury or internal injury ( $p < 0.0001$ ), and having suffered violent trauma ( $p < 0.0001$ ). Patients not attending OPD physiotherapy were significantly more independent at IPD discharge than patients attending OPD (median 80 and 73, respectively). More specifically, patients with traumatic brain injury only receiving IPD physiotherapy tended to have higher GCS score and a relatively better IPD discharge functional score (median GCS 12, score 89) than patients with traumatic brain injury receiving both IPD and OPD physiotherapy (median GCS 8, score 78), however no significant difference was observed.

Out of the patients who received physiotherapy, 27.5% (388/1410) had only internal injuries and/or soft tissue injuries, and were excluded from subsequent analyses. Across the four remaining subgroups (1022), 966 patients received IPD physiotherapy, with the majority (61.7%; 596/966) receiving a session within 2 days of admission. Overall, patients received an average of 6.6 IPD/intensive care unit sessions, with a median length of stay of 5 days (IQR 3–10). Six hundred and ninety-six patients received OPD physiotherapy. The delay between the IPD discharge and the first OPD session varied: 31.8% (221/696) arrived in the OPD after one month of discharge while 36.9% (257/696) within two weeks. Patients received on average 2.5 OPD sessions, at a median of one every 3.1 weeks (IQR 1.9–4.9) (Tables 2 and 3).

### Evolution of functional recovery

A trend was observed towards functional independence and less pain throughout the course of IPD and OPD treatment (Figures 2 and 3) for each patient type, the increase in functional score of the affected limb was statistically significant. Out of 966 patients who received IPD physiotherapy, 954 (98.8%) had an IPD admission functional score, and 535 patients had a functional score taken at both IPD admission and discharge, as

**Table 1.** Socio-demographic and clinical characteristics, and physiotherapy care coverage of patients admitted to Kunduz Trauma Centre, between January and June 2015 (n = 1528)

Variable	Received physiotherapy n (%)	No physiotherapy n (%)
Total	1410 (92.3)	118 (7.7)
Sex		
Female	252 (17.9)	21 (17.8)
Male	1158 (82.1)	97 (82.2)
Age group		
<5	110 (7.8)	9 (7.6)
5–17	491 (34.8)	32 (27.1)
18–45	665 (47.2)	60 (50.9)
46–65	122 (8.6)	13 (11.1)
>65	22 (1.6)	4 (3.3)
SATS score		
Red	362 (25.7)	42 (35.6)
Orange	719 (51)	52 (44.1)
Yellow	326 (23.1)	23 (19.5)
Green	3 (0.2)	1 (0.8)
Cause of trauma		
Violent trauma		
Blast	219 (15.5)	28 (23.7)
Assault	43 (3)	10 (8.5)
Gun shot	300 (21.3)	28 (23.7)
Accidental trauma		
Road traffic accident	374 (26.6)	19 (16.1)
Other accidental	474 (33.6)	33 (28)
Type of injury		
Lower limb fracture	427 (30.3)	13 (11)
Upper limb fracture	306 (21.7)	25 (21.2)
Traumatic brain injury	118 (8.4)	15 (12.7)
Multiple injury	171 (12.1)	17 (14.4)
Internal injury	155 (11)	11 (9.3)
Other	233 (16.5)	37 (31.4)
Total surgical interventions		
0	414 (29.4)	56 (47.5)
1–2	798 (56.6)	61 (51.7)
>2	198 (14)	1 (0.8)
Fixation		
No fixation	1038 (73.6)	106 (89.8)
Only internal fixation	130 (9.2)	3 (2.5)
Only external fixation	229 (16.2)	9 (7.7)
Internal and external fixation	13 (1)	0 (0)

SATS: South African Triage Scale<sup>21</sup>

well as an IPD stay of at least two days. At IPD discharge, their mean functional score was 69 (SD 17), 32.1% (172/535) were independent, while 49.9% (267/535) patients remained with a mild dependence and 5.8% (31/535) were highly dependent. Patients with lower limb fracture and upper limb fracture tended

to have similar patterns, with the respective sub-score increasing over time, and the other sub-score rapidly reached the maximum. For patients with multiple injuries, both sub-scores and total scores evolved similarly, however those patients tended to be less independent than those with limb fractures, both at IPD admission and discharge. Patients with traumatic brain injury (n = 69) showed a different pattern, with proportionally more patients being independent (52%; 36/69) but also more patients being highly dependent (16%; 11/69) than in the other groups; independence was associated with a higher GCS score in these patients (data not shown). Patients with more than one injury of the same extremity had IPD admission sub-scores significantly lower than patients with only one injury (lower limb sub-score for patients with lower limb fracture[s], 16 and 21 respectively (p=0.001); upper limb sub-score for patients with upper limb fracture[s], 15 and 19 (p=0.04). While the majority of patients (43.4%; 227/523) were discharged from IPD with pain present only during heavy activities, 27.7% (145/523) had either no pain or only occasional and slight pain.

Out of 696 patients who received OPD physiotherapy, 490 (70.4%) had a functional score at OPD admission, with 95 patients having scores taken at both OPD admission and discharge and an OPD course longer than 6 days. Their mean total functional score at OPD discharge was 89 (SD 12), 79% (75/95) were independent, and no patients were highly or moderately dependent. However, patients with multiple injuries tended to be discharged with a lower score than those with upper limb and lower limb fractures. At OPD discharge, most (45%; 39/95) had either no or occasional/slight pain, and no patients experienced pain constantly.

## Discussion

To our knowledge, this is the first study focusing on early rehabilitation as well as functional outcomes of various types of acute trauma patients in an active conflict context. This study demonstrates the feasibility and need of the provision of physiotherapy in such setting, and the relevance of the use of the adapted functional score for trauma patients with different types of injury.

The integration of a team of physiotherapists within the MSF KTC allowed the provision of physiotherapy to the great majority of admitted patients (92%), in a context where physiotherapy is still rare within health facilities. In KTC, a multidisciplinary approach was applied throughout the patient treatment course, where physiotherapy service was widely used by the medical team, which confirms its relevance in such settings. To our knowledge, only Christian et al.<sup>22</sup> reported on physiotherapy provision for acute trauma patients in LMIC, only 17% of eligible patients received physiotherapy services in a Ghanaian trauma centre. Various barriers already reported in the literature might explain delays observed before the first OPD physiotherapy session and the low proportion of patients receiving OPD care: financial, geographical and security barriers hinder access to health care in Afghanistan.<sup>23</sup> Additionally, the lack of awareness or cultural beliefs of both patients and medical staff regarding the important impact of early rehabilitation care after IPD discharge probably further influenced OPD attendance.<sup>22</sup> This

**Table 2.** Characteristics of physiotherapy provision in Inpatient Department (IPD), for patients of the four subgroups, admitted to Kunduz Trauma Centre, between January and June 2015 in KTC (n = 966)

	LLF n (%)	ULF n (%)	TBI n (%)	MI n (%)	Total n (%)
Total	411 (42.6)	272 (28.2)	116 (12.0)	167 (17.3)	966
Time between admission and first IPD session (days)					
0–1	253 (61.6)	164 (60.3)	66 (56.9)	113 (67.7)	596 (61.7)
2–3	136 (33.1)	89 (32.7)	46 (39.7)	47 (28.1)	318 (32.9)
≥4	22 (5.4)	19 (7)	4 (3.4)	7 (4.2)	52 (5.4)
Number of IPD physiotherapy sessions					
1–4	190 (46.2)	209 (76.8)	51 (44)	56 (33.5)	506 (52.4)
5–9	116 (28.2)	47 (17.3)	34 (29.3)	59 (35.3)	256 (26.5)
≥10	105 (25.5)	16 (5.9)	31 (26.7)	52 (31.1)	204 (21.1)
LOS IPD (days)					
≤7	233 (56.7)	221 (81.3)	59 (50.9)	72 (43.1)	585 (60.6)
8–13	117 (28.5)	29 (10.7)	31 (26.7)	49 (29.3)	226 (23.4)
≥14	61 (14.8)	19 (7)	26 (22.4)	44 (26.3)	150 (15.5)
Missing	0	3 (1.1)	0	2 (1.2)	5 (0.5)

IPD: Inpatient Department; LLF: Lower limb fracture; LOS: Length of stay; MI: multiple injury; TBI: traumatic brain injury; ULF: Upper limb fracture

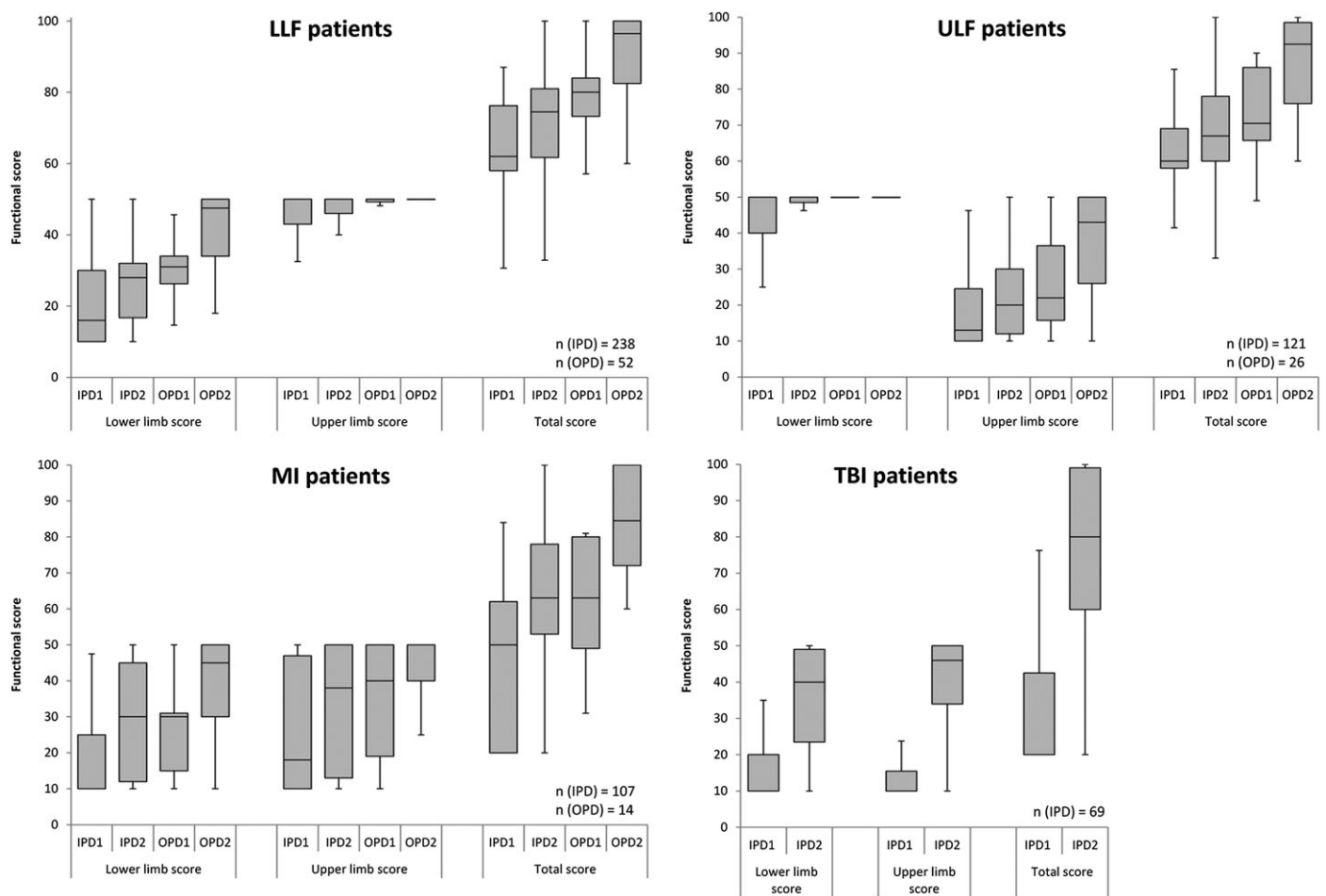
**Table 3.** Characteristics of physiotherapy provision in Outpatient Department (OPD), for patients of the four subgroups, admitted to Kunduz Trauma Centre, between January and June 2015 (n = 696)

	LLF n (%)	ULF n (%)	TBI n (%)	MI n (%)	Total n (%)
Total	309 (44.4)	225 (32.3)	43 (6.2)	119 (17.1)	696
Time between IPD discharge and first OPD session (days)					
0–14	127 (41.1)	51 (22.7)	34 (79.1)	45 (37.8)	257 (36.9)
15–29	80 (25.9)	92 (40.9)	6 (14)	36 (30.3)	214 (30.7)
≥30	102 (33)	79 (35.1)	3 (7)	37 (31.1)	221 (31.8)
Missing	0	3 (1.3)	0	1 (0.8)	4 (0.6)
Number of OPD sessions					
1–2	187 (60.5)	169 (75.1)	37 (86)	73 (61.3)	466 (67)
3–9	117 (37.9)	51 (22.7)	5 (11.6)	43 (36.1)	216 (31)
≥10	5 (1.6)	5 (2.2)	1 (2.3)	3 (2.5)	14 (2)
Length of OPD course (days)					
≤14	128 (41.4)	155 (68.9)	32 (74.4)	55 (46.2)	370 (53.2)
15–29	39 (12.6)	24 (10.7)	4 (9.3)	10 (8.4)	77 (11.1)
≥30	142 (46)	46 (20.4)	7 (16.3)	54 (45.4)	249 (35.8)

IPD: Inpatient Department; LLF: Lower limb fracture; MI: multiple injury; OPD: Outpatient Department; TBI: traumatic brain injury; ULF: Upper limb fracture

appears to be even evident in patients with traumatic brain injury, as observed by Zhang et al.<sup>24</sup> The heterogeneity of patients with traumatic brain injury, with various levels of severity, might have also played a role, with patients recovering faster from injury already in IPD, and therefore not considered in critical need of OPD treatment. Patients aged 18 and 45 years were

less likely to attend OPD, which could be explained by the competing priorities of such group to provide for their families. Based on SATS, more severe patients were less likely to receive OPD care; however, based on their functional score at IPD discharge, patients not attending OPD were those with a better independence, therefore potentially less in need of care. Home



**Figure 2.** Functional independence of four subgroups of trauma patients admitted to MSF Kunduz Trauma Centre between January and June 2015, at admission and discharge from IPD and OPD physiotherapy, using the adapted functional score.

n is the number of patients with both admission and discharge functional scores.

IPD: Inpatient Department; IPD1: admission to IPD physiotherapy; IPD2: discharge from IPD physiotherapy; LLF: lower limb fracture; MI: multiple injury; OPD: Outpatient Department; OPD1: admission to OPD physiotherapy; OPD2: discharge from OPD physiotherapy; TBI: traumatic brain injury; ULF: upper limb fracture.

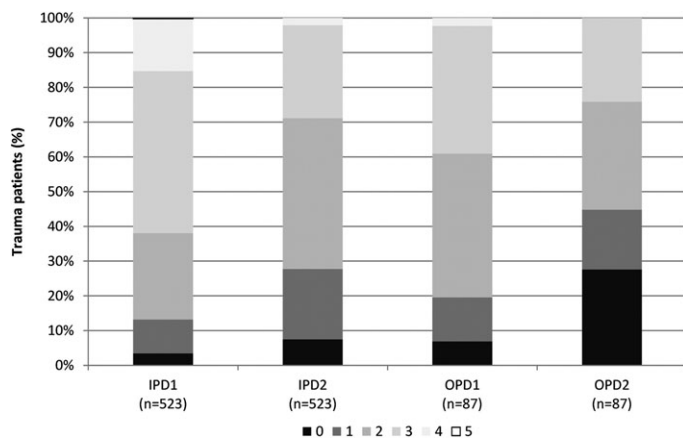
visits could have been appropriate to address some of the abovementioned barriers, but were precluded because of security constraints. Some local rehabilitation services were available at community level, but were not always specialised in acute trauma care management. A step-down facility, as defined by WHO as an inpatient facility to provide interim care for medically stable patients to prepare them for discharge into the community,<sup>6</sup> would allow provision of transitional multidisciplinary rehabilitation care and would be a great asset to such trauma centres, ensuring proper follow-up of the most severe cases.

The adapted functional score facilitated assessment of functional recovery and addressed the limitations of other validated scales. It is a generic tool, sensitive to changes in all types of trauma patients while maintaining specificity, as observed in patients with one limb fracture. It is shorter than most tools described in the literature, widely used by the team, and therefore, a practical routine tool. Finally, it is culturally relevant, being an observation based tool and encompassing important cultural activities. While not described here, it also helped in

goal setting and guidance over the course of treatment, as well as in the discharge process.

Restoring functional independence is one of the main objectives in trauma care. Overall, one must bear in mind that recovery from trauma is a multifaceted process, positive patient evolution cannot be entirely attributed to physiotherapy,<sup>25</sup> even though it has been proven to influence the outcomes.<sup>26</sup> Based on the adapted tool, most of the patients' function improved over the course of treatment. However, the scarce literature on functional outcomes of trauma patients in LMICs limits comparison with other various outcome measures, among different populations characteristics (age, gender, types of injuries) and type of rehabilitation care.<sup>10,12,24,26-28</sup> Holbrook et al.<sup>29</sup> has underlined that a patient can reach functional independence but still have a poor quality of well-being due to other factors, such as pain,<sup>13,26</sup> psychosocial distress and low level of social integration.<sup>29</sup> In our study, very few patients had constant pain in IPD, which decreased further over the course of OPD care – similar or better than other studies.<sup>13,30</sup>





**Figure 3.** Pain score of trauma patients admitted to MSF Kunduz Trauma Centre between January and June 2015, at admission and discharge from IPD and OPD physiotherapy, using adapted functional pain score. IPD: Inpatient Department; IPD1: admission to IPD physiotherapy; IPD2: discharge from IPD physiotherapy; OPD: Outpatient Department; OPD1: admission to OPD physiotherapy; OPD2: discharge from OPD physiotherapy. Pain score 0: none; 1: occasional and slight; 2: present during heavy activities; 3: present during light activities; 4: present always but bearable; 5: present always, unbearable.

The study's strengths include: the study population size was large compared to other studies in LMICs and it included trauma patients with various causes and types of injury, allowing better generalization. Moreover, this study took place in a setting with high quality medical and surgical care provided from the acute stages of trauma to after patient discharge. This study describes the functional recovery of trauma patients in a challenging conflict context; however, all patients received the same level of pre-physiotherapy care, in contrast with other contexts where pre-rehabilitation treatment varies (e.g., in the Syrian crisis,<sup>12</sup> and following natural disasters<sup>11,24</sup>). The functional score used in this study was a routine tool for years, and was thus adapted based on the reality on the ground; for most other studies, scores were only used under more controlled study conditions.

This study has some limitations including missing patient files, which is closely linked to the destruction of the hospital on 3 October 2015, where patient file archives were destroyed. This precluded analysis of the individual 20 items constituting the functional score and the intermediary scores collected between IPD admission and OPD discharge (not routinely encoded electronically). Another limitation was the decrease of population size from IPD to OPD, which hampered conclusions regarding OPD functional recovery. It is partially due to missing files but also to the low OPD attendance, particularly for patients with traumatic brain injury. Moreover, no information on patients' eligibility for physiotherapy was available, precluding the assessment of rehabilitation needs coverage. Patients were not assessed following a fixed schedule (as done in most of the prospective studies). Lastly, it must be noted that KTC provided a relatively high level of care compared to other settings in LMICs, therefore the present results may not be fully representative of such contexts.

Future studies should include assessment of outcomes at fixed schedules, including longer term outcomes (>1 year),

looking at different characteristics influencing these outcomes. Patients' eligibility for physiotherapy as well as physiotherapy provision should be documented in diverse LMICs settings, in order to assess the rehabilitation needs coverage. Other aspects of recovery such as quality of life, community integration, psychosocial factors and caregiver burden should also be taken into account in future research. The use of the UCLA pain subscale for trauma patients should be further documented, in comparison with other pain scores. To allow further development of the adapted functional score and its validation, future studies should include comparisons with validated tools, analysis of the performance of individual components of the tool to refine both the scoring system and its items. In addition, administration characteristics and evaluations across different cultures and contexts should be assessed (i.e., non-conflict LMIC setting or less resourced or specialised health facilities, but also at community level) to ensure its cross-cultural validity and generalizability. Furthermore, the tool needs to be more specifically evaluated among patients with neurological conditions.

## Conclusions

Given the feasibility and utilisation of physiotherapy in this context, the integration of physiotherapists within any trauma medical team is a necessity. Raising the awareness of medical teams on the importance of physiotherapy and the criteria for prescribing physiotherapy is essential to ensure a good quality of care, allowing patients' optimal functional recovery. Due to different barriers experienced by patients to access the OPD, physiotherapists should adjust their treatment goals accordingly, emphasizing education of patients and caregivers on basic rehabilitation. Moreover, a link with community based rehabilitation services is essential and, if appropriate, building up of their capacities to provide specialised physiotherapy to trauma patients is strongly recommended. The use of the adapted functional score was shown to be feasible for complex trauma patients with different types of injury in a humanitarian setting. The relevance of the adapted score requires further evaluation and validation in different settings, including in non-conflict LMIC settings, to tailor it to continual new challenges faced in humanitarian settings.

**Authors' contributions:** MMN, EW, MN and BG developed the adapted functional score; MMN, MN, BG were involved in the routine data collection and ensure its technical quality; MT, CVO, RVdB, EA, SC, PS, PF and BG were involved in the design of the project; RVdB and ES carried out data analyses. EA, RVdB, ES and BG drafted the first manuscript; PF, EW, PS, CVO, MT, SC, MMN, MN critically revised the manuscript. All authors read and approved the final paper. BG is guarantor of the paper

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