Review Article

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Exploratory analysis of studies related to burn injuries, based on the International Classification of Functioning, Disability and Health: a systematic review

Análise exploratória de estudos relacionados a lesões por queimaduras, baseada na Classificação Internacional de Funcionalidade, Incapacidade e Saúde: uma revisão sistemática

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ABSTRACT

Objective: This study aimed to explore the characteristics of the studies that used the International Classification of Functioning, Disability and Health (ICF) to understand health and functioning after burns. **Method:** An exploratory research based upon a systematic review was conducted. A qualitative description of the studies regarding design, purpose, participants, and measures was provided. Descriptive data were provided to analyze the characteristics of the journals in which studies were published. The electronic search strategy identified 4032 papers, and 20 studies were included. Most studies were classified as conceptual (42%) or literature review (42%), and the purpose of most studies (84%) was to describe the instruments and outcomes using the ICF as a conceptual framework. **Results:** The population of interest was predominantly comprised of adults (42%), and the percentage of burned body ranged from 1 to 72%. Among all studies, 119 measurement instruments were cited. All studies were published in journals indexed in Pubmed, covering both medical and rehabilitation categories. **Conclusion:** Most studies solely provided a categorization of instruments according to the ICF domains. Great heterogeneity was observed regarding outcomes and population, and research is still focused on body structures and functions, instead of understanding how burns influence daily activities and participation.

Keywords: Burns, Systematic Review, International Classification of Functioning, Disability and Health

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Conflict of Interests
Nothing to declare

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RESUMO

Objetivo: Esse estudo teve como objetivo explorar as características dos estudos que utilizaram a Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF) para compreender a saúde e a funcionalidade após queimaduras. **Método:** Foi realizada uma pesquisa exploratória baseada em uma revisão sistemática. Uma descrição qualitativa dos estudos sobre design, propósito, participantes e medidas foi fornecida. Dados descritivos foram fornecidos para analisar as características dos periódicos em que os estudos foram publicados. **Resultado:** A estratégia de busca eletrônica identificou 4.032 artigos e 20 estudos foram incluídos. A maioria dos estudos foi classificada como conceitual (42%) ou revisão da literatura (42%) e o objetivo da maioria dos estudos (84%) foi descrever os instrumentos e resultados usando a CIF como uma estrutura conceitual. A população de interesse foi predominantemente composta por adultos (42%) e o percentual de corpo queimado variou de 1 a 72%. Dentre todos os estudos, foram citados 119 instrumentos de medida. Todos os estudos foram publicados em revistas indexadas no Pubmed, abrangendo as categorias médica e de reabilitação. **Conclusão:** A maioria dos estudos forneceu apenas uma categorização dos instrumentos de acordo com os domínios da CIF. Observou-se grande heterogeneidade em relação aos resultados e à população, e as pesquisas ainda estão focadas nas estruturas e funções do corpo, em vez de entender como as queimaduras influenciam as atividades diárias e a participação.

Palavras-chave: Queimaduras, Revisão Sistemática, Classificação Internacional de Funcionalidade, Incapacidade e Saúde

INTRODUCTION

Burns are the main cause of disability-adjusted life years lost in low- and middle-income countries.[1] Although most burns are preventable, more than 30 million people are still affected by burn injuries every year. Fortunately, most cases are not fatal and even people who have suffered large burns may survive due to improvements related to appropriate medical and surgical care.[2] On the other hand, those who survive may experience pain, limitations to perform daily activities and restrictions on community participation.[3,4] Attention, therefore, has evolved from focusing on mortality to also including functional outcomes that have the potential to comprehend life after burn injuries, using a biopsychosocial approach.[5,6]

The biopsychosocial approach has been promoted by the World Health Organization (WHO) to standardize assessments based upon the International Classification of Functioning Disability and Health (ICF).[3] The ICF gives an overview of health domains and health-related domains[6] but is yet underused to understand the short- and long-term needs after burn injuries and to help guide clinical decisions. Common challenges after burn injuries include resuming an active role at work, participating in leisure activities, interacting with friends and family, and maintaining a wealthy social life.[4] For instance, the ICF framework could be used to understand the needs of individuals who return to work after a burn injury or the emotional effects that can impact patients' commitment to rehabilitation.[1,4] In addition, the biopsychosocial approach would allow us to understand why a person with minor burns sometimes experiences a devastating psychological reaction, while someone with a major burn adjusts surprisingly well.[7]

In 2014-2016, a committee by the International Society for Burn Injuries attempted to develop practice guidelines to improve the care of patients with burns either in environments with limited resources or in environments with an abundance of resources.[8]

From these recommendations, clinical decisions can be made based on the costs, benefits, potential damages, values and preferences of the patient.[8] Due to the multifactorial nature of the complications that emerge after burn injuries, those decisions would be optimized if they are based upon a biopsychosocial assessment. The aim of present research was to characterize the scenario of ICF and burns by describing the studies that used the ICF to comprehend health and functioning of individuals who have survived a burn injury. The specific research questions were:

1. What are the characteristics of the studies that used the ICF to comprehend health and functioning of individuals who have suffered burns?
2. What are the characteristics of the journals in which these studies have been published?

METHOD

An exploratory research, based upon a systematic review of the literature for identifying studies that used the ICF to comprehend health and functioning of individuals with burn injuries, was conducted.

Searches were conducted on MEDLINE Ovid (1946 to February 2022), EMBASE (1947 to February 2022), Cochrane (2005 to February 2022), CINAHL (1986 to February 2022) and PsycINFO (1806 to February 2022) databases, without language or data restrictions. The search terms included keywords related to *burn injuries* and *ICF*.

Title and abstracts were displayed and screened to identify relevant studies. Full paper copies of peer-reviewed relevant papers were retrieved, and their reference lists were screened to identify further relevant studies. The method section of the retrieved papers was extracted and reviewed independently by two reviewers (CHS and FMGL), who were blinded to title, authors, journals, and results. To be included in the review, studies should have mentioned the ICF and referred to individuals with burn injuries. Letters, editorials, case reports, dissertation or thesis, conference abstracts, and protocols were excluded. Disagreement or ambiguities were resolved by consensus after discussion with a third reviewer (ASN).

The outcomes of interest were divided into: (a) characteristics of the included studies, and (b) characteristics of the journals in which the studies have been published. Data was extracted and registered in an Excel spreadsheet by one reviewer (ASN) and checked by a second reviewer (FMGL). Data related to the characteristics of the included studies were: (1) year of publication, (2) study design; (3) purpose of the study; (4) characteristics of the participants and the burn injury; (5) mentioned clinical outcomes;

Data related to the characteristics of the journals were: (1) the Journal Citation Reports (JCR) category, from the Web of Science, In Cites Journal Citation Reports - Clarivate Analytics; (2) language of publication, categorized into English or non-English; (3) if the journal is indexed on PubMed; (4) if the journal is classified as predatory, based upon information available at https://predatoryjournals.com/journals/; (5) 2022 journal Impact Factor (from the Web of Science, In Cites Journal Citation Reports - Clarivate Analytics), categorized in three strata (Journals with Impact Factor ≥2.0, Journals with Impact Factor <2.0; and Journals without Impact Factor); (6) and if the journal was open access (yes, no, or optional, when there was an option to pay for an open access publication), which was obtained from the Directory of Open Access Journals, PubMed Central or the journal's web-site.

A qualitative description of the studies was provided regarding design, purpose, participants, and measures. Descriptive statistics were provided to describe the characteristics of the journals in which studies were published. Data were displayed in an Excel spreadsheet, and calculations were performed using SPSS for Windows version 26.0.

RESULTS

The electronic search strategy identified 4032 papers, but 76 were duplicates. After screening titles, abstracts, and reference lists, 28 potentially relevant full papers were retrieved. Eight studies did not meet inclusion criteria and therefore, 20 studies were included (Figure 1). Their descriptive data are provided (Chart 1).

In most studies the population of interest was comprised of adults (65%), or children and teenagers (30%). The percentage of the total body burned area ranged from 1 to 72%, and the time since injury ranged from 0 to 38 years across studies. Burned body structures included face, head, neck, thorax, abdomen, forearms, elbows, distal, upper arms, lower back, hands, feet, trunk, upper and lower limbs, and genitals. Face, hands, and feet were cited by two or more studies. A total of 119 different measurement in-struments were cited among all studies, and most instruments were (71%) self-reported questionnaires. Most studies had their design classified as conceptual (40%), literature review or systematic review (40%).

Chart 1. Characteristics of the included studies (n= 20)

Study	Design	Purpose	Participants	Measures
Dunpath et al.[1] (2015)	Qualitative	To understand the effects of burn injuries on participation and rehabilitation using the ICF as a conceptual framework	Population= Adults Time since injury (months)= 0–3 TBSA (%)= 15-50 Body structure= trunk, upper and lower limbs	Interview (semistructured)
Johnson et al.[3] (2017)	Conceptual	To describe the instruments and outcomes to evaluate hand burns using the ICF as a conceptual framework	Population= not applicable Time since injury (months)= not applicable TBSA= not applicable Body structure= hands	8 measures= HRQL, DASH, POSAS, BSHS-B, JTHF, MHQ, SF-36 and VSS
Marino et al.[4] (2016)	Literature review	To develop and validate a conceptual model for understanding areas of social life important for individuals who have had burn injuries, using the ICF as a conceptual framework	Population= Adults Time since injury (months)= 96 TBSA (%)= 60 Body structure= not reported	19 measures= YABOQ, BSHS-B, SBIQ, FSFI, IIEF, IBM, DAS, FIS, RSQ, PLS, DLS, ISS, SWAP, Neuro-QOL, PROMIS, PSQ, SCQ, BIQLI and CWBQ
Osborne et al.[5] (2017)	Systematic review	To analyze the return to activities and participation in children and teenagers who have had burns	Population= Children and teenagers Time since injury (months)= 0-36 TBSA (%)= 1-72 Body structure= not reported	25 measures= CAPE, WeeFIM, PROM, VGHSA, DN, VABS, Denver, HSQ, Interviews, DDST, PDMS, ROM, CBCL, PDS, FRI, BDI, STAI, SSQ, WCQ, SCI, CWBQ, CBQ, TABP, PAS, FES
Simons et al.[6] (2004)	Literature review	To critically analyze the literature on measurements of activity and participation in children who have had burn injuries, using the ICF as a conceptual framework	Population= Children and teenagers Time since injury (months)= not reported TBSA= not reported Body structure= not reported	Not applicable
Brady et al.[11] (2020)	Literature review	To identify the ICF domains most impacted in children who have had burn injuries	Population= Children Time since injury (months)= 19 TBSA (%)= 15 Body structure= face, hands, and/or feet	1 measures= BOQ 0-4
Falder et al.[12] (2009)	Conceptual	To identify the outcome measures used after adult burn injuries	Population= not applicable Time since injury (months)= not applicable TBSA (%)= not applicable Body structure= not applicable	43 measures= MVSS, SS, MAPS, HS, POSAS, WEST, ROM, MMT, TW, TUG, QuickDASH, COPM, HiMAT, MHQ, TEMSPA, DASH, JHFT, SHFT, SRT, 6MWT, SWT, VAS, MPQ, BPI, BSPAS, MVSS, POSAS, QPA, SCID, IES, DTS, BDI II, HADS, CES-D, AMPS, MBI, FIM, CIQ, CHART, SF-36, SIP, BSHS
Huang et al.[13] (2020)	Randomized clinical trial	To examine the effects of an unsupervised 6-month exercise training program after burns	Population= Adults Time since injury (months)= 120-204 TBSA (%)= < 40% > Body structure= Not reported	4 measures= BSD, SF-36, BSHS-R, HRQL
McKittrick et al.[14] (2020)	Systematic review	To identify the outcome measures used after severe hand burn injuries	Population= adults Time since injury (months)= 6-192 TBSA (%)= 27% Body structure= hands	35 measures= GSD, Quick DASH, TAM, MHQ, DASH, APS, POSAS, SRBSC-UE, WHODAS, PHQ, ISI, BSHS-B, HADS, SF36, AROM, VSS, ROM, JTHFT, BBT, TEMPA, SHFT, T-MAM for burns, DP, BSHS-RBA, LEFS, MAPS, ADL questionnaire, DSC, HRQoL, PRO, MSWT, BSHS-A, VAS, EQ- 5D, PROM
Lin et al.[15] (2021)	Conceptual	To develop a basic set of ICF items for chronic burns	Population= Not applicable Time since injury (months)= Not applicable TBSA (%)= Not applicable Body structure = Not applicable	Measure= Not applicable
Marino et al.[16] (2017)	Literature review	To develop a self-reported test based on responses to items that address social impact	Population= Adults Time since injury (months)= 3-456 TBSA (%)= 28 % Body structure= Not reported	18 measures= YABOQ, BSHS, SBIQ, FSFI, IIEF, IBM, DAS, FIS, RSQ, DLS, ISS, SWAP, Neuro-QOL, PROMIS, PSQ, SCQ, BIQLI, CWBQ
Meirte et al.[17] (2014)	Conceptual	To identify the ICF domains covered by questionnaires of quality of life in individuals who have had burn injuries	Population= Adults Time since injury (months)= not applicable TBSA= not applicable Body structure= not applicable	7 measures= SF-36, EQ-5D, BSHS-B, SIP, QLQ, QOLS and DLQI
Meirte et al.[18] (2017)	Conceptual	To identify the ICF domains covered by questionnaires of quality of life in individuals who have had burn injuries	Population= Adults Time since injury (months)= 9 TBSA (%)= 12 Body structure= not reported	3 measures= BSHS-B, SF-36 and EQ-5D

(Contínua)

(Contiuação)

Osborne et al.[19] (2016)	Conceptual	To classify and describe the *Burn Association Burn Outcome Questionnaire,* using the ICF as a conceptual framework	Population= Children, teenagers, and adults Time since injury (months)= not reported TBSA (%)= 20 Body structure= face, hands, feet, and/or genitals	1 measure= BOQ
Osborne et al.[20] (2017)	Systematic review	To analyze the return to activities and participation in children and teenagers who have had burns	Population= Children and teenagers Time since injury (months)= 0-36 TBSA (%)= 1-72 Body structure= not reported	25 measures= CAPE, WeeFIM, PROM, VGHSA, DN, VABS, Denver, HSQ, Interviews, DDST, PDMS, ROM, CBCL, PDS, FRI, BDI, STAI, SSQ, WCQ, SCI, CWBQ, CBQ, TABP, PAS, FES
Passos et al.[21] (2022)	Cross-sectional, correlational study	Assess burn patients' quality of life, function and health using the BSHS-B and ICF in order to assess correlations in the results of these instruments	Population= adults Time since injury (months)= not reported TBSA (%)= not reported Body structure= head, neck, thorax, abdomen, hands, upper limbs, lower limbs	2 measures= BSHS-B and interview (semi structured - based on CIF)
Rencken et al.[22] (2021)	Conceptual	To develop and validate a conceptual model for understanding after burn injuries, using the ICF as a conceptual framework	Population= children Time since injury (months)= 13 TBSA (%)= not reported Body structure= hand, feet, genitals, face	1 measure= BOQ
Stergiou-Kita et al.[23] (2013)	Guideline	This review aimed to identify the key processes evaluators should follow and the key factors they should consider when completing such evaluations	Population= Adults Time since injury (months)= not reported TBSA= Not reported Body structure= Not reported	Not applicable
van Baar et al.[24] (2006)	Literature review	To characterize the study design, populations, outcomes, and covered domains of ICF in studies with individuals who have had burn injuries	Population= Children, teenagers, adults, and older adults. Time since injury (months)= 16-204 TBSA (%)= > 70 Body structure= not reported	10 measures= CHQ, SF-36, TACQOL, BSHS-B, SIP, FIM, IES-R, STAI, BSI, and CIQ
Wasiak et al.[25] (2011)	Systematic review	To identify the evaluations used for adult burn care, and to link the outcomes to the ICF domains	Population= Adults Time since injury (months)= not reported TBSA (%)= 12-22 Body structure= not reported	14 measures= BSHS-B, BSPAS, CWBQ, MAPS, POSAS, SWAP, VBSAS, BDI, BSI, HADS, IES-R, SF-36, PSQ and SCQ

**Total body surface area (TBSA), Burn Association Burn Outcome Questionnaire 0-4 (BOQ 0-4), Health related quality of life (HRQL/HRQoL), The Disabilities of the Arm, Shoulder, and Hand Score (DASH), Patient and Observer Scar Assessment Scale (POSAS), Burn Specific Health Scale Brief (BSHS-B), Jebsen-Taylor Hand Function Test (JTHF), Michigan Hand Outcomes Questionnaire (MHQ), Short Form-36 (SF-36), Vancouver Scar Scale (VSS), Young Adults Burn Outcomes Questionnaire (YABOQ), Sexuality after Burn Injury Questionnaire (SBIQ), The Female Sexual Function Index (FSFI), The International Index of Erectile Function (IIEF), Intimate Bond Measure (IBM), Dyadic Adjustment Scale (DAS), Fear of Intimacy Scale (FIS), Rejection Sensitivity Questionnaire (RSQ), Passionate Love Scale (PLS), Differential Loneliness Scale (DLS), Index of Sexual Satisfaction (ISS), Satisfaction with Appearance Scale (SWAP), Quality of Life in Neurological Disorders (Neuro-QOL), The Patient-Reported Outcomes Measurement Information System (PROMIS), Perceived Stigmatization Questionnaire (PSQ), Social Comfort Questionnaire (SCQ), Body Image Quality of Life Inventory (BIQLI), Coping with Burns Questionnaire (CWBQ), The European Quality of Life 5 Dimensions (EQ-5D), The Sickness Impact Profile (SIP), The Quality of Life Questionnaire (QLQ), The Quality Of Life Scale (QOLS), Dermatology Life Quality Index (DLQI), Children's Assessment of Participation and Enjoyment (CAPE), The Functional Independence Measure for children (WeeFIM), Passive Range of Motion (PROM), Vancouver General Hospital's Scar Assessment (VGHSA), Vineland Adaptive Behavior Scales (VABS), Home Screening Questionnaire (HSQ), Denver Developmental Screening Test (DDST), Peabody Developmental Motor Scales (PDMS), Range of Motion (ROM), Child Behavior Checklist (CBCL), Posttraumatic Diagnosis scale (PDS), Family Relationship Index (FRI), Beck Depression Inventory (BDI), State-Trait Anxiety Inventory(STAI), Social Support Questionnaire (SSQ), Ways of Coping Questionnaire (WCQ), The Social Competence Inventory (SCI), Children's Behavior Questionnaire (CBQ), The Psychosocial Adjustment to Illness Scale (PAS), The Family Environment Scale (FES), Burn Association Burn Outcome Questionnaire (BOQ) Child Health Questionnaire (CHQ), The TNO AZL Children's Quality of Life questionnaire (TACQOL), Functional Independence Measure (FIM), Impact of Event Scale-Revised (IES-R), Brief Symptom Inventory (BSI), Community Integration Questionnaire (CIQ), Burn Specific Pain and Anxiety Scale (BSPAS), Matching Assessment of Scars and Photographs (MAPS), Vancouver Burn Scar Assessment Scale (VBSAS), Hospital Anxiety and Depression Scale (HADS), Grip Strength Dynamometry (GSD), Quick Disability of the Arm, Shoulder and Hand (Quick DASH), Total Active Movement (TAM), Assessment of patient satisfaction (APS), Stanford- ReSurg Burn Scar Contracture Scale Upper Extremity (SRBSC-UE), World Health Organisation Disability Assessment Scale (WHODAS), Patient Heath Questionnaire (PHQ), Insomnia Severity Index (ISI), Active Range of Motion (AROM), Hand function-Jebsen Taylor Hand Function Test (JTHFT), Berg Balance Test (BBT), Test d' Evaluation des Membres Supérieurs des Personnes Agées (TEMPA), Sollerman Hand function test (SHFT), Taiwanese Manual Ability Measure for Burns (T-MAM for burns), Dynamometer and pinch (DP), Burn Specific Health Scale revised, brief and adapted (BSHS-RBA), Lower extremity Functional Scale (LEFS), Activities of Daily Living questionnaire (ADL questionnaire), Derma spectrometer Cutometer (DSC), Patient Report Outcomes (PRO), Modified Shuttle Walk Test (MSWT), Burns Specific Health Scale Abbreviated (BSHS-A), Visual Analogue Scale (VAS), EuroQol 5 dimensions measure of quality of life (EQ- 5D), Burn Specific Health Scale revised (BSHS-R), The Achenbach Behavioral Profile (TABP), Canadian Occupational Performance Measure (COPM), Dynamometry (DN), Biodex System 3 dynamometer (BSD), The Burn Specific Health Scale (BSHS), Modified Vancouver Scar Scale (MVSS), Seattle scale (SS), Hamilton scale (HS), Weinstein Enhanced Sensory Test (WEST), Manual Muscle Testing (MMT), Tandem Walk (TW), Timed Up and Go (TUG), High-Level Mobility Assessment Battery (HiMAT), Test d'Evaluation des Membres Superieurs des Personnes Agees (TEMSPA), Jebsen Hand Function Test (JHFT), Shuttle Run Test (SRT), 6 min walk test (6MWT), Shuttle Walk Test (SWT), McGill Pain Questionnaire (MPQ), Brief Pain Inventory (BPI), Burn Specific Pain Anxiety Scale (BSPAS), Questionnaire for Pruritis Assessment (QPA), Structured Clinical Interview for DSM IV Axis I Disorders (SCID), Impact of Event Scale-Revised (IES), Davidson Trauma Scale (DTS), Beck Depression Inventory II (BDI II), Centre for Epidemiological Studies-Depressed Mood Scale (CES-D), Assessment of Motor and Process Skills (AMPS), Modified Barthel index (MBI), Craig handicap assessment and reporting techniques (CHART)*

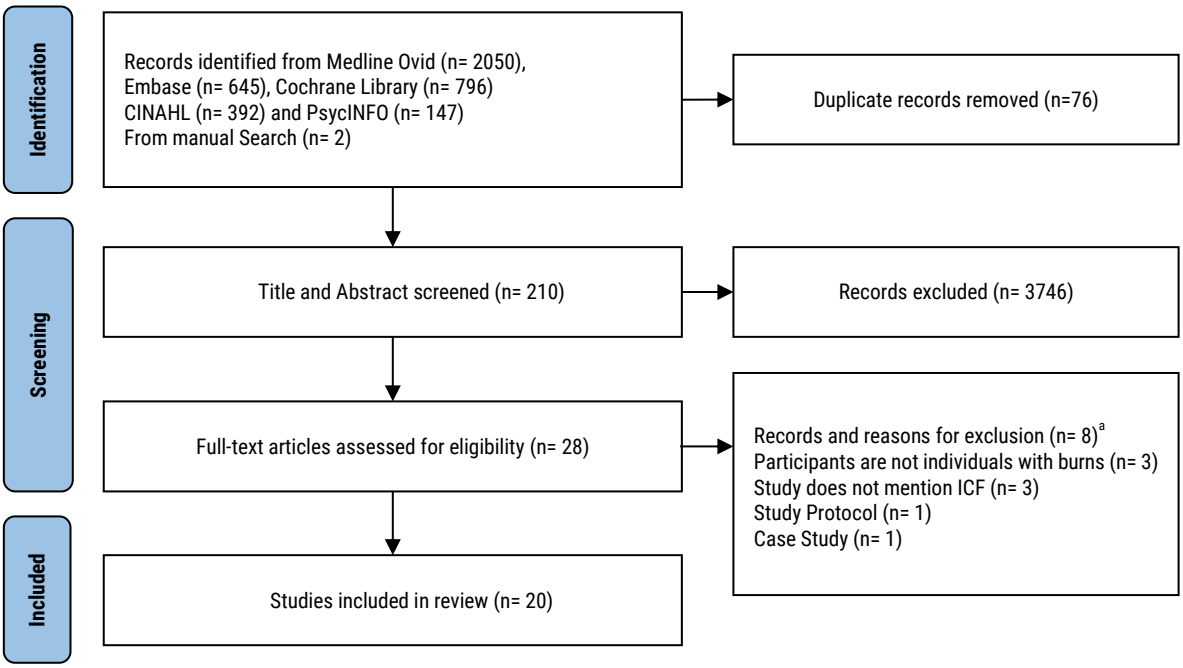

Figure 1. Flow diagram of included studies

Only one study was classified as a randomized clinical trial, which was aimed at examining the effects of an unsupervised 6-month exercise training program after burns. The purpose of most studies (85%) was to describe the instruments and outcomes using the ICF as a conceptual framework. Only four studies (i.e., two systematics reviews, one qualitative study and one guideline) focused on activities or participation, according to the ICF.

The studies were published between 2004 and 2022. A detailed description of the journals in which studies were published was provided in Table 1. The 20 included studies were published in six journals: Burns; Disability and Rehabilitation; Journal of Burn Care & Research; International Journal of Environmental Research and Public Health; Hand Clinics and Journal of Occupational Rehabilitation. Four journals (67%) had an Impact Factor ≥ 2.0, and two journals (33%) had an Impact Factor <2.0. The journals in which the studies were published are all indexed in PubMed. One journal has open access to studies, and five journals offer open access based on authors' optional fee payment.

The journals are included in eight JCR categories: (1) Dermatology, (2) Critical Care Medicine, (3) Rehabilitation, (4) Orthopedics, (5) Surgery, (6) Public Environmental & Occupational Health (6), and (7) Environmental sciences (8) Social Issues. Half of the journals are included in one or more JCR categories. No journals were classified as predatory, and all studies were published in English.

Table 1. Characteristics of the journals

Characteristic	n= 6
Idiom, number English (%)	6 (100)
Indexation, number Pubmed (%)	6 (100)
Predatory journal, number no (%)	6 (100)
Impact Factor, number (%)	
None	0 (0)
< 2.0	2 (33)
≥ 2.0	4 (67)
Open-access, number (%)	
Yes	1 (17)
No	0 (0)
Optional	5 (83)

DISCUSSION

This systematic review examined the characteristics of the studies that used the ICF to understand health and functioning of individuals with burn injuries. Most studies included in this review [1,4-6,11,14,16-19,21,22,25] reported a description of measurements according to the ICF concepts but provided no clinical recommendations to help standardize clinical or research activities. A high number of instruments was cited, and most of them focused on body structures and function, or quality of life. On the other hand, all studies were published in journals with impact factor, indexed in Pubmed and covering eight JCR categories.

The qualitative analysis of the studies revealed substantial heterogeneity regarding the measurement methods and population.

For instance, 119 instruments were cited, and 92 (71%) were self-reported questionnaires. This lack of consensus for measuring outcomes in research minimizes understanding of clinical outcomes and precludes pooling of data in meta-analyses.[9] Although the included studies were able to translate the instruments into the ICF language, no clear recommendations for standardizing and analyzing outcomes after burn injuries have been provided. The identification of the most affected domains after burns and which instruments cover these domains is insufficient to help guiding randomized trials looking for effective interventions.

One of the reasons that may explain the variety of instruments related to body structures and body functions is the lack of full adhesion to the biopsychosocial model. Because the biomedical

model has been used to understand how medical interventions improve damaged structures and increase the likelihood of survival after burns, it may be challenging to shift focus to understanding activity limitations and participation restrictions after burn injuries. Among the papers included in this review, only one systematic review[5] and one qualitative study[1] aimed to understand the effects of burns on activity and participation.

A roundtable with experts[10] in rehabilitation could provide recommendations on how to incorporate activity and participation for evaluating people who have survived burns. This would improve the methods of trials in rehabilitation and strengthen the most appropriate outcomes. Because the population of individuals with burns was quite heterogeneous, a possible solution for studies focusing on functioning would be the recruitment of participants based on age and burned body area. If studies are planned according to the age of the participants and the expected activity limitations associated with age and body burned area, this may reduce heterogeneity related to instruments and population.

Although there were few studies examining health and functioning after burns according to the ICF, all studies were published in journals indexed in Pubmed with significant impact factors. In addition, the journals covered both medical and rehabilitation categories, favoring dissemination of information. If consensus on appropriate methods for participants' recruitment and outcomes in clinical trials is reached, based on the biopsychosocial model, studies tend to become more homogeneous and representative of clinical interests, *i.e.*, to comprehend how burn injuries influence activity and participation. This may increase the number and quality of further publications.

The main limitation of this systematic review is the number of included studies. Although we aimed to include all studies that used the ICF to comprehend health and functioning after burn injuries, some studies which did not include the term ICF in the text may have been missed due to the inclusion criteria. On the other hand, the main strength of our study was to provide a broad review that constrained the conclusions based on studies, which examined ICF in the population of people with burns. Therefore, the review allowed the identification of the gaps and limitations in this area.

The immediate contribution of the review is to inform researchers that further studies are needed to guide clinicians on how to use appropriate instruments focused not only on body structures and functions, but on how to include an understanding of daily activities and participation after burns.

CONCLUSION

This systematic review demonstrated that the studies, which examined health and functioning after burns according to the ICF, solely provided a categorization of instruments on ICF domains.

Great heterogeneity was observed regarding outcomes and population, and research is still focused on body structures and functions, instead of understanding how burns influence daily activities and participation.

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Author contributions

CHS and LRN: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Supervision; Roles/Writing - original draft; Writing - review & editing. ASN, FMGL and NFFO: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Roles/Writing - original draft.

REFERENCES

1. Dunpath T, Chetty V, Van Der Reyden D. The experience of acute burns of the hand - patients perspectives. Disabil Rehabil. 2015;37(10):892-8. Doi: 10.3109/09638288.2014.948129
2. Sasor SE, Chung KC. Upper Extremity Burns in the Developing World: A Neglected Epidemic. Hand Clin. 2019;35(4):457-466. Doi: 10.1016/j.hcl.2019.07.010
3. Johnson SP, Chung KC. Outcomes Assessment After Hand Burns. Hand Clin. 2017;33(2):389-97. Doi: 10.1016/j.hcl.2016.12.011
4. Marino M, Soley-Bori M, Jette AM, Slavin MD, Ryan CM, Schneider JC, et al. Development of a Conceptual Framework to Measure the Social Impact of Burns. J Burn Care Res. 2016;37(6):e569-e578. Doi: 10.1097/BCR.0000000000000358
5. Osborne CL, Meyer WJ 3rd, Ottenbacher KJ, Arcari CM. Burn patients' return to daily activities and participation as defined by the International Classification of Functioning, Disability and Health: a systematic review. Burns. 2017;43(4):700-714. Doi: 10.1016/j.burns.2016.10.013
6. Simons M, Ziviani J, Tyack ZF. Measuring functional outcome in paediatric patients with burns: methodological considerations. Burns. 2004;30(5):411-7. Doi: 10.1016/j.burns.2004.01.023
7. Wiechman Askay S, Patterson DR. What are the psychiatric sequelae of burn pain? Curr Pain Headache Rep. 2008;12(2):94-7. Doi: 10.1007/s11916-008-0018-1
8. ISBI Practice Guidelines Committee; Steering Subcommittee; Advisory Subcommittee. ISBI Practice Guidelines for Burn Care. Burns. 2016;42(5):953-1021. Doi: 10.1016/j.burns.2016.05.013
9. Herbert R, Elkins M. Publishing code: an initiative to enhance transparency of data analyses reported in Journal of Physiotherapy. J Physiother. 2017;63(3):129-130. Doi: 10.1016/j.jphys.2017.05.011
10. Kwakkel G, Lannin NA, Borschmann K, English C, Ali M, Churilov L, et al. Standardized measurement of sensorimotor recovery in stroke trials: consensus-based core recommendations from the stroke recovery and rehabilitation roundtable. Int J Stroke. 2017;12(5):451-61. Doi: 10.1177/1747493017711813
11. Brady KJS, Grant GG, Stoddard FJ, Meyer WJ, Romanowski KS, Chang PH, et al. Measuring the impact of burn injury on the parent-reported health outcomes of children 1 to 5 years: a conceptual framework for development of the preschool life impact burn recovery evaluation profile CAT. J Burn Care Res. 2020;41(1):84-94. Doi: 10.1093/jbcr/irz110

12. Falder S, Browne A, Edgar D, Staples E, Fong J, Rea S, et al. Core outcomes for adult burn survivors: a clinical overview. Burns. 2009;35(5):618-41. Doi: 10.1016/j.burns.2008.09.002
13. Huang M, Moralez G, Romero SA, Jaffery MF, Cramer MN, Petric JK, et al. The benefits of an unsupervised exercise program in persons with well-healed burn injuries within the International Classification of Functioning, Disability and Health (ICF). Burns. 2020;46(6):1280-8. Doi: 10.1016/j.burns.2020.06.023
14. Mc Kittrick A, Gustafsson L, Marshall K. A systematic review to investigate outcome tools currently in use for those with hand burns, and mapping psychometric properties of outcome measures. Burns. 2021;47(2):295-314. Doi: 10.1016/j.burns.2020.07.009
15. Lin YR, Wang JY, Chang SC, Chang KH, Chen HC, Escorpizo R, et al. Developing a Delphi-Based Comprehensive Core Set from the International Classification of Functioning, Disability, and Health Framework for the Rehabilitation of Patients with Burn Injuries. Int J Environ Res Public Health. 2021;18(8):3970. Doi: 10.3390/ijerph18083970
16. Marino M, Soley-Bori M, Jette AM, Slavin MD, Ryan CM, Schneider JC, et al. Measuring the Social Impact of Burns on Survivors. J Burn Care Res. 2017;38(1):e377-e383. Doi: 10.1097/BCR.0000000000000398
17. Meirte J, van Loey NE, Maertens K, Moortgat P, Hubens G, Van Daele U. Classification of quality of life subscales within the ICF framework in burn research: identifying overlaps and gaps. Burns. 2014;40(7):1353-9. Doi: 10.1016/j.burns.2014.01.015
18. Meirte J, Van Daele U, Maertens K, Moortgat P, Deleus R, Van Loey NE. Convergent and discriminant validity of quality of life measures used in burn populations. Burns. 2017;43(1):84-92. Doi: 10.1016/j.burns.2016.07.001
19. Osborne CL, Petersson C, Graham JE, Meyer WJ 3rd, Simeonsson RJ, Suman OE, et al. The multicenter benchmarking study of burn injury: a content analysis of the outcome measures using the international classification of functioning, disability and health. Burns. 2016;42(7):1396-1403. Doi: 10.1016/j.burns.2016.07.023
20. Osborne CL, Petersson C, Graham JE, Meyer WJ 3rd, Simeonsson RJ, Suman OE, et al. The burn model systems outcome measures: a content analysis using the International Classification of Functioning, Disability, and Health. Disabil Rehabil. 2017;39(25):2584-93. Doi: 10.1080/09638288.2016.1239767
21. Passos MCN, Gragnani A, Piccolo MS, Daher RP, Cordeiro ES, Ferreira LM. Burn Specific Health Scale - Brief - Brazil and International Classification of Functioning, Disability and Health in Burn Patients. J Burn Care Res. 2022;43(1):30-6. Doi: 10.1093/jbcr/irab055
22. Rencken CA, Rodríguez-Mercedes SL, Patel KF, Grant GG, Kinney EM, Sheridan RL, et al. Development of the School-Aged Life Impact Burn Recovery Evaluation (SA-LIBRE5-12) profile: a conceptual framework. J Burn Care Res. 2021;42(6):1067-75. Doi: 10.1093/jbcr/irab104
23. Stergiou-Kita M, Grigorovich A. Guidelines for vocational evaluation following burns: integrated review of relevant process and factors. J Occup Rehabil. 2013;23(4):476-503. Doi: 10.1007/s10926-013-9428-y
24. van Baar ME, Essink-Bot ML, Oen IM, Dokter J, Boxma H, van Beeck EF. Functional outcome after burns: a review. Burns. 2006;32(1):1-9. Doi: 10.1016/j.burns.2005.08.007
25. Wasiak J, McMahon M, Danilla S, Spinks A, Cleland H, Gabbe B. Measuring common outcome measures and their concepts using the International Classification of Functioning, Disability and Health (ICF) in adults with burn injury: a systematic review. Burns. 2011;37(6):913-24. Doi: 10.1016/j.burns.2011.02.012