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Burden of treatment in the light of the international classification of functioning, disability and health: a “best fit” framework synthesis

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ABSTRACT

Purpose: This systematic literature review aimed to (1) summarize and explain the concept of Burden of Treatment (BoT) using the International Classification of Functioning, Disability and Health (ICF) terminology, and (2) inform the development of a future Comprehensive ICF Core Set for BoT.

Method: Searches on Embase, Medline, CINAHL and PsycINFO were conducted. Only qualitative studies were considered for inclusion. The screening and data extraction stages were followed by a “Best-fit” framework synthesis and content analysis, using the established ICF linking rules. Screening, data extraction, quality appraisal and data analysis were performed by two independent researchers.

Results: Seventeen studies were included in this review. The “Best-fit” framework synthesis generated 179 subthemes which identified that BoT impacts negatively on body functions and structures, restricts valued activities and participation and influences contextual factors through life roles, self-identity and relationships. The identified subthemes were linked to 77 ICF categories.

Conclusions: This study is part of the preparatory phase of a Comprehensive ICF Core Set for BoT and our findings will inform the further needed studies on this phase. The use of ICF terminology to describe BoT provides an accessible route for understanding this complex concept, which is pivotal for rethinking clinical practice.

> IMPLICATIONS FOR REHABILITATION

- Health professionals applying the ICF should consider the negative impact of interventions on patient's life roles and self-identity, body functions and structures and on valued activities and participation.
- Health professionals who may be concerned about the treatment burden being experienced by their patients can now use the ICF terminology to discuss this with the multidisciplinary team.
- Poor adherence to rehabilitation programs may be explained by an increased BoT. This phenomenon can now be mapped to the ICF, and coded using a framework well known by multidisciplinary teams.

Introduction

Patients' decisions regarding treatment options, such as which treatment to receive and how much they adhere to treatment recommendations, are related to the anticipated and actual experience of undertaking the treatment,[1] particularly the perceived burden of treatment (BoT).[2] BoT has been described as the increased demand experienced from performing self-care activities, undertaking treatment regimens and monitoring health outcomes.[3] It also includes the impact of treatment on patient functioning and well-being.[4] Increased BoT is associated with non-adherence, wasted resources, poor health outcomes, reduced quality of life and, ultimately, with increased mortality.[3–7] Health professionals therefore need to be sensitive to recognizing, understanding and reducing BoT, in order to balance the potential benefits and burdens of treatments and maximize adherence.[7,8]

The International Classification of Functioning, Disability and Health (ICF), developed by the World Health Organization, provides a framework for the description of health and health-related states within a common terminology.[9,10] This classification, with its four components (body functions and structures, activities and participation, environmental factors and personal factors) reflects the biopsychosocial model in a unified and coherent view of various dimensions of health (biological, individual and social).[10] The ICF proposes that patients are not a “passive receiver of medical care”.[11] Rather, their experiences of illness are more than just the direct impact of disease on body functions and structures (i.e., physiological systems or anatomical structures): they are influenced by the effect of health conditions on their ability to undertake valued activities (such as walking and dressing) and to participate in life situations (such as work, leisure and family). Each patient's illness experience is also influenced by both environmental factors (i.e., physical, social and attitudinal environment in which the patient lives, such as family support or wheelchair provision) and personal factors (i.e., attributes of the patient with an internal influence on functioning and disability, such as resilience or skills). The ICF captures these various perspectives of functioning, disability and health, and has been increasingly applied by healthcare professionals worldwide, as the reference framework for describing health according to the biopsychosocial model.[11]

The concept of BoT has not been previously aligned with the ICF framework; however, the conceptual connections are apparent. Patients' experiences and perceptions of BoT have been shown to relate to various factors such as fatigue or pain (body functions),[6,12] family circumstances, treatment design, health care systems (environmental factors) [4–8,12–16] and personal factors.[4–8,12–16] Many health professionals are familiar with and applying the ICF in research and clinical practice.[11] The ICF framework can therefore act as a useful tool for elucidating the complex concept of BoT. As a novel concept, BoT is receiving increasing attention in the literature [17,18] however, robust outcome measures, to cover the complexity of this concept across conditions are still being developed and fundamental understanding of this concept, based on the perspectives of patients and researchers, has been generated by qualitative studies.[4,18] Linking the findings from these studies with the ICF will inform future developments of an ICF Core Set for BoT.

The development of ICF Core Sets is recommended by the World Health Organization as they represent a list of categories specifically relevant for a health condition or context, promoting the applicability of the ICF in clinical practice.[19,20] ICF Core Sets are designed in comprehensive and/or short versions. The former are exhaustive lists of categories used to describe a health condition or context; the latter represent only the most essential of these categories.[20] Recent guidance on the development of ICF Core Sets has been published and recommends a three stage process: a preparatory phase, followed by an international ICF consensus conference and a last phase, which consists of the implementation of the first version of the ICF Core Set.[20] The preparatory phase includes a systematic literature review which aims to gather the perspectives of researchers and identify aspects of functioning that can then be linked to the ICF through the established linking rules.[9,20] The type and characteristics of the systematic review may vary in this preparatory phase.[20] In this particular case, it is important to consider that the concept of BoT is complex and recent in the literature,[3,18,21] and has not yet been widely linked to measurement tools.[22]

This systematic qualitative literature review aimed to (i) summarize and explain the concept of BoT using the ICF terminology, and (ii) inform the development of a future Comprehensive ICF Core Set for BoT. The results of this study will facilitate communication within multidisciplinary teams regarding BoT; allow the concept of BoT to be mapped to the ICF and therefore understood and recognized among more health professionals; and ultimately, inform the development of instruments/assessment tools of BoT.

Methods

This qualitative literature review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-

Analyses (PRISMA) statement, developed to promote optimal clarity, transparency and reliability of systematic literature reviews.[23] The following sections adopted the PRISMA terminology, with the necessary adaptations for a qualitative literature.

Eligibility criteria

Qualitative studies that focused on patients' experiences of BoT in any health condition were sought. The decision to only include qualitative studies was based on the need to gain a rich and deep understanding of "what" BoT is, from the perspective of both patients and researchers, and to then link this to "how" it is represented in the ICF. Therefore, studies met the inclusion criteria if they: (1) used both qualitative data collection and analysis methods; (2) contained the expressions "treatment burden" or "burden of treatment" in the title or abstract and (3) considered BoT as the main focus or included BoT in the research questions. Studies that may have contained the expressions "treatment burden" or "burden of treatment" only in the body of the paper, but not in the title or abstract, were excluded. This was used as an indicator of studies that have BoT as their main focus, and would therefore explore this topic in greater depth. Studies describing "burden of disease", "caregiver burden", "financial burdens to society or health services"; not written in English or Portuguese; and, those not including qualitative data were also excluded.

Search and information sources

The search was undertaken electronically in four different databases – Embase, Medline, CINAHL and PsycINFO – aiming to achieve an extensive search strategy that would cover the available studies focusing on BoT. The key words "treatment burden" OR "burden of treatment" were used in all the listed databases. No restrictions were established regarding treatment intervention, health condition, participant demographics, year of publication or study settings. No filters were used in any of the databases. The search was initially conducted in June 2012 and updated in December 2014.

Screening and study selection

Two blinded researchers screened the titles, abstracts and, when necessary, full texts of all studies to determine inclusion and exclusion and remove duplicates. In order to avoid early incorrect filtering of qualitative studies, no restrictions regarding paradigm were set on the databases and the identification of qualitative studies was undertaken manually, during the screening of titles and abstracts.[24]

Quality appraisal

The Critical Appraisal Skills Program Checklist for qualitative studies [25] was used to assess the quality of the included studies. Quality appraisal was initially performed independently, and then discussed and agreed, by two researchers [SH and KH]. An increasing body of evidence proposes that neither study design nor quality assessment scores should be used to exclude qualitative studies.[26,27] All studies were therefore included and analysed regardless of their design or quality score. Quality scores are provided to enrich the description of the included studies.

Synthesis of results

The extracted data were analysed using two methods: firstly a qualitative "Best-fit" framework synthesis; secondly a content analysis applying the ICF linking rules.[9] Both methods are described below. "Data" were defined as both direct primary quotations presented in the included studies and authors' analytical interpretations presented in either the results/findings or discussion sections. The use of both "quotations" and "analytical interpretations" as data for this literature review aimed to allow the gathering of a richer set of data to better illustrate the concept of BoT. This approach has been used in previous reviews of qualitative studies.[28]

"Best-fit" framework synthesis

"Best-fit" framework synthesis uses the conceptual categories of an existing model or theory to facilitate thematic data extraction and analysis. This synthesis method offers the means to test, reinforce and build on an existing published model, conceived for a potentially different but relevant population or context.[26,27,29] The ICF was selected as the model of "Best-fit" to explore how BoT may be conceptualized within a biopsychosocial perspective of health.[10] An *a priori* framework using the ICF components (body functions and structures, activities and participation, environmental factors and personal factors) was used to extract data from the included studies. NVivo software

(v0).10 QSR International Pty Ltd., Melbourne, AU) was used to aid data management.

Framework analysis allows a description of both *a priori* and newly emerged themes. Following extraction, data attributed to the *a priori* framework were further thematically analysed, grouping similar issues to generate a list of emergent themes and subthemes. For instance, the quotes “*One individual adopted a more generally sedentary lifestyle to prevent symptoms rather than undertake physical activity alongside their peers*” [16] and “*Fatigue alongside breathlessness and cough, was reported as a factor limiting ability to keep up with peers, and also as a cause of low motivation*” [16] were both coded under the theme “Participation linked to body functions and structures” and the sub-theme “Symptoms limiting participation with peers”.

The themes and subthemes and the links and conflicts between them were thereafter used to explain the concept of BoT from the perspective of the ICF.

Content analysis following the ICF linking rules

Content analysis, applying the ICF linking rules,[9] was undertaken to classify the subthemes generated as previously described, against the most appropriate ICF category. According to these rules, meaningful concepts should be extracted from a text prior to assigning the ICF categories.[30] The example below, extracted from the analysis, illustrates this process:

The subtheme (generated by “Best-fit” synthesis) “*Having a routine as a strategy to reduce treatment workload and promote adherence*” was analysed and the following meaningful concepts were identified: (i) “*having a routine as a strategy to reduce treatment workload*”; (ii) “*having a routine as a strategy to promote adherence*” and (iii) “*reduced workload promotes adherence*”.

Two researchers experienced in using the ICF and with a deep understanding of the concept of BoT [ACG and CJ] independently linked the meaningful concepts to the appropriate ICF categories. The example above was coded as d230 (carrying out a daily routine); the concepts “treatment workload” and “adherence” were coded as not covered by the ICF and the concept “*having coping strategies*” was coded as personal factors. The agreement between the codifications of both researchers was calculated with Cohen’s Kappa statistics,[31] using IBM SPSS statistics (Version 21, IBM Corp. Released 2012, Armonk, NY). The strength of agreement associated to the Cohen’s Kappa statistics can be classified as poor (<0), slight (0.00–0.20), fair (0.21–0.40), moderate (0.41–0.60), substantial (0.61–0.80) or almost perfect (0.81–1.00).[32] Any disparities were discussed by the same researchers, a third party [SHD] resolved disagreements and a final list was generated.

Results

Study selection

The search generated 1736 studies. Once duplicates ($n = 590$) were removed, 1146 abstracts and titles were screened; 378 full texts were considered for eligibility. Studies not using qualitative methods ($n = 167$), or not exploring patients’ perspective of BoT ($n = 194$) were excluded. Seventeen studies met the inclusion criteria and were included in this review. A PRISMA flow chart illustrating the study selection process is presented in [Figure 1](#).

Study characteristics

The samples of the included studies show a wide range of ages (from 7 to 96 years old), health conditions and countries. Further details about the included studies can be found in [Table 1](#).

The quality scores regarding aspects such as recruitment, data collection, validity, methodology, relationship between researchers and participants, ethical issues, data analysis and relevance of the findings were considered high in all included studies. However, the “relationship between researchers and participants” and a detailed discussion of “ethical issues” were often less clear.

ICF components applied to the concept of burden of treatment: best-fit framework synthesis

Burden of treatment and body functions and structures

All studies reported BoT experienced as either physical and/or emotional side effects. Applying the ICF, these side-effects can be considered as treatment induced impairments to body functions and structures additional to those

generated by the disease itself. These included pain, fatigue and nausea and altered emotional functions, such as feeling anxious or depressed. For instance, patients using Percutaneous Endoscopic Gastrostomies described a large range of treatment generated physical impairments:

Blockage, leakage, site infection, tube falling out, emesis caused by excessively rapid infusion of feed, sleep difficulties due to noise from machines, bleeding from PEG [Percutaneous Endoscopic Gastrostomies] sites when coughing, and malodorous leakage from the stoma. Feeling sick and terrible coughing that leads to vomiting, nausea, regurgitation or heartburn (. . .) [and] abdominal pain.[8]

The included studies also described the increased treatment workload (BoT), which was frequently required in order to manage the side-effects (impairments in body functions and structures) generated by the treatments.

The primary issue during the first injections was adjusting to the cycle of symptoms and 'side effects'. [12]

Finally, impairments in body functions and structures often reduced patients' physical capacity to engage with the recommended treatment requirements. For instance a patient with diabetes, stated:

I was supposed to look at my feet once a week but I can't see my feet because of my poor vision.[4]

Treatment induced impairments were also frequently reported as contributing to restrictions in patients' activities and their ability to participate in life roles, and it was the impact of treatments on participation restriction that appeared to be most burdensome for patients.

People wanted me to come and play bridge and to do other things, [but] I think, on the higher dose of the prednisone I feel tremulous and it is more difficult to concentrate.[4]

How BoT relates to activities and participation is described under the following section.

Burden of treatment and activities and participations

The studies also identified that treatment regimens often required patients to engage in a complex set of new and additional

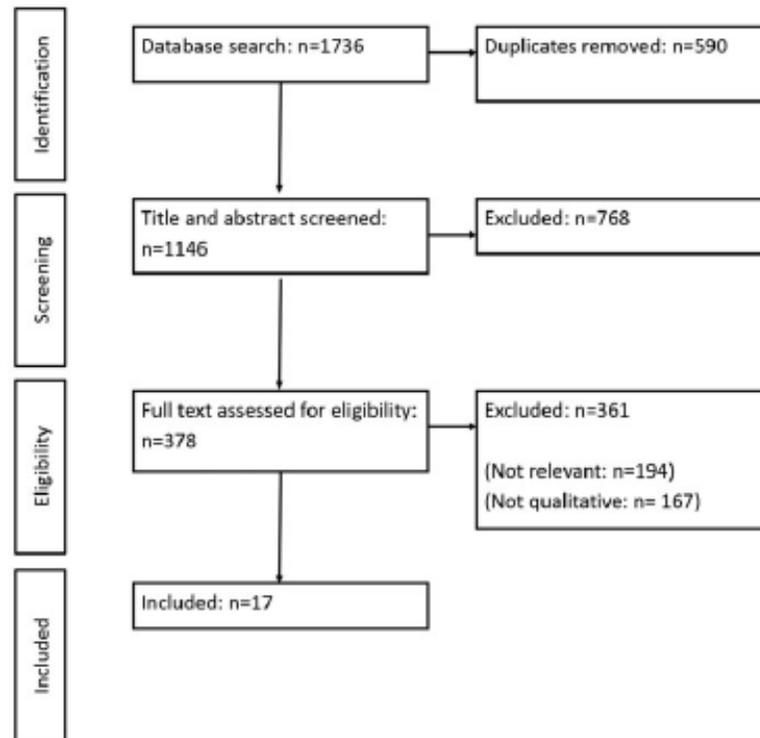


Figure 1. Study selection process.

Table 1. Characteristics of the included studies.

Study	Age range	Health condition	N	Qualitative data collection methods	Country
Alansari et al., 2014 [33]	18–60	Cleft lip and palate	11	Interviews	Canada
Baybr et al., 2007 [12]	49–80	Spasmodic dysphonia	6	Interviews	USA
Eton et al., 2012 [4]	26–85	Multi pathologies	32	Interviews	USA
Fried et al., 2003 [1]	(mean =70)	Chronic diseases (end of life)	23	FG and interviews	USA
Gallacher et al., 2011 [5]	45–88	Chronic heart failure	47	Interviews (secondary analysis)	UK
George et al., 2010 [13]	16–35	Cystic fibrosis	25	Interviews	USA
Hyland et al., 2014 [34]	28–70	Severe asthma	23	Interviews	UK
Johnston and Noble, 2012 [14]	74–96	Chronic kidney disease	9	Interviews	UK
Jordan et al., 2006 [8]	24–84	Percutaneous endoscopic gastrostomies	20	Mixed methods (interviews and QoL measure)	UK
Kahn et al., 2014 [35]	(mean =61.7)	Chronic kidney disease	34	Interviews	USA
Karamanidou et al., 2014 [6]	32–68	Renal disease	7	Interviews	Greece
LeBovidge et al., 2014 [36]	Study 1: 9–18 Study 2: 7–15	Food allergies	Study 1: 10 children +9 parents; Study 2: 13 children +13 parents	Interviews	USA
Lewis and Newell, 2009 [15]	Not mentioned	Tuberculosis	23	FG and interviews	Nepal
Ridgeway et al., 2014 [37]	26–87	Chronic diseases	75	FG and interviews	USA
Sav et al., 2013 [7]	16–83	Chronic diseases	97	Interviews	Australia
Schofield and Horobin, 2014 [16]	8–15	Primary ciliary dyskinesia	5	Interviews	UK
Sawicki et al., 2014 [38]	16–21	Cystic fibrosis	18	Interviews	USA

treatment activities; for instance, exercising, learning about treatment options and modifying diets. These activities took time and impacted on patients' ability to engage in their valued activities. According to the included studies, participation in valued occupational, social and leisure activities, sports or other hobbies contributed to patients' identity and sense of self. Maintaining these activities was therefore seen as a priority and a way of keeping a "normal life". For instance, one woman worried about the impact of injections for spasmodic dysphonia on her valued activity of hiking:

I'm more concerned that [if I have the treatment] I'm not going to be able to go hiking with my friends.[12]

Many patients therefore engaged in complex decision making and prioritization, adapting their life to enable both their treatment and meaningful activities to occur.

A friend called me 'Hey, I have tickets to a baseball game. Do you want to go?' I am like, 'Well, can I plan my treatment around it?'.[13]

However, the ability to maintain a stable self-identity by participation in valued activities and roles was often seen as a greater priority than engaging in treatment. Participants of the included studies described the process of making rational decisions to modify or even cease their adherence to treatments, in order to preserve aspects of participation, such as career or social/leisure activities:

When I am out with friends, I don't carry them (enzymes) like my parents tell me to.[13]

Conversely, when treatment activities were meaningful, compatible with patients' valued activities or caused less disruption to participation were seen as less burdensome:

I used to not be able to do anything when I went to parties and now [thanks to oral immunotherapy] I can sit with other kids and actually enjoy ice cream instead of watching... I was sort of glad I could be more like normal kids.[36]

A further link was identified between the concept of BoT, activities and participation and environmental factors. For instance, the financial costs of treatment (which would be classified as environmental factors) were described as a factor contributing to a restriction in family leisure activities (activities and participation).

Money spent on obtaining treatment had a negative impact on family leisure and social/sporting activities.[7]

In other cases, where treatment-induced activity restrictions might otherwise have led to non-adherence, involvement and support of relatives (also considered environmental factors) increased patients' capacity to engage in treatment and promoted adherence.

I'm getting a repeat [prescription], my daughter (takes) it up to the chemist and X in the chemist (takes) it to the doctor, (gets) everything signed and it will be ready today, so my daughter will bring it down... I can't get up there...[5]

Further information as to how BoT relates to the environmental factors is described in the following section.

Burden of treatment and environmental factors

Environmental factors were reported as sources of BoT by all studies in this review. Aspects such as health policies and health professionals' attitudes were described as causes of BoT through their disruption to patients' self-identity, as demonstrated by this quote, about a patient with tuberculosis:

[She] Felt she had no say over her treatment and could not approach healthcare staff with her concerns, for fear of recrimination.[15]

Family support, attitudes of health professionals, architectural barriers or treatment related stigma clearly worked as either barriers to or facilitators of treatment which may influence the perception of BoT. Others were considered responsible for triggering a more complex cycle of burden.

Treatment burden encompassed a cyclical aspect. For example, contradictory advice on treatment by health care professionals (health care access burden) could lead to polypharmacy (medication burden), which could then result in both a requirement for extra time to organise medications (time burden) and extra strain on financial resources (financial burden).[7]

However, it is important to highlight that environmental factors were not just acting as triggers, barriers or facilitators, but were also negatively affected by the treatment. An example commonly found in the included studies was the negative impact of treatment regimens on patients' relationships and support received from family and friends, which can both be linked to environmental factors (support and relationships) and activities and participation (particular interpersonal relationships).

It was down to the point where it was nothing but, you know, "the rules"... It is hard for a parent to be a nurse at the same time. It just changes the whole dynamics of the relationship...[38]

Burden of treatment and personal factors

Personal characteristics influenced each patient's psychological and emotional capacity to deal with a treatment and their perception of the burden generated:

The ability to overcome fear and manage symptoms varies between individuals, with less distress expressed in situations of self-confidence.[16]

The BoT literature also identified age as an important factor in patients' ability and willingness to tolerate treatment burdens:

I'm too old now, that dialysis thing is more for younger people... Not for me.[14]

Finally, treatment regimens can also be seen to negatively influence personal factors. Adhering to complex and potentially stigmatizing treatment regimes, as well as the tendency for people to be viewed as "patients" rather than "individuals" may directly influence patients' self-identity:

The parameters of normality in patients with PCD (Primary Ciliary Dyskinesia) are developed through experiences, achievements, expectations and comparison with healthy peers.[16]

The impact of treatment on personal factors, such as individual priorities, preferences or sense of normality, was described by patients as reasons not to adhere:

My time is more valuable to me than that. It's not worth it for me... I just don't [do the treatment] because it is more fun not to.[5]

Although, non-adherence can result in deterioration of patients' health status (thus having direct consequences on body functions and structures), patients in the included studies were often aware of these potential negative consequences but still decided to prioritize their personal life.

Patients' treatment adherence behaviour is to some extent a product of rational decisions by the patient after contemplating perceived benefits and weighing them against perceived risks."(..) "Instances of non-adherence take place even when patients are aware of direct immediate negative consequences.[6]

The concept of burden of treatment and the ICF categories: content analysis following the ICF linking rules

There was substantial inter-rater agreement for the initial coding (ICF component: $k=0.748$, 95% CI=0.71–0.792; 1st level: $k=0.811$, 95% CI=0.768–0.854; 2nd level: $k=0.744$, 95% CI 0.697–0.791; 3rd level: $k=0.715$, 95% CI=0.620–0.805).

The thematic analysis of the studies included in this review (described above) generated 179 subthemes. Using the ICF linking rules,[9] these subthemes were coded to 77 ICF categories: 36 of which refer to the body functions and structures, 19 to the activities and participation, and 22 to the environmental factors (Table 2). Only the 1st and 2nd level categories are presented in Table 2, when a 3rd level category was agreed, the equivalent 2nd level was selected.

Additionally, 44 meaningful concepts emerged from the second stage of the analysis and were not possible to link to a specific ICF category. These included 33 personal factors (which have not yet been classified by the ICF) and 11 'not-covered' concepts by the ICF, identified as "nc". Tables 3 and 4 list all personal factors and concepts identified as "nc", respectively. A table with a list of sub-themes, its meaningful concepts and the corresponding ICF codes is available as Supplementary material.

Discussion

The present systematic review and best-fit analysis is, to our knowledge, the first to explain the concept of BoT using the standardized ICF terminology. The content analysis generated lists of ICF

Table 2. Burden of treatment concept linked to the ICF categories.

ICF Code	ICF category title	Studies
Body functions		
b126	Temperament and personality functions	[34]
b130	Energy and drive functions	[6,8,12,13,15,16]
b134	Sleep functions	[4,34]
b152	Emotional functions	[1,4,5,8,12,13,16,34,36]
b210	Seeing functions	[4]
b240	Sensations associated with hearing and vestibular function	[36]
b280	Sensation of pain	[1,4,6,12,33–36]
b310	Voice functions	[12,16]
b420	Blood pressure functions	[35]
b435	Immunological system functions	[6,8,36]
b440	Respiration functions	[1,13]
b450	Additional respiratory functions	[6,13,16,34]
b455	Exercise tolerance functions	[1,4,6,12,16,33–35,38]
b460	Sensations associated with cardiovascular and respiratory functions	[6,12,13,16,34,36]
b510	Ingestion functions	[8,12,34,36]
b515	Digestive functions	[8]
b525	Defecation functions	[34]
b530	Weight maintenance functions	[34,37]
b610	Urinary excretory functions	[6]
b620	Urination functions	[35]
b7	Neuromusculoskeletal and movement related functions	[8,34]
b780	Sensations related to muscles and movement functions	[12]
b8	Functions of the skin and related structures	[6,34,36]
Body structures		
s2	The eye, ear and related structures	[4]
s330	Structure of pharynx	[16,36]
s410	Structure of cardiovascular system	[6,16]
s430	Structure of respiratory system	[1,12,13,16,36]
s530	Structure of stomach	[8,34,36]
s540	Structure of intestine	[34]
s610	Structure of urinary system	[6,35]
s7	Structures related to movement	[34]
s710	Structure of head and neck region	[12]
s720	Structure of shoulder region	[6]
s770	Additional musculoskeletal structures related to movement	[12]
s8	Skin and related structures	[34]
s810	Structure of areas of skin	[6]
Activities and participation		
d1	Learning and applying knowledge	[4–8,12]
d230	Carrying out daily routine	[5,6,13,35,37,38]
d240	Handling stress and other psychological demands	[12,33]
d3	Communication	[4–6,14]
d330	Speaking	[12]
d4	Mobility	[8]
d455	Moving around	[13,16]
d470	Using transportation	[5]
d5	Self-care	[7,12,14,16,35,37,38]
d550	Eating	[4,8]
d570	Looking after one's health	[4,5,13,37,38]
d620	Acquisition of goods and services	[37,38]
d7	Interpersonal interactions and relationships	[4–8,12,14,33,35,37,38]
d8	Major life areas	[8,12,13,38]
d850	Remunerative employment	[4,5,7,12,13,38]
d855	Non-remunerative employment	[8]
d9	Community, social and civic life	[5,12,36,38]
d920	Recreation and leisure	[4,7,8,13,16,36,38]
d930	Religion and spirituality	[35]
Environmental factors		
e1	Products and technology	[8]
e110	Products or substances for personal consumption	[4,5,7,37,38]
e115	Products and technology for personal use in daily living	[1,4,5,7,8,13,35,37]
e245	Time-related changes	[16]
e3	Support and relationships	[4–6,8,12,14,33,38]
e310	Immediate family	[5,12–16,35,37,38]
e315	Extended family	[5,12,14–16,35,37,38]
e320	Friends	[4,5,35,37]
e325	Acquaintances, peers colleagues, neighbors and community members	[6,12,13,15,35,37]
e355	Health professionals	[5–8,12–15,33,35,37,38]
e4	Attitudes	[6–8,12,13,15,16,33,38]
e410	Individual attitudes of immediate family members	[5,12–16,35,37,38]
e415	Individual attitudes of extended family members	[5,12,14–16,35,37]
e420	Individual attitudes of friends	[4,5,12,35,37]
e425	Individual attitudes of acquaintances, peers colleagues, neighbors and community members	[12,13,15,35,37]

(continued)

Table 2. Continued

ICF Code	ICF category title	Studies
e450	Individual attitudes of health professionals	[4–8, 12–15, 33, 35, 37, 38]
e460	Societal attitudes	[16]
e515	Architecture and construction services, systems and policies	[7]
e530	Utilities services, systems and policies	[5]
e540	Transportation services, systems and policies	[5, 7, 14, 35]
e580	Health services, systems and policies	[4–8, 12–16, 35, 37, 38]
e590	Labour and employment services, systems and policies	[7, 13]

The ICF codes starting with "b", "s", "d" and "e" indicate the components: "body functions" (b), "body structures" (s), "activities and participation" (d) and "environmental factors" (e).

Table 3. Meaningful concepts linked to personal factors.

Personal factors	Studies
Age	[1, 6, 7, 12–14, 33, 38]
Being active	[6, 15]
Beliefs about illness and treatment	[1, 5, 6, 12, 14–16, 38]
Coping strategies	[4–7, 12, 16, 37]
Desire to avoid being a burden	[1, 14]
Discipline	[13]
Disease acceptance	[6, 8, 16]
Employment	[4, 13, 35]
Empowerment	[6, 13–16, 33, 37, 38]
Ethnicity and religion	[4, 7, 13]
Family context	[12, 14, 35]
Fears	[4, 5, 12, 36]
Feeling isolated	[15, 33]
Financial Context	[4, 5, 7, 35]
Gender	[4, 13]
Hope and faith	[6, 35, 37]
Individual judgements/decisions or choices	[1, 6, 7, 12–14, 16, 33, 35, 38]
Individual needs/characteristics	[4–7, 12–14, 16, 33]
Knowledge/education	[4–7, 12, 13, 15, 16, 35, 38]
Life experiences	[12, 16]
Life style	[12, 13]
Marital status	[4, 13]
Not feeling capable	[5, 14]
Organization skills	[4, 5, 37, 38]
Perception of own health status	[4, 14, 16]
Perception of quality of life (coded as not defined – quality of life)	[1, 6, 38]
Positive/negative mental attitude	[6, 8, 12, 13, 15, 16]
Treatment preferences	[1, 4, 13, 16, 35, 37, 38]
Priorities and life goals	[13, 38]
Resilience	[4–8, 12, 16, 33, 35]
Self-confidence and motivation	[6, 13, 15, 16, 33, 35, 37]
Self-image	[6, 7, 12, 13, 16, 33, 38]
Sense of normality	[6, 12, 13, 16, 33, 36–38]

Table 4. Meaningful concepts identified as not covered by the ICF.

Concepts not covered by the ICF	Studies
Adherence/non-adherence to treatment	[1, 4–7, 12–16, 33, 35, 37, 38]
Absence of empowerment	[6, 15, 16]
Burdens to others	[14]
Capacity	[4, 5, 7, 8, 12, 14, 16]
Discharge process	[8]
Time frame/time burden	[1, 4, 5, 7, 8, 13, 14, 16]
Treatment regimen	[1, 4–8, 12–16, 33–38]
Workload	[4, 5, 7, 12–14, 35, 38]
Work needed to adjust the requirements imposed by treatment	[5, 7, 12]
Performing more than one activity at the same time	[16]
Sputum production	[16]

categories (Tables 2–4) that form the first list of candidate categories of a future ICF Core Set for BoT. These findings represent a robust base of knowledge that can now inform and be complemented with further studies of the preliminary phase of the development of a Comprehensive ICF Core Set,[20] namely qualitative studies and expert surveys using our findings as a framework.

BoT has been shown to impact negatively on body functions and structures and restrict valued activities and participation, life roles and self-identity. Environmental and personal factors were shown to shape the experience of BoT. For instance, strong family support can reduce the perception of burden; similarly lack of appropriate equipment can increase the perceived BoT. Conversely, BoT can also impact on personal and environmental factors such as when treatment obligations have a negative impact on family relationships and family support. This description of BoT using the ICF terminology can be linked to previous studies exploring the concept of BoT, where it has been described as a bio- graphical (self-identity; personal factors), relational (environmental factors and activities

and participation) and biological (body functions and structures) disruption.[18]The findings of this literature review also represent an important contribution for future developments of the ICF itself. Our analysis found the current list of ICF categories insufficient to fully describe BoT. Many fundamental BoT concepts such as “adherence”, “capacity” and “workload” [3–5,18] are “not covered” by the ICF (Table 4). This is, nevertheless, an understandable finding, given that the concept of BoT post-dates the development of the ICF framework. Other concepts such as “treatment goals” or “treatment outcomes” were too general to be linked to the ICF and were coded as “not defined”. Additionally, many concepts were linked to Personal Factors which have not yet been specified by the ICF, although BoT theory places a significant emphasis on how treatments affect and are affected by people’s personal identities.[3] This study has begun to delineate and specify some of the important concepts under the component personal factors and highlighted the importance of contextual factors in general. These have relevance beyond a future ICF Core Set for BoT and can inform future developments of the ICF document itself.[9]

Strengths and limitations and future directions

BoT is a new concept which, authors have argued, has the potential to radically change the way that interventions are prescribed and managed in the patient/professional relationship.[3,18,21] However, BoT may be unfamiliar to many health professionals. By using the uniform terminology of the ICF, this study enables health professionals to more readily access a potentially complex,[21] but highly relevant theory.

This study has its limitations. Including only qualitative studies, which expressly used the terms “Burden of Treatment” or “Treatment Burden” may have resulted in the exclusion of studies which explore the concept but without using the same terminology. A further limitation, common to all qualitative literature reviews, is that some of the information and context provided by the original participants may have been excluded from the original papers and therefore, lost to the secondary analysis. Lastly, the inclusion of all relevant qualitative studies regardless of their quality may have influenced our findings.

This study sought to explore the links between BoT and the ICF across a range of conditions and treatments. This was an appropriate approach for demonstrating the conceptual similarities between the two models. However, this approach of combining conditions could potentially lead to an infinite number of categories, especially in the component body functions and structures. As BoT research progresses into more conditions, it may become more appropriate to incorporate the important BoT factors into the condition specific Core Sets.

Future studies to complete the preparatory phase of a future ICF Comprehensive Core Set for BoT are necessary. Qualitative research involving a range of stakeholders (patients, healthcare professionals, policy-makers and caregivers) is needed. Furthermore, the need of developing outcome measures of BoT has also been suggested in previous literature:[4,5] the ICF could provide a useful framework for this.

Conclusion

BoT impacts negatively on body functions and structures and restricts valued activities and participation, life roles and self-identity. Contextual factors have a dual role both influencing and being influenced by treatment burden. The use of ICF terminology to describe BoT provides an accessible route for understanding this concept which although complex is pivotal for rethinking clinical practice. This may lead to recognition that BoT is an important

consideration for treatment plans and patient adherence. Additional studies are also necessary complete the preparatory phase of development of a future Comprehensive ICF Core Set for BoT.

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