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**Context**

We conducted a scoping review of the recommendations in the literature for using disability outcomes to evaluate trauma care. The rationale behind this broad question was the increased use of disability outcomes in the evaluation of trauma care and the lack of consensus in the literature on how best to use these outcomes to evaluate care. Based on a review of disability outcomes in the literature, we attempted to use Porter’s framework\(^1\) as a basis for relating the multiple outcomes of trauma care to progress toward recovery after injury.

We explored 5 main domains of knowledge relevant to the study question: trauma care, rehabilitation, outcome measurement, injury and performance assessment. Articles included in the review were required to present objectives for the use of disability measures for evaluating care, but this did not need to be the focus of the paper. Diagnosis of clinical impairment was not a requirement for inclusion as a disability outcome. Manuscripts were initially screened by title and abstract to identify the literature focusing specifically on disability outcomes used or recommended for trauma care. Manuscripts were assessed using 2 criteria. First, does the article address an outcome relating to disability? Second, is the article written with the intention of using injury-related disability to evaluate trauma care?

We used 2 strategies for grouping outcomes reported in the reviewed studies into the framework developed by Porter.\(^1\) First, we created a list of search terms of relevant outcome constructs after review of the scope and context of the studies included in the review. These search terms were constructed using the language presented in the International Classification of Functioning, Disability, and Health (ICF).\(^2\) Second, we created search terms using examples of descriptive terms and statements published by the International Consortium for Health Outcomes Measures (ICHOM) for medical conditions other than traumatic injury.\(^3\) The list of terms used for classifying the manuscripts is shown in Table S1.

**Table S1. Trauma literature search terms used to classify outcomes of trauma care identified in the scoping review (part 1 of 2)***

<table>
<thead>
<tr>
<th>Domain</th>
<th>Dimension</th>
<th>ICHOM Description</th>
<th>Article keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health status achieved or retained</td>
<td>1. Survival</td>
<td>Did the patient die? If so, how and when?</td>
<td>Survival, Death, Risk-adjusted survival</td>
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<td></td>
<td></td>
<td>Cognitive limitation</td>
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<td>Motor limitation</td>
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<td>Impairments to mobility</td>
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<td></td>
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<td>Discomfort</td>
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<td>Emotional pain</td>
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<td>Impairments to self care or domestic duties</td>
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<td></td>
<td>Participation in social life and relationships</td>
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<td></td>
<td></td>
<td>Ability to perform work, go to school or perform other usual or physical activities</td>
<td>Anxiety, Depression</td>
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<td></td>
<td>2. Degree of health or recovery</td>
<td>The patient’s ability to perform activities shortly after treatment</td>
<td>Discomfort, Pain, Readmission, Reintervention</td>
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<td></td>
<td></td>
<td>Service coordination</td>
<td>Inappropriate care</td>
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<td></td>
<td></td>
<td>Delay to treatment</td>
<td>Medical error</td>
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<tr>
<td></td>
<td></td>
<td>Triage</td>
<td>Complication, Operative intervention</td>
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<td>Length of stay in hospital</td>
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<td></td>
<td></td>
<td>Delay to rehabilitation</td>
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<td>Process of recovery</td>
<td>3. Time to recovery and time to return to normal activities</td>
<td>Time spent waiting for or receiving care and speed of recovery</td>
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<tr>
<td></td>
<td></td>
<td>Service coordination</td>
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<td>Delay to treatment</td>
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<td></td>
<td></td>
<td>Transfer time</td>
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<td></td>
<td></td>
<td>Triage</td>
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<td></td>
<td>Length of stay in hospital</td>
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<tr>
<td></td>
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<td>Delay to rehabilitation</td>
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<tr>
<td></td>
<td>4. Disutility of care (e.g. adverse effects, complications, diagnostic errors)</td>
<td>Potentially avoidable adverse events caused by treatment</td>
<td>Discomfort, Pain, Readmission, Reintervention, Inappropriate care, Medical error, Complication, Operative intervention</td>
</tr>
</tbody>
</table>

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Table S1. Trauma literature search terms used to classify outcomes of trauma care identified in the scoping review (part 2 of 2)*

<table>
<thead>
<tr>
<th>Domain</th>
<th>Dimension</th>
<th>ICHOM Description</th>
<th>Article keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainability of health</td>
<td>5. Sustainability of health or recovery and nature of recurrences</td>
<td>The patient’s long-term ability to perform activities after the initial treatment</td>
<td>Cognitive limitation, Motor limitation, Impairments to mobility, Discomfort, Emotional pain, Impairments to self care or domestic duties, Participation in social life and relationships, Ability to perform work, go to school, or perform other usual or physical activities, Anxiety, Depression, Posttraumatic stress.</td>
</tr>
<tr>
<td></td>
<td>6. Long-term consequences of therapy</td>
<td>Long-term side effects of therapy that occur after the initial treatment</td>
<td>Inadequate care, Insufficient access to care, Loss of physical ability.</td>
</tr>
</tbody>
</table>

ICF = International Classification of Functioning, Disability, and Health; ICHOM = International Consortium for Health Outcomes Measurement.

*The domain and dimension headings were adapted from Porter’s original article. Article keywords and subject headings were developed from reviewing the literature and using the language of the ICF as well as outcomes classified for other medical conditions by the ICHOM.

In building our classification, we made a number of modifications to Porter’s original framework. First, we dropped dimensions defined by Porter if they were specific to morbidity and not disability. The lone exception was the inclusion of survival. Although survival is often measured as an indicator of morbidity, it is also measured in reference to a patient’s long-term course of rehabilitation, or return to normal activities or participation. One disability outcome instrument, the Glasgow Outcome Scale, has been used in this manner. Second, we dropped dimensions in instances where a corresponding disability outcome was not identified in the literature. Lastly, we created 2 new groups related to mental health outcomes following trauma that were not previously defined, but are emerging as key outcomes in the trauma literature relevant to patient recovery.

Evidence synthesis

We retrieved a total of 367 articles that had the potential to meet our search criteria. Using the screening criteria, 61 articles were selected for further review. An additional 18 articles were retrieved from the article references and 2 articles identified from manually searching journals, increasing this total to 81 manuscripts. Using our 2 search strategies, we classified outcomes presented in the studies into the 10 groups of outcomes shown Table 1 of the main commentary. A summary of the 30 manuscripts included in the review is provided below.

Swaine and colleagues applied the Functional Independence Measure (FIM), the Functional Independence Measure for Children (WeeFIM), and the Personal Adjustment and Role Skills Scale (PARS III) to youth with severe head injuries who required in-hospital rehabilitation therapy to assess whether early, well-coordinated provision of the various services thought to improve recovery yielded better outcomes than less well-coordinated programs.

Tepas and colleagues compared access time to rehabilitation clinics among patients with traumatic brain injuries (TBI) to assess whether increased delay between release from intensive care and initiation of comprehensive inpatient rehabilitation diminished functional outcomes. Outcomes were assessed between initiation and completion of inpatient rehabilitation with the FIM and the WeeFIM.

Glance and colleagues assessed functional outcomes in patients with blunt trauma at discharge from acute care to determine whether the assessment of a hospital’s quality of care depended on the choice of outcome measure: survival or survival combined with functional outcomes. Assessments were based on the modified FIM score.
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Vles and colleagues used the Glasgow Outcome Scale (GOS), EQ-5D (EuroQol health outcome instrument), and a measure of return to work and cognitive ability to assess postdischarge experiences among severely injured patients (injury severity score [ISS] ≥ 16) at least 1 year after discharge.

Livingston and colleagues evaluated aspects of postdischarge functional health and quality of life 2 years or more after TBI in relation to delays to rehabilitation following care and outcomes experienced while in care. Disability outcome measures included the FIM, the GOS, return to work and a measure of general health.

Sirois and colleagues measured the time to access rehabilitation by determining transfer delays caused by administrative barriers before patients were admitted to rehabilitation following acute care. Outcomes were measured with the FIM.

Potoka and colleagues applied a study-specific measure of functional status at time of discharge to assess outcomes among severely injured children (ISS > 15) according to the type of trauma centre where they were treated.

Parks and colleagues summarized the rate of return to work at multiple time points over a 3-year period among patients with TBI.

MacKenzie and colleagues assessed 1-year outcomes among persons treated for a lower limb injury according to the type of trauma centre where they were treated. Disability outcome measures included the mobility subscale of the Musculoskeletal Function Assessment (MSA), the 36-Item Short-Form Health Survey (SF-36), and the Center for Epidemiologic Studies Depression Scale Revised (CESD-R).

Gabbe and colleagues evaluated functional outcomes at 6 months after discharge from hospital among patients hospitalized following severe injury (ISS > 15). Outcome measures included the FIM, the modified FIM, the GOS, and the modified GOS.

Gabbe and colleagues assessed levels of functional ability and return to work at 6 months after injury among hospitalized trauma patients. Disability outcome measures included the modified FIM and return to work.

Gabbe and colleagues used the FIM, the King’s Outcome Scale for Childhood Head Injury (KOSCHI), the modified GOS, the Child Health Questionnaire Parent Form28 (CHQ-PF28), and the Pediatric Quality of Life Inventory (PedsQL) to identify subgroups of children and young adults who were severely injured (ISS > 15) and likely to benefit from early interventional rehabilitation.

Baldry Currens used the FIM and the rate of return to work to assess the rate of disability 1 year after injury among all trauma patients.

Michaels and colleagues used the Sickness Impact Profile (SIP), the SF-36, the Brief Symptom Inventory (BSI), and the Mississippi state-verified posttraumatic stress disorder (PTSD) assessment test at multiple time points within the first 12 months after injury to identify opportunities for early detection and treatment of pain among patients with major burn injury.

Holbrook and colleagues applied the Quality of Well Being symptom scale (QWB), the Center for Epidemiologic Studies Depression Scale (CES-D), and the Impact of Events Scale (IES) 12 and 18 months after discharge to assess changes in physical and psychological health among patients with significant head-related injury.

Jurkovich and colleagues recorded changes in SIP score at multiple time points after discharge during the first 12 months after injury among patients treated for unilateral lower-extremity fractures.

Heinemann and colleagues compared functional outcomes among SCI patients treated at specialized and nonspecialized hospitals, using the Modified Barthel Index (MBI) to measure the effect of care processes on postrehabilitation functional ability at 6 and 12 months after injury.

Rhodes and colleagues applied the GOS and a study-specific measure of employment status 4 years after injury to assess outcomes among patients with general trauma who required transfer by helicopter to a definitive care facility.

Battistella and colleagues applied the modified Katz Index of Independence in Activities of Daily Living (Katz ADL) functional assessment score to assess outcomes 6 months after injury in a review of aggressive resuscitation practices for elderly trauma patients.

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O’Flaherty and colleagues23 recorded changes in children’s functional ability using the Stanford Binet Intelligence Scale (SBIS), the Wide Range Assessment of Memory and Learning (WRAML), the Westmead Hospital Communication and Feeding Outcome Rating Scales (WORS), the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP), and the Peabody Development Motor Scales (PDMS) at multiple time points over a 2-year period to identify patients with TBI who would have benefited from inpatient rehabilitation services.

Pezzin and colleagues24 used the SF-36 for a 10-year follow-up assessment of patients who underwent amputation of a lower extremity followed by inpatient rehabilitation to assess whether psychosocial outcomes provided a suitable measure of the effectiveness of care.

Sirois and colleagues25 applied the FIM and 12-Item Short-Form Health Survey (SF-12) to adults who required rehabilitation following hospitalization over a 4-year period to assess whether outcomes could be attributed to variations in access to rehabilitation services.

Helling and colleagues26 used the FIM to retrospectively assess quality of trauma care in terms of functional outcomes among patients referred or transported directly to a trauma hospital following admission for moderate or minor injury (ISS > 9).

Brown and colleagues27 assessed FIM scores at hospital discharge among patients with Glasgow Coma Scale (GCS) score ≤ 12 who were treated at level I and level II trauma centres to assess the impact of early access to rehabilitation while in hospital.

Nirula and Brasel28 compared functional outcomes at discharge with survival rates at discharge to assess whether the evaluation of hospital performance would differ when determined with different measures. Functional outcomes were measured with the FIM for a cohort of patients with general injury.

Polinder and colleagues29 used the EQ-5D to compare outcomes among hospitalized and nonhospitalized trauma patients over multiple time periods during the first 2 years after injury.

Holbrook and colleagues30 used the QWB to assess complications experienced while in care in relation to differences in functional ability attained among persons with severe head injury (GCS > 11) at multiple time points in the first 18 months following injury.

Sluys and colleagues31 used SF-36 scores and complication rates among injured patients with an ISS ≥ 9 to assess whether outcomes from acute care were associated with health-related quality of life states up to 4 years after discharge.

Soberg and colleagues32 used SF-36 and WHODAS II disability scores to examine changes in functioning and quality of life at multiple time points within the first 2 years after discharge among a general injury cohort having ISS scores > 15.

van der Sluis and colleagues33 used study-specific functional, emotional and participatory instruments among an injury cohort with an ISS ≥ 16 for purposes of identifying aspects of a vocational rehabilitation program that would benefit long-term physical and social outcomes.

References


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