EDNA YUKIMI ITAKUSSU

FUNCIONALIDADE EM ADULTOS VÍTIMAS DE QUEIMADURAS INTERNADOS EM UM CENTRO DE TRATAMENTO ESPECIALIZADO

Londrina
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Tese apresentada ao Programa de Pós-Graduação em Ciências da Reabilitação (Programa Associado entre Universidade Estadual de Londrina [UEL] e Universidade Pitágoras Unopar [UNOPAR]), como requisito parcial para a obtenção do título de Doutor em Ciências da Reabilitação.

Orientadora: Prof. Dra. Nidia A. Hernandes

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Londrina, 17 de agosto de 2021.

DEDICATÓRIA

Aos meus pais Tikao e Setsuko

Meus exemplos...

AGRADECIMENTOS

À Deus que é PAI, criador de tudo e de todas as coisas. É Ele que direciona os meus passos, ilumina meus caminhos por onde quer que eu ande. À Ele toda honra, glória, louvor e agradecimento.

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Ao meu abençoado filho Marcelo Yuji e ao meu querido esposo Claudio: meus companheiros, meus amores, minha base, meu mundo.

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“Permanecer indiferente perante
aos desafios é imperdoável.
Se o objetivo é nobre, seja ele realizado
durante a nossa vida é o mais irrelevante.
O que devemos fazer portanto é
nos esforçar, perseverar e nunca desistir”.

(Dalai Lama)

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RESUMO

Introdução: Queimaduras graves podem desencadear injúrias locais e sistêmicas que repercutem nos mais diversos órgãos e sistemas do corpo humano e os sobreviventes frequentemente vivenciam consideráveis problemas que afetam amplas dimensões da funcionalidade. Instrumentos capazes de identificar as dificuldades funcionais enfrentadas tornam-se cada vez mais necessários para medir os resultados das intervenções terapêuticas e avaliar as progressões individuais de cada sobrevivente. Atualmente, não há um consenso na literatura que forneça a ferramenta mais adequada para este fim. Uma padronização dos métodos de avaliação da funcionalidade após uma queimadura seria de grande valia para os profissionais que trabalham com esta população. O primeiro objetivo desta tese foi investigar os instrumentos (questionários ou testes objetivos) utilizados para avaliar a funcionalidade em adultos após uma lesão por queimadura; identificar as características e as propriedades de medidas desses instrumentos e avaliar sua utilidade clínica. O segundo objetivo foi traduzir, adaptar transculturalmente, validar, verificar a confiabilidade e a responsividade e estimar a mudança mínima detectável (MMD) do questionário Upper Extremity Functional Index (UEFI) para o português do Brasil. **Métodos:** A revisão sistemática foi registrada no PROSPERO (CRD42016048065) e conduzida pelo protocolo guiado pelo Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement, e a pesquisa foi conduzida por três autores em seis bases de dados eletrônicas. Estudos nos quais as propriedades de medida foram mensuradas, foram submetidos a uma avaliação de qualidade através do Consensus-based Standards for the Selection of Health Status Measurement Instrument (COSMIN) checklist. Para a avaliação da utilidade clínica de cada instrumento encontrado, foram utilizados os critérios de Tyson e Connell que avaliaram: o tempo de administração, análise e interpretação do instrumento, custo e a necessidade de equipamentos especiais e treinamento para seu uso ou aplicação. O estudo da tradução e análise das propriedades psicométricas do UEFI foi realizado no Centro de Tratamento de Queimaduras (CTQ) do Hospital Universitário de Londrina. O processo de tradução e adaptação transcultural foi baseado em recomendações internacionais, divididas em cinco etapas: tradução, síntese e revisão das traduções por um comitê de especialistas, retro tradução, avaliação pelo autor do instrumento original e pré-teste. As propriedades psicométricas foram testadas em dois momentos importantes e distintos: na alta hospitalar e no primeiro retorno ambulatorial ao CTQ. Para a avaliação da validação de constructo, o coeficiente de correlação de Spearman foi calculado entre os escores do UEFI e dos escores do '*domínio função'* do Burn Specific Health Scale Brief Brazil (BSHS-B-Br); para a confiabilidade intra e inter examinadores o Coeficiente de Correlação Intraclasse (CCI) e o α de Cronbach foram calculados. A responsividade foi calculada pelo tamanho do efeito ou *effect size* através do Cohen *d* e do Standardized Response Mean (SRM). E finalmente a MMD foi estimada pelo método baseado na distribuição: 1) 0,5 vezes o desvio padrão (DP) da medida da baseline; 2) empirical rule effect size; 3) Cohen *d* effect

size; 4) Standard Error of Measurement (SEM). **Resultados:** A revisão sistemática encontrou 34 estudos que avaliaram a funcionalidade ou função de membros superiores e inferiores em adultos após uma queimadura. Dezenove ferramentas foram encontradas, sendo doze questionários e sete testes objetivos; as propriedades psicométricas dos instrumentos foram pouco estudadas, ou seja, apenas nove deles tiveram algumas de suas propriedades avaliadas, desses, quatro obtiveram boa pontuação quando avaliamos a qualidade do estudo via COSMIN. Apenas um instrumento não apresentou escore suficiente para ser considerado de boa utilidade clínica. No segundo estudo, uma amostra de 131 adultos que sofreram queimaduras e ficaram internados no CTQ de Londrina foram avaliados. Encontrou-se uma forte correlação entre o UEFI-Br e o BSHS-B-Br (domínio função), valores excelentes de ICC e do α de Cronbach foram encontrados, portanto a confiabilidade intra e inter avaliador do UEFI-Br foram consideradas excelentes. A responsividade do instrumento foi considerada moderada e a MMD variou de 11 a 13 pontos nos dois momentos. **Conclusão:** A presente revisão sistemática demonstrou que apesar de terem sido utilizados muitos instrumentos para a avaliação da funcionalidade, poucos foram validados para esta população específica; além disso, não há um consenso sobre qual é a melhor ferramenta para este fim. Há uma necessidade de maiores estudos para validá-los e compará-los entre si, para encontrar um que melhor avalie a funcionalidade após uma injúria por queimadura. No segundo estudo concluímos que o UEFI-Br mostrou ser uma ferramenta válida, confiável, responsiva e capaz de detectar uma mudança ao longo do tempo. O estudo mostrou que o uso do UEFI-Br é uma boa escolha quando o objetivo é medir a limitação de atividade dos membros superiores e mudança na funcionalidade em adultos brasileiros vítimas de queimaduras.

Palavras-chave: queimaduras; funcionalidade; performance físico funcional; estudo de validação; avaliação de resultado.

ITAKUSSU, Edna Yukimi. **Functionality in adult victims of burns admitted to a specialized treatment center.** 2021. 136 p. Thesis (PhD em Ciências da Reabilitação) – Universidade Estadual de Londrina, Londrina, 2021.

ABSTRACT

Introduction: Severe burns can trigger local and systemic injuries that affect the most diverse organs and systems of the human body and survivors often experience considerable problems that affect wide dimensions of functionality. Instruments capable of identifying the functional difficulties faced become increasingly necessary to measure the results of therapeutic interventions and to assess the individual progressions of each survivor. Currently, there is no consensus in the literature that provides the most appropriate tool for this purpose. A standardized method of assessing functionality after a burn would be of great value to professionals working with this population. The first objective of this thesis was to investigate the instruments (questionnaires or objective tests) used to assess functionality in adults after a burn injury; identify the characteristics and measurement properties of these instruments and assess their clinical utility. The second objective was to translate, cross-culturally adapt, validate, verify reliability and responsiveness, and estimate the minimal detectable change (MMD) of the Upper Extremity Functional Index (UEFI) questionnaire into Brazilian Portuguese. **Methods:** The systematic review was registered in PROSPERO (CRD42016048065) and conducted by the protocol guided by Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement, and the search was conducted by three authors in six electronic databases. Studies in which measurement properties were measured were submitted to a quality assessment using the Consensus-based Standards for the Selection of Health Status Measurement Instrument (COSMIN) checklist. To assess the clinical utility of each instrument found, the criteria of Tyson and Connell were used, which assess: time of administration, analysis and interpretation of the instrument, cost and the need for special equipment and training for its use or application. The study of the translation and analysis of the psychometric properties of the UEFI was carried out at the Burn Treatment Center (CTQ) of the University Hospital of Londrina. The translation and cross-cultural adaptation process was based on international recommendations, divided into 5 steps: translation, synthesis and revision of the translations by a committee of experts, back translation, evaluation by the author of the original instrument and pre-test. The psychometric properties were tested at two important and distinct moments: at hospital discharge and at the first outpatient return to the CTQ. To assess construct validation, Spearman's correlation coefficient was calculated between the UEFI scores and the 'function domain' scores of the Burn Specific Health Scale Brief Brazil (BSHS-B-Br); for intra- and inter-examiner reliability, the Intraclass Correlation Coefficient (ICC) and Cronbach's α were calculated. Responsiviness was calculated by the effect size or effect size using Cohen *d* and the Standardized Response Mean (SRM). Finally, the MDC was estimated by the distribution based method: 1) 0.5 times the standard deviation (SD) of the baseline measurement; 2) empirical rule effect size; 3) Cohen d effect size; 4) Standard Error of Measurement (SEM). **Results:** The systematic review found 34 studies that assessed the functionality or function of upper and lower limbs in adults after a burn. Nineteen tools were found, twelve questionnaires and seven objective

tests; the psychometric properties of the instruments have been little studied, that is, only nine of them had some of their properties evaluated, these four had good scores when assessing study quality by COSMIN. Only one instrument did not score enough to be considered of good clinical use. In the second study, a sample of 131 adults who suffered burns and were hospitalized at the BCT in Londrina were evaluated. A strong correlation was found between the UEFI-Br and the BSHS-B-Br (function domain), excellent ICC and Cronbach's α values were found, therefore the intra- and inter-rater reliability of the UEFI-Br were considered excellent. The responsiveness was considered moderate and the MMD ranged from 11 to 13 points. **Conclusion:** The present systematic review showed that although many instruments have been used to assess functionality, few have been validated for this specific population; furthermore, there is no consensus on the best tool for this purpose. There is a need for further studies to validate and compare them to each other, to find one that better assesses functionality after a burn injury. In the second study, we concluded that the UEFI-Br proved to be a valid, reliable, responsive tool, capable of detecting change over time. The study showed that the use of UEFI-Br is a good choice when the objective is to measure the activity limitation of the upper limb and the change in functionality in Brazilian adults after a burn injury.

Keywords: Burns; Physical Functional Performance; Validation study; Patient Outcome Assessment.

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LISTA DE ABREVIATURAS E SIGLAS

ABVD	Atividade Básica de Vida Diária
ADL	Activity of Daily Living
ADM	Amplitude de Movimento
AVD(s)	Atividade(s) de Vida Diária
BHOT	Burnt Hand Outcome Tool
BSHS	Burn Specific Health Scale
BSHS-B	Burn Specific Health Scale Brief
BSHS-B-Br	Burn Specific Health Scale Brief Brazilian version
BTC	Burn Treatment Center
CO	Monóxido de carbono
COSMIN	Consensus-based Standards for the selection of health Measurement INstruments
CPAx	Chelsea Critical Care Physical Assessment
CTQ	Centro de Tratamento de Queimados
DASH	Disabilities of the Arm, Shoulder and Hand Questionnaire
FAB score	Functional Assessment for Burns score
FAB – CC	Functional Assessment for Burns – Critical Care
FIM	Functional Independence Measure
FM	Força Muscular
FV	Final Version
GST	Grocery Shelving Task
HiMAT	Hight Mobility Assessment Tool
IC	Internal Consistency
ICC	Intraclass Correlation Coefficient
ISBI	International Society of Burn Injury
JTHFT	Jebsen Taylor Hand Function Test
LEFS	Lower Extremity Functional Scale
LI	Lesão Inalatória
LLFI – 10	Lower Limb Functional Index – 10
LOS	Length of Stay
MDC	Minimal Detectable Change
MMD	Mudança Mínima Detectável

MHQ	Michigan Hand Questionnaire
MMSS	Membros Superiores
MMII	Membros Inferiores
O_2	Oxigênio
OMS	Organização Mundial de Saúde
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analysis
QuickDASH	Shortened Disabilities of the Arm, Shoulder and Hand Questionnaire
ROM	Range of Motion
SCQ	Superfície Corpórea Queimada
SEM	Standard Error of Measurement
SHT	Sollerman Hand Function Test
TBSA	Total Burn Surface Area
TEMPA	Test d'Evoluation des Membres Supériorieus des Personnes Agées
TUG	Timed Up and Go Test
UTQ	Unidade de Terapia Intensiva de Queimados
UEFI	Upper Extremity Functional Index
UEI	Upper Extremity Index

SUMÁRIO

1 INTRODUÇÃO

Anualmente aproximadamente 12 milhões de pessoas ao redor do mundo sofrem algum tipo de queimadura que requer tratamento especializado e em torno de 265.000 vão a óbito em decorrência das lesões ou complicações decorrentes delas (1). Em virtude dessa estatística alarmante, a Organização Mundial de Saúde (OMS) descreve as queimaduras como sendo a ‘crise de saúde pública global esquecida’, uma vez que não recebem atenção das iniciativas políticas nacionais ou globais (2). A maioria das queimaduras ocorre nos países de baixa e média rendas onde programas de prevenção não existem ou são inadequados e os cuidados de saúde, reabilitação e pesquisas ainda são limitados (3). No Brasil, alcançam índices significantes; estima-se que ocorram 1 milhão de queimaduras com 200 mil atendimentos em serviços de emergência e 40 mil hospitalizações por ano (4). Apesar dos números alarmantes, poucos dados estatísticos específicos em relação à gravidade dos acidentes e áreas atingidas, faixa etária acometida, agente causador, tipo de tratamento, tempo e custos de internação são observados no país (5).

Nas últimas três décadas houveram avanços significativos nos cuidados agudos das vítimas de queimaduras (6): técnicas cirúrgicas mais refinadas; excisão e enxertia precoces; desenvolvimento de substitutos cutâneos; melhora no cuidado intensivo e na ressuscitação volêmica; avanço no aporte nutricional e no desenvolvimento farmacológico entre outros fatores; proporcionaram uma melhora nos resultados para os grandes queimados, com redução na taxa de mortalidade e diminuição dos dias de hospitalização (7–10). No entanto significantes desafios persistem ao longo prazo; apesar de fornecer uma cicatrização das queimaduras, permanecem as complicações e as morbidades

psicológicas e funcionais, distanciamento familiar e social entre outras (11). Diante desta nova realidade, membros da equipe e pesquisadores voltaram o olhar para as morbidades e às sequelas das queimaduras em ordem a melhorar a capacidade funcional e a qualidade de vida dos indivíduos sobreviventes (11,12).

A meta dos cuidados da equipe é capacitar as vítimas de queimaduras a levarem uma vida produtiva após a injúria (8). Grandes queimados representam um grande desafio uma vez que repentinamente veem suas atividades diárias e laborais interrompidas, seguidas de longos e extensivos dias de hospitalização acompanhados de um doloroso tratamento para a cicatrização das feridas e um processo de reabilitação que se inicia no momento em que o paciente é internado no Centro de Tratamento de Queimados (CTQ) podendo prolongar-se por anos após a cicatrização das feridas (13,14).

Sobreviventes de grandes extensões de queimaduras frequentemente experimentam consideráveis problemas que afetam dimensões amplas da funcionalidade (física, psicológica e social) (15,16) porém pequenas extensões também podem apresentar sequelas funcionais importantes, especialmente quando áreas como as mãos são afetadas, impactando diretamente em sua qualidade de vida (17).

A avaliação dos resultados funcionais dos sobreviventes de queimaduras é um desafio complexo (18). Instrumentos capazes de identificar as dificuldades funcionais enfrentadas por indivíduos que sofreram queimaduras tornam-se necessários para medir os resultados das intervenções terapêuticas e avaliar suas progressões. Existe uma gama de instrumentos internacionais utilizados para esse fim como o *Burnt Hand Outcome Tool* (19),

Lower Limb Functional Index – 10 (20), *Functional Assessment for Burns score* (21), *Michigan Hand Questionnaire* (22) porém ainda não foram traduzidos e validados para o português do Brasil. Uma recente revisão sistemática mostrou vários questionários e testes para a avaliação da funcionalidade em adultos após uma queimadura, entre eles o *Upper Extremity Functional Index (UEFI*) (23).

O *UEFI* foi desenvolvido inicialmente no Canadá para indivíduos com disfunção da extremidade superior de origem musculoesquelética cujo objetivo é investigar sobre o atual estado funcional do membro superior na execução de uma série de atividades (24). O questionário UEFI é de fácil aplicação; fácil entendimento, com instruções simples e diretas; permite a identificação simples de áreas de dificuldade que podem ser relevantes para serem abordadas na terapia; além de avaliar a situação do membro superior no momento da aplicação do teste, diferentemente de outros testes que se baseiam em como o membro superior encontrava-se nas semanas anteriores. Acredita-se que este questionário traduzido e validado para o português brasileiro poderá ser um poderoso aliado quando inserido na rotina clínica, promovendo meios para uma melhor avaliação da funcionalidade em adultos após uma injúria por queimadura.

2 OBJETIVOS

2.1 OBJETIVO GERAL

A presente tese de doutorado foi desenvolvida para determinar quais instrumentos estão sendo utilizados para avaliar funcionalidade em adultos após uma queimadura e fornecer um instrumento que poderá ser utilizado na prática clínica estendendo-se à pesquisa no Brasil.

2.1.1 Objetivos Específicos

1. Investigar os instrumentos (questionários ou testes objetivos) utilizados para avaliar a funcionalidade em adultos após uma lesão por queimadura; identificar as características e as propriedades de medidas desses instrumentos e avaliar suas utilidades clínicas;
2. Traduzir, adaptar transculturalmente, validar, verificar a confiabilidade e a responsividade e estimar a mudança mínima detectável (MMD) do questionário UEFI para o português do Brasil.

3 REVISÃO DE LITERATURA – CONTEXTUALIZAÇÃO

3.1 PELE

A pele corresponde a 15% do peso corporal, recobre em média 7500 cm^2 de área de superfície em um adulto e recebe cerca de 1/3 de toda a circulação sanguínea do corpo. Considerada o maior órgão do corpo humano, é elástica e autorregeneradora em situações comuns (25).

Protege o ser humano do meio ambiente contra a passagem de agentes físicos, químicos e biológicos, impedindo a perda excessiva de água e eletrólitos funcionando como uma barreira natural do organismo; é responsável pela sensação/sensibilidade através de suas terminações nervosas (dor, temperatura e pressão); termorregulação do corpo e secreção (suor e secreção sebácea); além da síntese de vitamina D (25).

Histologicamente é composta de duas camadas unidas firmemente entre si, contendo diversos apêndices e glândulas, como pelos, glândulas sudoríparas e sebáceas e uma rede capilar. Abaixo delas vem o tecido subcutâneo (25) (Figura 1).

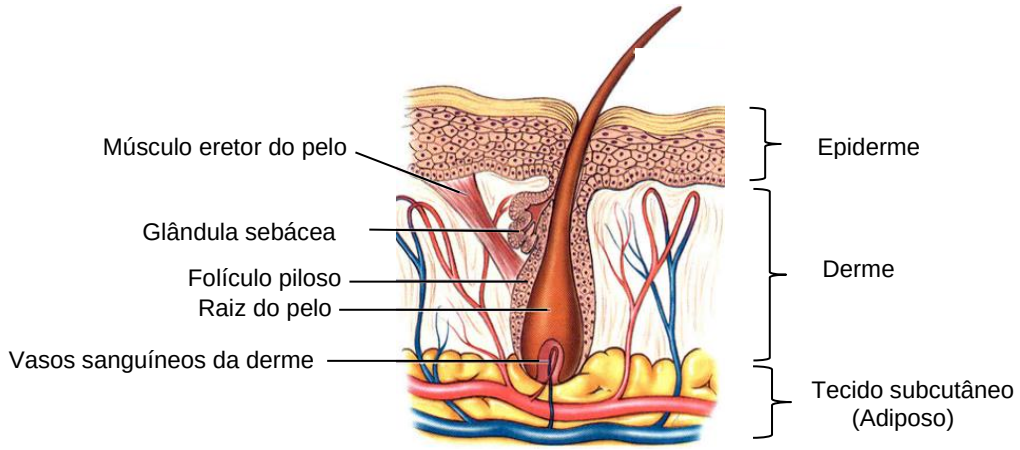

Figura 1 - Camadas da pele (26)

3.1.1 Epiderme

A epiderme é um epitélio multiestratificado formado por vários estratos de epitélio pavimentoso justapostos e varia de 0,05 mm a 1 mm de espessura. Toda a superfície cutânea está provida de terminações nervosas capazes de captar estímulos térmicos, mecânicos ou dolorosos, porém não existem vasos sanguíneos. Os nutrientes e oxigênio chegam à epiderme por difusão a partir de vasos sanguíneos da derme (25,26).

A camada mais interna é chamada de estrato basal ou germinativo constituída por células que se multiplicam continuamente e é onde que encontram-se os melanócitos responsáveis pela produção de melanina, pigmento que determina a coloração da pele; a camada mais externa, conhecida como camada queratinizada ou córnea é altamente impermeável à água e resistente ao atrito (25–27). Evita a perda de líquidos e serve como barreira protetiva entre os meios interno e externo o que dificulta a invasão fúngica ou bacteriana (28).

3.1.2 Derme

Imediatamente sob a epiderme, a derme ou cório dá à pele força e elasticidade pelo entrelaçamento de colágeno e fibras elásticas cuja espessura média é de 1 a 2 mm. Consiste em tecido conjuntivo que contém fibras colágenas brancas (resistência) e fibras elásticas amarelas (elasticidade). O colágeno é a proteína mais abundante no corpo humano, representando cerca de 30% total das proteínas do corpo (25,27).

Formada por células e matriz extracelular é dividida em duas camadas: a

mais fina superficial é a camada papilar e a mais espessa e profunda é camada reticular. A camada papilar é constituída por tecido conjuntivo frouxo da qual originam as papilas dérmicas, que se aderem à epiderme. É nessa camada delgada que encontramos as fibrilas especiais de colágeno (colágeno tipo VII). A camada reticular é constituída por tecido conjuntivo denso, que confere o aspecto mais espesso (25,27). Outras estruturas que estão mergulhados na derme são os vasos sanguíneos, nervos, vasos linfáticos, folículos pilosos e glândulas sudoríparas e sebáceas, além das células de defesa como mastócitos, linfócitos, eosinófilos, neutrófilos, plasmócitos, entre outros (25,27).

3.1.3 Tecido subcutâneo

Conhecida como a tela subcutânea ou tecido adiposo, atua como isolante térmico, reserva energética e proteção contra os choques mecânicos. Constitui-se de uma camada de tecido conjuntivo frouxo rica em fibras e células que armazenam gordura (adipócitos) (25).

3.2 QUEIMADURAS

As queimaduras são lesões traumáticas sobre o tecido de revestimento do corpo humano (pele) que podem acometer camadas mais profundas podendo causar repercussões sobre todo o organismo dependendo do tempo de exposição, da extensão, da profundidade da área lesada e do tipo de agente causal (29). Resultantes de um efeito térmico, químico, elétrico, radioativo ou biológico, podem desencadear respostas sistêmicas proporcionais à extensão e a profundidade podendo comprometer a vida na fase aguda da lesão;

enquanto que sobreviventes de grandes queimaduras podem apresentar consideráveis problemas nas dimensões físicas, mentais e sociais por longos períodos após a cicatrização das feridas exigindo um longo e cuidadoso processo de reabilitação (15,30).

3.2.1 Etiologia das Queimaduras

Os agentes causadores de queimaduras dividem-se em três grandes grupos: *físicos, químicos e biológicos*. Partes internas do corpo também podem ser atingidas como o tubo digestivo (ingestão de substâncias aquecidas, ou químicos) e a árvore respiratória (lesão inalatória).

Os agentes físicos são os principais responsáveis pelas queimaduras e são divididos em cinco subgrupos:

1. Térmicos: *frio* ou por congelamento; *calor* através de líquidos superaquecidos (escaldo) frequentemente acometem crianças em acidentes domésticos; inflamáveis (álcool, petróleo e derivados) que merecem atenção especial por determinar alto índice de queimaduras graves por atingirem grande área corporal e por muitas vezes acometerem as vias aéreas agravando o prognóstico do indivíduo.
2. Sólidos: contato com superfícies superaquecidas como escapamento de moto, chapas de fogão, ferro de passar, ou atrito.
3. Gasosos: queimaduras provocadas por explosão de caldeira, panela de pressão, onde o trauma mais frequente é na face e região dos olhos.
4. Elétricos: a passagem da corrente elétrica pelo corpo, produz queimadura grave pela profundidade das lesões, que podem evoluir para amputações de membros ou a lesões nervosas periféricas que

evoluem para incapacidade funcional do membro. Depende da duração do contato, da intensidade da corrente e da resistência do sistema.

5. Radiantes: raios infravermelhos e ultravioletas, raios-X e Gama, e substâncias radioativas (31).

Agentes químicos são os álcalis e os ácidos. Substâncias alcalinas tendem a causar necrose por liquefação enquanto os ácidos causam necrose de coagulação (32,33). Provocam queimaduras profundas dependendo da dose e do tempo de exposição; é muito comum subestimar a gravidade deste tipo de queimaduras pois inicialmente aparentam ser superficiais, porém alguns agentes químicos continuam causando danos aos tecidos apesar do tratamento tópico. Como agentes biológicos podemos citar as lagartas-de-fogo, águas marinhas, medusas, caravelas, urtigas, entre outros (32).

3.2.2 Profundidade ou Grau das Queimaduras

Determinar a profundidade da queimadura significa determinar o grau da lesão na pele sendo diretamente proporcional a temperatura e ao tempo de exposição à fonte de calor (34). Avaliar a profundidade da lesão é um importante norteador do planejamento do tratamento; fatores como uma ressuscitação volêmica inadequada, edema e quadros infecciosos contribuem para o aprofundamento das lesões; reavaliações da profundidade entre 48 a 72 horas após a injúria inicial são necessárias (33). São divididas em três grupos como descritas a seguir:

1. Queimaduras de espessura superficial: as queimaduras de espessura superficial ou chamadas de 1º grau, atingem a camada mais externa da

pele, a epiderme. Caracterizam-se por serem extremamente dolorosas, hiperemiadas, úmidas e edemaciadas. Reepitelizam-se em torno de 5 a 7 dias; um clássico exemplo são as queimaduras solares (35).

2. Queimaduras de espessura parcial: conhecidas como queimaduras de segundo grau, atingem a epiderme e a derme podendo ser diferenciadas em queimaduras de espessura parcial superficial e profunda. A característica mais marcante da superficial é a formação de flictenas (bolhas) e o tempo de cicatrização é mais lento, de 14 a 28 dias, podendo haver a necessidade de desbridamentos cirúrgicos para a aceleração da cicatrização. Embora as de espessura parcial profunda possam evoluir para a restauração após três semanas, o tratamento mais comumente empregado é a excisão e a enxertia de pele pois o epitélio neoformado é muito friável, com ulcerações recorrentes e forte tendência à cicatrização hipertrófica e formação de contraturas, o que ocasionariam piores prognósticos funcionais aos sobreviventes (35).
3. Queimaduras de espessura total: também conhecidas como queimaduras de 3º grau são aquelas onde todas as camadas da pele são acometidas e, em muitos casos, outros tecidos como subcutâneo, músculo e o tecido ósseo também podem estar comprometidos. Com aspecto muitas vezes esbranquiçado, marmóreo, coriáceo ou até carbonizado, nestas queimaduras ocorrem a necrose de coagulação celular, destruição vascular localizada, edema maciço que levam a importantes repercussões hemodinâmicas (35). Os tecidos ficam inelásticos além de insensíveis ao tato e à dor pela destruição das terminações nervosas livres (33). Normalmente provocam lesões

deformantes, muitas vezes mutilantes e as causas mais frequente são as queimaduras elétricas ou térmicas (35). (Figura 2)

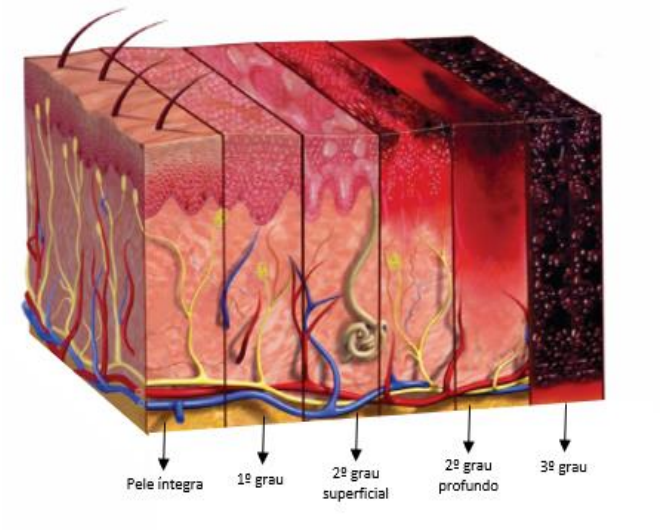

Figura 2 – Profundidade ou graus das queimaduras (36)

3.2.3 Superfície Corpórea Queimada (SCQ) ou Extensão da Queimadura

Determinar a SCQ ou extensão da queimadura é fundamental não apenas para o prognóstico do indivíduo mas norteia o tratamento inicial agudo como a reposição volêmica onde o cálculo da mesma é baseado na SCQ, quer seja pela utilização da Fórmula de Parkland ou pela Fórmula de Brooke modificada; subestimar ou superestimar a SCQ pode agravar o quadro do indivíduo que sofreu queimaduras (37). Ressalta-se que apenas áreas com queimaduras parciais ou totais são levadas em consideração para o cálculo da SCQ (4).

O método mais avançado e preciso utilizado internacionalmente para calcular a extensão da lesão é o descrito por Lund & Browder que leva em consideração as proporções do corpo em relação à idade e o resultado é expresso em percentual de superfície corpórea queimada (38) (Tabela 1).

Tabela 1 – Esquema de Lund & Browder para o cálculo da superfície corporal queimada (39)

Idade (anos) / Área	0 – 1	1 – 4	5 – 9	10 – 14	15	Adulto
Cabeça	19	17	13	11	9	7
Pescoço	2	2	2	2	2	2
Tronco anterior	13	13	13	13	13	13
Tronco posterior	13	13	13	13	13	13
Nádega direita	2 ½	2 ½	2 ½	2 ½	2 ½	2 ½
Nádega esquerda	2 ½	2 ½	2 ½	2 ½	2 ½	2 ½
Genital	1	1	1	1	1	1
Braço direito	4	4	4	4	4	4
Braço esquerdo	4	4	4	4	4	4
Antebraço direito	3	3	3	3	3	3
Antebraço esquerdo	3	3	3	3	3	3
Mão direita	2 ½	2 ½	2 ½	2 ½	2 ½	2 ½
Mão esquerda	2 ½	2 ½	2 ½	2 ½	2 ½	2 ½
Coxa direita	5 ½	6 ½	8	8 ½	9	9 ½
Coxa esquerda	5 ½	6 ½	8	8 ½	9	9 ½
Perna direita	5	5	5 ½	6	6 ½	7
Perna esquerda	5	5	5 ½	6	6 ½	7
Pé direito	3 ½	3 ½	3 ½	3 ½	3 ½	3 ½
Pé esquerdo	3 ½	3 ½	3 ½	3 ½	3 ½	3 ½

3.2.4 Gravidade das Queimaduras

As queimaduras são classificadas quanto à gravidade em três grupos distintos como mostrado na tabela 2:

Tabela 2 - Gravidade das queimaduras (40,41)

Queimadura Leve ou Pequeno Queimado	Queimadura Moderada ou Médio Queimado	Queimadura Grave ou Grande Queimado
1º grau – qualquer extensão	2º grau entre 10 e 20% da SCQ	2º grau > 20% da SCQ
2º grau < 10% da SCQ	2°grau envolvendo mão ou pé ou face ou pescoço ou axila	3º grau > 10 % da SCQ 3º grau envolvendo mão, pé, face, pescoço ou axila
3º grau < 2% da SCQ	3º grau até 10% da SCQ	Queimaduras de períneo e por corrente elétrica

Existem algumas situações especiais que quando associadas às

queimaduras são considerados ‘grandes queimados’ independente da SCQ. Alguns exemplos são a presença de lesão inalatória, politraumatismo, trauma craniano, choque de qualquer origem, doenças cardíacas e metabólicas (40,41).

3.2.5 Fisiopatologia das Queimaduras

Quando mais de um terço da superfície corporal total sofre queimaduras, invariavelmente, distúrbios graves e únicos são iniciados, provocando uma intensa liberação de mediadores inflamatórios locais e sistêmicos que desencadeia alterações na homeostase corporal; o *burn shock* é um processo com complexo comprometimento circulatório bem como a formação de edema em tecidos traumatizados e não traumatizados; pode levar à falência de múltiplos órgãos caso protocolos adequados de ressuscitação volêmica não sejam prontamente instituídos (42–44). Uma resposta imediata do organismo frente à agressão sofrida leva a um quadro hipometabólico (*ebb phase*) o que ocasiona uma rápida depressão do débito cardíaco. Por volta do terceiro dia, a situação inverte-se com o surgimento do estado hipermetabólico (*flow phase)*, onde a taxa metabólica está de duas a três vezes aumentada em relação à taxa basal (42,45). Aumentos na pressão arterial, na resistência à insulina e na degradação do glicogênio, proteínas e lipídeos; aumento do gasto de energia em repouso, aumento da temperatura corporal, da perda total de proteína corporal, da perda de massa muscular na fase aguda são achados comuns (29,43).

O sistema renal também é afetado e as alterações sofridas são traduzidas em forma de oligúria como um sinal precoce de comprometimento

renal que pode levar a necrose tubular aguda (NTA), insuficiência renal e morte (29). Efeitos no sistema gastrointestinal incluem atrofia da mucosa, redução da capacidade de absorção (43,46).

Uma marca registrada da resposta adaptativa ao trauma da queimadura é o catabolismo do músculo esquelético. O músculo desempenha um papel importante na regulação metabólica por ser o principal depósito de glicose; funciona como uma reserva de aminoácidos endógenos fornecendo combustível para funções mais vitais, como a síntese de proteínas da fase aguda e a reconstrução da nova pele o que leva a grande perda de massa muscular (o músculo é sacrificado para auxiliar na cicatrização das feridas) (47).

As fases de cicatrização das queimaduras estão exacerbadas. Esta exacerbação faz com que o tecido de cicatrização formado nas regiões afetadas apresente características estruturais mais graves, conferindo um maior número de queratinócitos, fibras de colágeno (excessivas e desorganizadas), maior quantidade de matriz extracelular, porém menor de elastina, dificuldade de formação de novos vasos sanguíneos e linfáticos; pode haver alterações nas funções das glândulas sudoríparas e sebáceas. Tais características fazem com que o tecido cicatricial tenha menos possibilidades de regredir espontaneamente durante o processo de remodelamento resultando na formação de cicatrizes anormais, hipertróficas ou queloides e contraturas (48).

Adicionalmente, a função pulmonar pode estar comprometida como resultado de várias complicações causadas pela inalação de fumaça, lesão térmica direta no trato respiratório, edema pulmonar e infecção no trato respiratório (49). Nos casos em que está associado uma lesão inalatória (LI),

as consequências e o prognóstico são ainda mais reservados. Usualmente diagnosticada com base na combinação da história do paciente (queimaduras em locais fechados, perda de consciência no local do acidente, inalação de fumaça); achados físicos (escarro carbonáceo, vibrissas nasais chamuscadas, queimadura facial); e outras modalidades de diagnóstico (broncoscopia, aferição dos níveis de monóxido de carbono, tomografia computadorizada, raios X seriados) (50). A resposta inflamatória pode causar uma progressiva disfunção pulmonar, aumento nos dias de assistência ventilatória mecânica, pneumonias, e até mesmo evoluir para uma Síndrome do Desconforto Respiratório Agudo (50,51). A longo prazo, uma diminuição significativa da capacidade aeróbia e uma maior dessaturação pode ser observada durante o teste de exercício máximo (49).

3.2.6 Processo de Reparação Tecidual

A reparação tecidual é um processo interativo e dinâmico que ocorre sequencial e simultaneamente envolvendo células sanguíneas e teciduais, mediadores solúveis e matriz extracelular. Apesar da cicatrização ocorrer em um *continuum* de tempo, didaticamente o processo cicatricial é dividido em quatro fases que se sobrepõem no decorrer dos dias (52,53).

A primeira fase conhecida como hemostasia, constitui a resposta imediata à lesão e tem a função de prevenir a perda de sangue no local da ferida. Abrange a coagulação, agregação e degranulação de plaquetas e finalmente a formação do coágulo de fibrina. Logo após a hemostasia da ferida inicia-se a segunda fase, chamada de fase inflamatória que é caracterizada pelos sinais físicos: eritema, calor, edema e dor. A nível celular ocorre a dilatação dos vasos, aumento da permeabilidade vascular e recrutamento de

leucócitos para o local da lesão. Duas populações de leucócitos dominam os eventos sequenciais da cicatrização das feridas: neutrófilos e macrófagos que têm a função crítica de desbridamento da ferida e recrutamento celular para as etapas subsequentes na cicatrização (52,53).

Aproximadamente três dias após o ferimento inicial, começa o processo proliferativo da cicatrização, constituindo-se na terceira fase. Esta fase tem como características concentrar-se nos fibroblastos, na produção de colágeno e matriz extracelular, os quais formarão o arcabouço do tecido cicatricial na área da ferida. Simultaneamente a esse processo, as células endoteliais iniciam uma fase de rápido crescimento e proliferação (neoangiogênese), produzindo o tecido de granulação, dotado de uma rica e extensa rede vascular para suprir o intenso metabolismo tecidual durante a cicatrização (54).

A fase de maturação ou de remodelação é caracterizada pela substituição do colágeno do tipo II para o tipo I, onde durante esse processo que se repete várias vezes, o tecido sofre amadurecimento, resultando em reticulação completa e restauração o mais próximo da pele normal. A rede vascular regride, modificando a coloração roxo-avermelhada para um tom róseo até próximo às áreas adjacentes. A cicatrização final resulta em um revestimento cutâneo com características diferentes da normal, gerando alterações das propriedades físicas da pele (5,54).

Cada fase é essencial para o sucesso do fechamento da ferida e desvios da normalidade podem estar associados a atrasos no processo ou uma cicatrização anormal das feridas (53,54) conforme ilustrado na Figura 3.

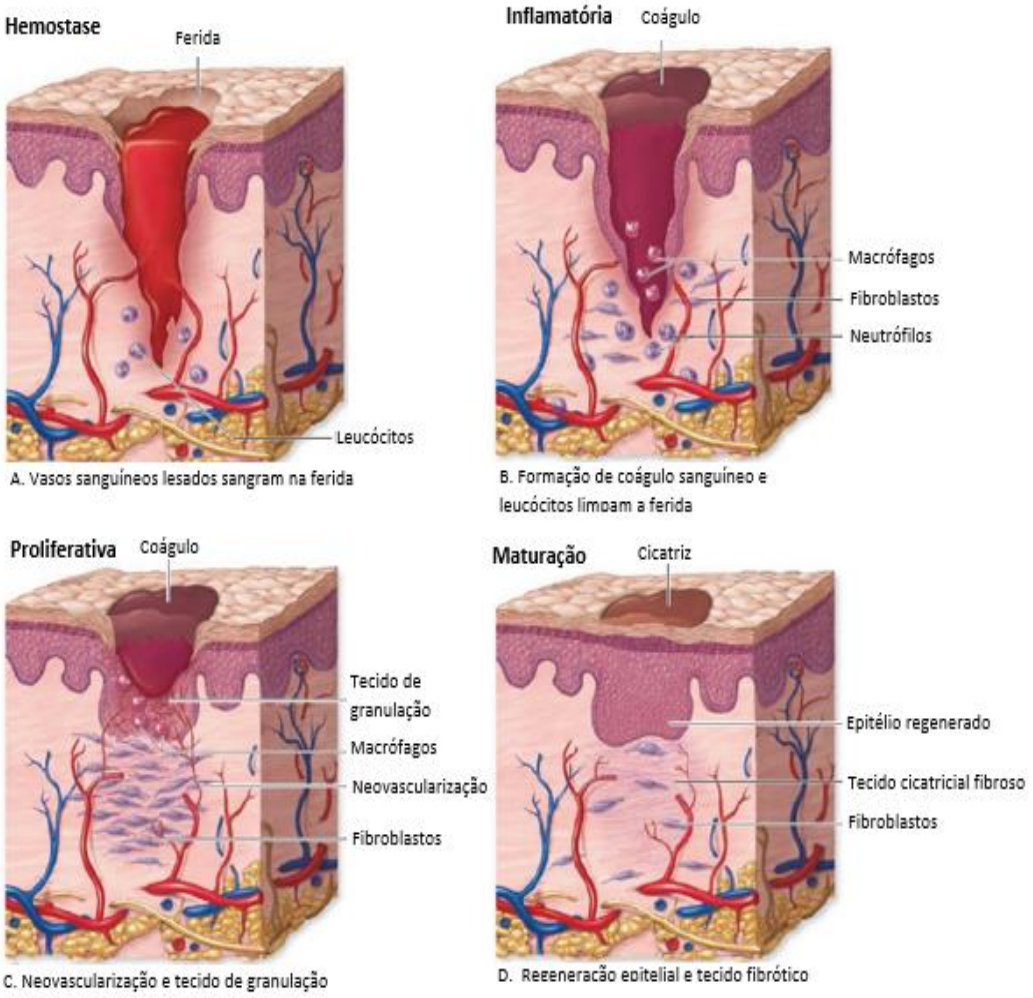

Figura 3 - Fases da cicatrização (55)

3.2.7 Centro de Tratamento de Queimados (CTQ)

O tratamento das queimaduras sempre representou um grande desafio pela gravidade e multiplicidade das complicações. Avanços no tratamento foram alcançados nas últimas décadas: melhor entendimento da fisiopatologia das queimaduras, ressuscitação volêmica adequada na fase aguda da lesão, excisão e enxertia precoces, manejo das LIs e repercussões pulmonares, controle de infecção e modulação metabólica, regimes de suporte nutricional, modulação farmacológica das respostas hipermetabólicas e catabólicas, permitiram melhoras dos índices de sobrevida dos grandes queimados. A

complexidade do tratamento confirma a exigência de atenção especializada e qualificada para a obtenção de êxito no tratamento do grande queimado (56); no Brasil existem 59 unidades especializadas em atendimento ao paciente queimado, porém esse número é insuficiente frente ao número de acidentes anuais.

O Paraná possui duas unidades, uma ala no Hospital Evangélico de Curitiba e o CTQ do Hospital Universitário de Londrina, campo de estudo escolhido para esta pesquisa. Fundado em agosto de 2007, o CTQ de Londrina conta com dezesseis leitos, dez de enfermaria e seis de unidade de terapia intensiva, atende pessoas de todas as partes do Estado, dos estados vizinhos e até das fronteiras do Paraguai, após regulação de vagas pela Central de Leitos. O setor possui duas salas de Centro Cirúrgico onde são realizados os procedimentos cirúrgicos necessários; uma sala de Pronto Atendimento, para as balneoterapias e o primeiro atendimento ao paciente; e um ambulatório para as consultas após alta hospitalar.

A indicação de internação de uma vítima de queimadura em um serviço de atendimento especializado é baseada em critérios pré-estabelecidos internacionalmente (39) como descrito na tabela 3.

Tabela 3 – Critérios para a internação em um CTQ (41)

Critérios para internação em um centro especializado
▪ Lesão de 3º grau atingindo mais de 10% de SCQ; ▪ Lesão de 2º grau atingindo área superior a 20% no adulto e 10% na criança; ▪ Queimaduras importantes de face, mãos e pés; ▪ Queimaduras de região perineal ou genitália; ▪ Queimaduras circunferenciais de extremidades; ▪ Queimaduras elétricas; ▪ Queimaduras de vias aéreas; ▪ Crianças menores de dois anos;

- Concomitância de doenças sistêmicas;
- Outros traumas associados;
- Impossibilidade de hidratação oral (vômitos).

A natureza complexa das lesões por queimaduras exige uma gama diversificada de habilidades para o tratamento ideal. Não se pode esperar que um único profissional possua todas as habilidades, conhecimento e energia necessários para o atendimento abrangente. Assim a integração concentrada de profissionais e seus diversos saberes, trabalhando com abordagem multidisciplinar é essencial. Uma equipe especializada de médicos de diversas especialidades, fisioterapeutas, enfermeiros e técnicos, assistentes sociais, psicólogos, nutricionistas, farmacêuticos, fonoaudiólogos, terapeutas ocupacionais, técnicos administrativos, laboratoriais e de higiene hospitalar, proporciona um atendimento especializado, individualizado e humanizado para o paciente e seus familiares. (56,57).

3.3 FISIOTERAPIA NAS QUEIMADURAS

O processo de reabilitação envolve tratamentos prolongados e uma intervenção focados em diferentes níveis de atenção. Queimadura é sinônimo de dor e por isso o trabalho da fisioterapia é desafiador; mobilizar a vítima de queimadura o mais precocemente possível implica em um profissional firme e seguro em suas decisões, demonstrando clareza, objetividade e entendimento

(58,59); é o especialista responsável pela recuperação físico funcional do indivíduo acometido pela queimadura e o acompanhará por um longo período de tempo. Deve ser criativo e capaz de avaliar a gravidade e possíveis complicações, motoras ou respiratórias, adequando a terapêutica à fase em que o indivíduo se encontra (60).

Visando a independência funcional e o retorno à sua condição prévia o mais precoce possível, o fisioterapeuta traça estratégias individualizadas para cada caso, haja vista que cada um possui suas particularidades (área queimada, articulações acometidas, limiar de dor, entre outras) (60,61).

As ações da fisioterapia são muito amplas, com condutas importantes em todas as fases, da internação ao acompanhamento ambulatorial. Os objetivos da fisioterapia para um indivíduo que sofreu queimaduras são:

- Promover a redução do edema e do quadro álgico;
- Obter uma ferida limpa para o desenvolvimento da cicatrização e aplicação do enxerto;
- Condução das vias aéreas, mantendo permeabilidade de vias aéreas;
- Prevenir complicações pulmonares;
- Melhorar a resistência cardiovascular;
- Prevenir complicações osteomusculares;
- Proteger as articulações/tendões expostos para evitar maiores lesões;
- Proteger os enxertos/retalhos de pele e facilitar a cicatrização das feridas;
- Manter ou melhorar a ADM e a FM;
- Manter e/ou melhorar o alongamento muscular;
- Promover independência funcional, recuperando a funcionalidade

máxima prévia à lesão;

- Prevenir formação de cicatrização hipertrófica, reduzir as contraturas cicatriciais e prevenir as aderências cicatriciais (60).

3.3.1 Fisioterapia na Unidade de Terapia Intensiva de Queimados (UTQ)

Durante a fase de ressuscitação volêmica, ou seja, nas primeiras 48 horas, o tratamento do edema é o principal objetivo da equipe da fisioterapia. O edema pode afetar todas as partes do corpo incluindo o tecido não queimado, portanto a elevação das áreas edemaciadas é fundamental, desde que não haja suspeita de fraturas ou lesões vertebrais provenientes do acidente. Além disso, prevenção e tratamento de contraturas cicatriciais exigem alongamento muscular prolongado e posicionamento. O posicionamento anti-retração deve ser realizado desde o início e um plano de analgesia deve ser ajustado para que o indivíduo tolere o mesmo. Existem posições recomendadas para cada região do corpo afetada:

- *Cervical anterior:* posição neutra (de rotação e inclinação) e hiperextensão com coxim em região subescapular;
- *Membros superiores:* elevados acima da linha cardíaca e em extensão de cotovelo e supinação;
- *Mãos:* extensão de punho aproximadamente 30º, semiflexão de metacarpo e falangeanas, abdução de dedos, polegar favorecendo a oponência;
- *Região axilar:* abdução a 90º com membros superiores elevados em mesa acolchoada;
- *Quadril:* neutro;
- *Membros inferiores:* estendidos, em posição neutra (de rotação de joelhos e quadril) e elevados;
- *Pés:* posição neutra de calcâneos que devem permanecer livres, com coxins, evitando a plantiflexão (62).

O posicionamento anti-retração pode ser realizado utilizando posicionadores de espuma, travesseiros, entre outros recursos; a imobilização por sua vez, através do emprego de talas gessadas ou órteses termo moldáveis personalizadas, preferencialmente confeccionadas pelo fisioterapeuta dentro do centro cirúrgico após a enxertia da ferida, com a intenção combinada de proteger os enxertos de pele de cisalhamento e manter a posição necessária para o alongamento do tecido (58). O fisioterapeuta deve ter o conhecimento da anatomia, cinesiologia e biomecânica da superfície e articulação a ser imobilizada; estar ciente também dos princípios quanto à pressão, vantagem mecânica, torque, forças rotacionais, alavanca, fricção, forças paralelas recíprocas. Além disso, tem que estar atento e lembrar que é vital combinar as talas/órteses com movimentos apropriados, pois apesar de fornecer alongamento prologado de baixa carga, podem levar a contraturas se não combinadas com a mobilização (32,62–64).

Diversos estudos comprovaram que mobilizar precocemente o paciente criticamente doente em Unidades de Terapia Intensivas é um procedimento seguro, importante e resulta em diminuição de complicações para o indivíduo, além de diminuir o tempo de permanência hospitalar (65–67). Mostrou-se seguro e essencial também nas UTQs (68–70). A intervenção terapêutica precoce na UTQ tem implicações de longo prazo para a restauração da funcionalidade do indivíduo (61,62); em geral consistem em evoluir da mobilidade no leito para a mobilidade fora dele, incluindo as transferências, sedestação, ortostatismo e deambulação (61,71), como pode ser observado na figura 4.

Figura 4 - Progressão da mobilização precoce (67)

Existem algumas barreiras para a mobilização precoce do doente crítico, que aumentam quando se trata de grandes queimados:

- Nível de consciência;
- Dor;
- Dispositivos invasivos (cateteres, sondas, monitoração);
- Drogas vasoativas;
- Curativos;
- Enxertos recentes;
- Necessidade de imobilização de segmentos.

Tais barreiras dificultam, porém não impedem a mobilização, levando sempre em conta os riscos e os benefícios. Há um verdadeiro arsenal de recursos que podem ser implementados, evoluindo de acordo com a resposta de cada indivíduo (61,70).

Ponto fundamental no tratamento dentro da UTQ é a monitorização da mecânica respiratória e a manutenção das vias aéreas pérvias. A monitorização atenta evidencia a deterioração precoce na função pulmonar, direcionando o tratamento à melhor conduta. Na fase aguda são encontradas alterações como diminuição da complacência estática e dinâmica e um aumento importante da resistência pulmonar repercutindo na mecânica do sistema respiratório que podem levar a respostas como aumento da frequência respiratória, aumento do trabalho respiratório, diminuição da oxigenação além de alterações radiológicas e gasométricas (72,73).

Em casos de envenenamento por monóxido de carbono (CO), é

imprescindível a administração de oxigênio (O_2) a 100% com máscara não reinalante nas primeiras 6 horas, pois o CO difunde-se rapidamente e se liga competitivamente à hemoglobina resultando em hipoxemia. A afinidade do CO pela hemoglobina é aproximadamente 200 vezes maior que a do O_2. Além disso, o CO se liga aos citocromos, interferindo na utilização do O_2 celular. A hipoxemia causada por envenenamento por CO não é detectada por oximetria de pulso ou por medições de pressão parcial de oxigênio (6,29)

Se associado à queimadura tiver uma LI, a fumaça acaba provocando uma lesão da traqueia até os brônquios, levando a um aumento da permeabilidade microvascular, hiperemia da mucosa, esfoliação do epitélio de revestimento, secreção de muco e influxo de células inflamatórias. Somado a isso encontramos uma redução da atividade do surfactante com deposição de fibrina nos espaços alveolares, com consequente alteração na relação ventilação/perfusão podendo evoluir para Síndrome da Doença Respiratória Aguda (29,72).

Estratégias de ventilação mecânica protetora devem ser instituídas. Associado a esta terapêutica a nebulização com heparina e N-acetilcisteína nos sete dias iniciais após a injúria faz parte do padrão outro em casos de LI (29,57). Protocolo de prevenção de pneumonia associada à ventilação mecânica é imperativo; terapias de higiene brônquica, reexpansão pulmonar fazem parte dos recursos que o fisioterapeuta dispõe para o trabalho respiratório do indivíduo acometido por queimaduras (29,72,73).

Alguns passos importantes a serem observados na UTQ são:

- Posicionar o paciente com cabeceira elevada entre 30 e 45° (desde que não haja suspeita ou confirmação de lesão em coluna vertebral;

- Após intubação, fixar a cânula orotraqueal de modo que seu posicionamento não contribua para aprofundamento das lesões na face, cabeça e pescoço;
- Ficar atento as informações de vida prévia que auxiliará nos ajustes da ventilação mecânica em casos de doenças pré-existentes;
- Adoção de uma estratégia ventilatória protetora e individualizada;
- Ajustar os parâmetros sempre baseado no peso predito e não em seu peso real ou estimado;
- Monitorar RX;
- Monitorar gasometria arterial, ajustando os parâmetros ventilatórios necessários. Uma hipercapnia permissiva em alguns casos; é tolerada;
- Evitar assincronias uma vez que aumentam o gasto energético e predispõe o desenvolvimento de lesão pulmonar induzida pelo ventilador;
- Extubações acidentais podem aumentar o tempo de ventilação mecânica, a morbidade e a mortalidade (57,61).

3.3.2 Fisioterapia na enfermaria de um CTQ

Informações quanto ao estado funcional, atividades sociais, laborais e de vida diária prévias a lesão devem ser avaliadas nesta fase da hospitalização, para estabelecer objetivos de reabilitação a curto-prazo, como manutenção e recuperação da ADM articular e capacidade funcional; e a longo-prazo, direcionados para o retorno a uma vida independente que seja o mais próximo possível da vida pré-lesão, incluindo o aprendizado de compensações necessárias caso alguma perda funcional permanente tenha ocorrido (61,74).

A deambulação, a movimentação ativa, devem ser iniciadas o mais precoce possível, proporcionando ao indivíduo a oportunidade de exercitar-se evitando possíveis complicações funcionais; barreiras são frequentes nesta fase, mas é neste momento da hospitalização que se inicia um outro grande desafio ao indivíduo e à equipe: preparar para reassumir a vida fora do ambiente hospitalar (61). Há um verdadeiro arsenal de exercícios que podem

ser implementados: exercícios passivos, ativo-assistidos, ativos, alongamento muscular sustentado e exercícios de fortalecimento (57,62).

Manutenção dos cuidados com a função pulmonar, recuperação dos danos causados pelo tempo prolongado no leito, recondicionamento cardiopulmonar e musculoesquelético, independência para os cuidados essenciais, correção de posturas antálgicas, preparação de coto para protetização, entre outras atividades são algumas das terapêuticas que também podem ser utilizadas (59).

Vale ressaltar que a redução do edema e o posicionamento anti-retração continuam presentes nesta fase do tratamento, uma vez que limitações importantes, aderências cicatriciais, fibroses, iniciam-se neste período, e se não tratadas adequadamente poderão causar importantes danos funcionais ao indivíduo, principalmente quando se tratam de pequenas articulações como a mão (61).

3.3.3 Fisioterapia no centro cirúrgico de um CTQ

Em sua grande maioria, os indivíduos acometidos por uma queimadura necessitarão de intervenções cirúrgicas uma vez que queimaduras de espessura parcial profunda e as de espessura total impedem a reepitelização espontânea do tecido. A excisão dos tecidos desvitalizados e inviáveis e a cobertura cutânea o mais precoce possível são essenciais para a evolução do tratamento. A permanência no centro cirúrgico pode ser a oportunidade do fisioterapeuta mobilizar passivamente, ganhar ADM antes do procedimento e avaliar as condições reais desta articulação e dos tecidos moles adjacentes (61,74). Além disso, imediatamente após uma enxertia de pele o

posicionamento e a imobilização da área recém enxertada devem ser instituídos para minimizar as chances de perda dos enxertos. Talas de gesso ou órteses de material termo moldável podem auxiliar nesse processo. A preservação dos enxertos é parte fundamental da reabilitação, uma vez que quanto antes houver a resolução das lesões, menores serão as sequelas funcionais (61,74).

3.3.4 Fisioterapia no ambulatório de um CTQ

Os sobreviventes de queimaduras percorrem a fase de reabilitação ambulatorial por meses a anos após uma queimadura, passando pelo processo de recuperação físico-funcional, psicológica, até a reinserção e reintegração desse indivíduo na sua condição social (61,75). As principais alterações encontradas no pós-alta hospitalar são o desenvolvimento de cicatrizes patológicas e contraturas, que levam a diminuição ou limitação da ADM (48,61,62).

A cicatrização em um tecido queimado possui características estruturais mais graves, fazendo com que as cicatrizes evoluam de uma maneira negativa, com a formação de cicatrizes patológicas (48). Esta cicatriz com camada espessa e não maleável, muitas vezes provoca dor, prurido e limitação da funcionalidade. Geralmente, quanto mais profunda e quanto maior o tempo para a cicatrização da ferida, maiores serão as chances de formação de cicatrizes patológicas e maiores as possibilidades de limitações de ADM e mobilidade (61). Para a avaliação das cicatrizes temos duas escalas internacionalmente conhecidas e utilizadas; a Vancouver Scar Scale que avalia a pigmentação, vascularização, flexibilidade e altura/espessura da cicatriz (76);

e a Escala de Avaliação de Cicatriz do Paciente e Observador onde o paciente também participa como avaliador de suas cicatrizes, além do profissional (77).

A terapia compressiva ou também conhecida por pressoterapia é um dos tratamentos convencionais mais utilizados pós queimaduras e tem resultados importantes na prevenção e tratamento das sequelas teciduais patológicas (48). Durante o processo de maturação das feridas, ou seja, enquanto as cicatrizes estiverem ativas, elas podem sofrer a influência das terapias de pressão. Uma ferida que cicatriza após 21 dias exigirá o uso de vestimentas pressurizadas e das lâminas de silicone. A terapia de pressão proporciona uma cicatriz plana e uniforme, pois permite uma reorganização das fibras do tecido em recuperação (com pressão em torno de 15 a 25 mmHg). As malhas compressivas devem ser utilizadas de um modo contínuo após a completa cicatrização das lesões e são retiradas apenas para a higiene pessoal e para a fisioterapia; o tempo de utilização varia de seis meses a dois anos após a injúria inicial. Cabe ao fisioterapeuta sua indicação, avaliação periódica verificando se a compressão e o tamanho estão ideais e observando se há a necessidade de ajustes e a suspensão da mesma (61,62).

Existe também a possibilidade de surgimento de aderências cicatriciais. A mobilização cicatricial é indicada e deve ser realizada por meio de deslizamento das interfaces teciduais; nas regiões mais rígidas, as mobilizações são mais leves, curtas e em todas as direções, pois por serem menos maleáveis o estiramento excessivo não deve ser aplicado. É necessário respeitar o tempo para o organismo responder adequadamente à terapêutica e evitar o efeito rebote de uma abordagem agressiva. O intervalo entre uma aplicação da mobilização cicatricial e outra deve ser individual, de acordo com a resposta de cada organismo e de cada região do corpo. O objetivo é

conquistar mais mobilidade dos tecidos cicatriciais sem agredir ou causar dor, preparar e reestruturar o tecido, para ser possível realizar movimentos articulares dos menores aos mais amplos (48).

3.4 FUNCIONALIDADE DE VÍTIMAS DE QUEIMADURAS

O objetivo dos cuidados da equipe multiprofissional com o indivíduo acometido por queimaduras, é permitir que as pessoas tenham uma vida produtiva após a lesão (8). Este trauma pode variar desde uma pequena queimadura a uma lesão devastadora impactando em todos os aspectos da vida, incluindo a aparência estética, funcionalidade física e psicossocial e até mesmo o relacionamento com outras pessoas (78). O número crescente de sobreviventes de queimaduras de grande porte tornou-se uma realidade; porém resultados funcionais ruins têm sido uma constante ao redor do mundo o que destaca a importância de um tratamento precoce, especializado e eficaz (8,78).

Quando falamos em funcionalidade temos que ter em mente três definições que embora distintas, interligam-se entre si:

- *Estado funcional:* caracteriza-se pela capacidade do indivíduo em realizar as atividades que fazemos no curso normal da vida para atender às necessidades básicas, cumprir papéis usuais e manter a saúde e bem-estar;
- *Capacidade funcional* é o potencial máximo para realizar as atividades diárias normais. É comumente utilizada na fisiologia do exercício para descrever a taxa metabólica máxima alcançada durante o esforço;
- *Desempenho funcional* é a medida em que as pessoas executam certas atividades ou comportamentos como parte de suas atividades normais

de vida diária, que pode ser medido por meio de autorrelato, observação ou indicadores objetivos (entrevistas ou questionários) (79,80).

Segundo a OMS, a funcionalidade e a incapacidade estão ligadas ao bom funcionamento do corpo e a boa condição das estruturas corporais; além de dependerem da execução das AVDs e participação na sociedade. A limitação das atividades está presente quando o indivíduo apresenta dificuldade na realização das AVDs e as restrições de participação são problemas que um indivíduo pode enfrentar quando está envolvido em uma situação da realidade (81).

A funcionalidade é multidimensional, e é dividida em função física, psicológica e social como descritas a seguir:

- *Física:*
  - Atividades Básicas da Vida Diária (ABVD): comer, vestir-se, tomar banho, limpar-se;
  - Atividades Instrumentais da Vida Diária: compras, dirigir, atividades domésticas;
  - Funcional: caminhar, subir escadas, alcançar, levantar-se;
  - Fitness: equilíbrio, força, flexibilidade e resistência.

- *Psicológica:*
  - Autoimagem;
  - Enfrentamento;
  - Saúde mental;
  - Solução de problemas.

- *Social:*
  - Desempenho no trabalho;
  - Intimidade;
  - Contato casual;
  - Recreação (82).

3.4.1 Impacto das queimaduras na funcionalidade

O impacto que as queimaduras provocam no organismo do indivíduo

após a lesão constitui-se em um fenômeno complexo e desafiador (83). A resposta hipermetabólica do organismo à agressão sofrida e o catabolismo da musculatura esquelética, o longo tempo de internação, necessidades de cuidados intensivos, sedação, anestesia, longos períodos no leito e de jejum, inúmeros procedimentos cirúrgicos, provocam uma acentuada perda de massa corporal magra e fraqueza muscular generalizada (29,84). Além disso, contraturas musculares, deformidades articulares, limitações de ADM e déficit de força muscular (FM) e equilíbrio, dificuldades na marcha e na realização das AVDs têm sido frequentemente relatadas (83,85,86).

Embora as queimaduras em MMSS, principalmente nas mãos geralmente não sejam fatais e tenham um impacto mínimo na sobrevida geral do indivíduo, elas podem causar deformidades limitantes e incapacidades físicas devastadoras (87,88). A perda completa da função da mão pode impactar na função total do corpo em torno de 57% (89).

A prevalência das cicatrizes hipertróficas é alta, em torno de 70% dos casos após uma queimadura evoluem para a cicatrização patológica e estão associadas a restrições de movimentos, dor e comprometimento da funcionalidade, da qualidade de vida e da reinserção social do indivíduo (90,91). Maximizar e restaurar a funcionalidade tornou-se a meta principal no tratamento dos indivíduos acometidos por uma queimadura (87).

3.4.2 Avaliação da funcionalidade após uma queimadura

O objetivo principal da reabilitação funcional é atingir as condições físico-funcionais pré-trauma sempre quando possível. À medida que os profissionais se esforçam para fornecer um atendimento eficiente e eficaz,

documentar objetivamente os resultados deste tratamento tornou-se parte fundamental no processo de trabalho, tornando-se imperativas (6,8,82,87).

Define-se como *resultado* do paciente o ‘estado em que se encontra após o tratamento ofertado’ portanto, no caso das queimaduras, varia dependendo do tempo após a lesão. *Medição de resultado* é uma ferramenta com objetivo de descrever, monitorar e relatar as consequências das intervenções aos pacientes. Uma documentação precisa e consistente desempenha um importante marcador do progresso obtido (87).

Segundo o guideline da *International Society of Burn Injury (ISBI)* a avaliação funcional e a monitorização do tratamento pós queimadura devem contemplar:

1. A avaliação e o planejamento do tratamento de limitações funcionais devem ser orientados pelos domínios da Classificação Internacional de Funcionalidade, Incapacidade e Saúde, de maneira individualizada observando a necessidade de cada indivíduo;

2. Medidas de resultados funcionais adequadas devem ser utilizadas para documentar e monitorar o progresso e o resultado;

3. Para se alcançar os resultados ideais quanto a condição físico-funcional a equipe multidisciplinar deve incluir a fisioterapia e a terapia ocupacional, com início precoce desde a admissão hospitalar continuando durante todo o processo de reabilitação (6,61).

Instrumentos e testes utilizados para avaliar o resultado funcional geralmente incluem ABVDs e mobilidade; tradicionalmente utilizam-se a medição da ADM, a força de preensão palmar e força muscular isométrica, porém avaliar a capacidade de um indivíduo de realmente usar as mãos e MMSS também é necessário (82,87,92).

Alguns testes como o *Timed Up and Go Test (TUG), Sollerman Hand Function Test (SHT), High Mobility Assessment Tool (HiMAT), Grocery Shelving Task (GST), Jebsen-Taylor Hand function Test (JTHFT)* assim como questionários específicos ou genéricos como *Functional Assessment for Burns FAB score), Michigan Hand Questionnaire (MHQ), Functional Independence Measure (FIM),* foram utilizados para avaliar a funcionalidade após uma queimadura (30,93–99).

Apesar de muitos instrumentos e testes, ainda não há um consenso entre os clínicos e pesquisadores sobre qual seria a ferramenta mais apropriada para avaliar a funcionalidade após uma injúria por queimadura (23). Um método padronizado de avaliação da funcionalidade de indivíduos que sofreram queimaduras seria de grande valia para os profissionais que trabalham com essa população (15).

4 ARTIGO 1

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"Instruments to assess function or functionality in adults after a burns injury: a systematic review"

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ABSTRACT

Introduction: Assessment of functionality or function, through valid and reliable instruments, is essential during rehabilitation of adults after a burn injury. Currently, there is no consensus in the literature regarding the most appropriate tool that should be used to assess function or functionality; there is also no synthesis of the current studies published in this area.

Objectives: To investigate and report the instruments used to assess function or functionality in adults after a burn injury; to identify the characteristics and evidence on their measurement properties; and to evaluate their clinical utility.

Methods: We systematically searched the literature via six electronic databases and via screening reference lists of relevant studies. The review was registered in PROSPERO (CRD42016048065) and reported according to the PRISMA statement. Studies in which function or functionality of upper and/or lower limbs of adults after a burn injury was assessed were included. Exclusion criteria comprised studies in pediatric populations and conference abstracts.

Results: Thirty-four studies were included. Twelve questionnaires and seven objective tests for function or functionality were identified. Three specific tools were found; four generic instruments have been validated in burns. Nine studies evaluated the instruments' measurement properties, presenting at least one property classified as 'fair' quality. Finally, 18 instruments demonstrated clinical utility.

Conclusion: This systematic review demonstrated that most instruments used to assess function or functionality in adults with a burn injury have not been specifically developed for this population and had their measurement properties poorly studied. Conversely, almost all instruments had clinical utility.

Keywords: Burns; Motor Activity; Physical Functional Performance; Chronic Limitation of Activity.

INTRODUCTION

Burn trauma impacts on people's physical, psychological, and social functioning, often resulting in significant morbidity, impairment in emotional well-being, and negative effects on their appearance and relationships [1,3]. Patients with a burn injury can experience challenges throughout their recovery that include, but are not limited to, contractures and reduced range of motion, upper and lower limb impairment, and hypertrophic scars [4,5]. These common and challenging problems may affect performance of functional tasks, including activities of daily living (ADL), ambulation and transfer skills, and lead to long-term functional impairment [2,3].

Upper limb injuries occur in over 50% of all burns, increasing to 80% in people with severe burns [6,7]. Complete loss of hand function can lead to up to 57% loss of whole-body function [8]. Additionally, lower limb function can remain significantly reduced up to 12 months after the primary event. Further, it is observed that functional exercise capacity is still markedly reduced at six months following a burn injury [9]. Given the complexity of burn-related injuries, it is essential to assess patients' functionality and/or function within a multidisciplinary context [10,11].

The use of valid assessment tools may provide healthcare professionals with reliable information on patient recovery, guiding their clinical practice [12,13]. Recently, many burn centers worldwide, mainly in developed countries, have been engaged in creating and validating specific instruments to assess this population [14-16]. In order to obtain a solid evidence-based assessment, it is important to make a comprehensive comparison of the currently available tools, before creating and introducing new approaches into clinical and research practice [17]. However, to the best of author's knowledge, a synthesis of tools used in previous studies has not been published. Further, there is no consensus in the literature regarding the most appropriate tool to assess function and/or functionality in adults following a burn injury.

A standardized method to assess (and report) function and/or functionality of adults following a burn injury would be valuable for health professionals working with this population [2]. Therefore, it is imperative that a systematic review of the literature is conduced to identify tools with solid psychometric properties

which are useful in both research and clinical settings [9].

The first aim of this review was to investigate the instruments (questionnaires or objective tests) used to assess function and/or functionality of upper and lower limbs in adults following a burn injury. Secondly, to identify the characteristics of these instruments and the evidence on their measurement properties. Finally, to evaluate the clinical utility of these instruments.

METHODS

The present systematic review was registered in the PROSPERO database (number: CRD42016048065) and conducted following a protocol guided by the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) Statement [18].

Data sources and search strategy

A search strategy was developed and three authors (EYI, AAM and VC) conducted the search across six electronic databases: Pubmed (MEDLINE), EMBASE, CINAHL, PEDro, LILACS and Cochrane Library, from their inception until January 2020. The search strategy used for MEDLINE (and adapted for use in the other databases) was as follows:

#1 (Burn*[Title/Abstract]) OR Burn Injur* [Title/Abstract])

#2 Function* [Title/Abstract]

#3 (Hand*[Title/Abstract] OR upper-extremity [Title/Abstract] OR upper extremity [Title/Abstract] OR shoulder [Title/Abstract] OR elbow [Title/Abstract] OR wrist [Title/Abstract] OR arm [Title/Abstract] OR lower-extremity [Title/Abstract] OR lower extremity [Title/Abstract] OR upper limb*[Title/Abstract])

#4 (#1 AND #2 AND #3)

Further, references of the included studies were screened for potential additional studies not detected via database search.

Eligibility criteria

Studies in which function or functionality of upper and/or lower limbs after a burn injury was assessed were included. The following definition of function was

considered: “a multidimensional concept characterizing one’s ability to provide for the necessities of life; that is, those activities people do in the normal course of their lives to meet basic needs, fulfill usual roles, and maintain their health and well-being” [19]. Exclusion criteria comprised studies on burn injury in pediatric population, conference abstracts and other language than English, Portuguese, Spanish, French and Japanese.

Study selection

Two review authors (EYI and AAM) independently examined the titles and abstracts of all studies identified through database search and hand search to determine eligibility for inclusion. During this phase, these same authors removed the duplicates manually. The decisions of both review authors were recorded, and any disagreement was resolved by a third review author (NAH). The process of full text evaluation was the same as the one described for title and abstract screening. The specific reasons for excluding papers were recorded.

Quality assessment

Studies in which the measurement properties of the instruments were reported were submitted to quality assessment using the Consensus-based Standards for the Selection of Health Status Measurement Instrument (COSMIN) checklist [20]. Two review authors (EYI and AAM) judged each measurement property (i.e., construct and criterion validity, reliability and responsiveness) as excellent, good, fair or poor [20].

Clinical utility assessment

An evaluation of the clinical utility of the instruments included in this review was performed based to the criteria developed by Tyson and Connell [21], which include: time of administration, analysis and interpretation of the instrument; cost; need for specialized equipment and training for use; portability of the measure. The scale ranges between 0 and 10, and the instrument is recommended for use in clinical practice if it scores ≥ 9, as shown in Box 1.

[Box 1]

Data extraction and summary

Two review authors (EYI and AAM) extracted data using a standardized form. Disagreements were resolved by a third review author (NAH). Once consensus was reached, data and study details were entered in a standardized spreadsheet (Excel®, Microsoft Corp., USA) by a review author (EYI). Data extracted were study design, authors, year of publication, instruments/tool used for assessment, sample characteristics and measurement properties. Values of intraclass correlation coefficient (ICC), Cronbach's alfa (α), Pearson or Spearman correlation coefficient an effect size were collected when available. The parameters of the PRISMA checklist were used to ensure that the results were reported systematically [18].

RESULTS

Study selection

Initial database and hand search identified a total of 1664 papers. After screening and exclusions, a total of 34 studies were included in the systematic review. A PRISMA flowchart including study selection and reasons for exclusion can be found in Figure 1.

[Figure 1]

Characteristics of the instruments

Among the 34 studies, 12 questionnaires and seven objective tests were identified. Only three specific tools developed for burns were identified; only four generic instruments have been validated for burns patients. To assess the function or functionality of the hand and upper limbs, the following questionnaires were cited: Burnt Hand Outcome Tool (BHOT) (n=1 study) [16], Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH) (n=3 studies) [22-24], Michigan Hand Questionnaire (MHQ) (n=6 studies) [23,25-29], Shorted Disabilities of the Arm, Shoulder and Hand Questionnaire (QuickDASH) (n=5 studies) [30-33], Upper Extremity Functional Index (UEFI) (n=2 studies) [34,35] and Upper Extremity Index (UEI) (n=1 study) [36]. The following functional objective tests were cited: 400 Points evaluation test (n=1 study) [37], Grocery

Shelving Task (GST) (n=1 study) [34], Jebsen Taylor Hand Function Test (JTHFT) (n=6 studies) [28,38-42], Sollerman Hand Function Test (SHT) (n=1 study) [43] and Test d'Evaluation des Membres Supériorieus des Personnes Agées (TEMPA) (n=1 study) [29]. Concerning the assessment of function or functionality of the lower limbs, the following questionnaires and functional objective test were cited, respectively: Lower Extremity Functional Scale (LEFS) (n=2 studies) [9,32], Lower Limb Functional Index - 10 (LLFI-10) (n=1 study) [44] and Timed Up and Go Test (TUG) (n=1 study) [45]. Finally, in order to evaluate the general functionality after the burn injury, the questionnaires Chelsea Critical Care Physical Assessment (CPAx) (n=1 study) [36], Functional Assessment for Burns (FAB score) (n=3 studies) [14,15,30], Functional Assessment for Burns Critical Care (FAB-CC) (n=1 study) [47], and Functional Independence Measure (FIM) (n=3 studies) [48-50] were used, as well as the functional objective test High Mobility Assessment Tool (HiMAT) (n=1 study) [51]. Characteristics of the included studies as well as the instruments used in each study are described in Table 1.

[Table 1]

Questionnaires

Burnt Hand Outcome Tool (BHOT)

The BHOT is the most recently developed instrument specifically for adults with hand burns; it is divided into four parts (each one with 5 items). Part A: Specific hand tasks; Part B: General ability to carry out daily activities; Part C: Appearance, scar, pain and sensation; and Part D: Emotional, social and work impact. Each item score ranges between 1 and 5, with 1 being the least affected outcome, and 5 the most affected. The total score ranges between 20 (no adverse outcome) and 100 (extremely poor outcome). The BHOT measurement properties were studied, showing excellent reliability over time (Cronbach's α=0.92 – 0.97), criterion validity (BHOT vs. DASH: r=0.43 – 0.91, P≤0.001), construct validity (severe vs. non-severe burn injuries: P≤0.005) and responsiveness (effect size=0.86 – 1.08, according to Cohen's d and SRM analyses) [16].

Chelsea Critical Care Physical Assessment (CPAx)

The CPAx tool is a functional scoring system designed and validated for general patients with critical illness. It comprises ten commonly assessed components of physical function, which are graded on a Guttman scale ranging from dependent to independent (0 to 5). The components are respiratory function, cough, bed mobility, supine to sitting on the edge of the bed, sitting balance, sit to stand, transfers from bed to chair, standing balance, stepping and grip strength. The overall score ranges between 0 and 50 [4452]. The CPAx responsiveness was studied, showing differences in its score in four time points ($P \leq 0.0001$). Its minimal clinically important difference was estimated as 6 points [46]. No one other measurement property was investigated in burn injured patients.

Disabilities of the Arm, Shoulder and Hand Questionnaire (DASH)

The DASH questionnaire evaluates impairments and activity limitations, as well as restriction for both leisure and work activities caused by upper limb dysfunction. It comprises 30 items related to daily activities with five response options: no difficulty (1 point), mild difficulty (2 points), moderate difficulty (3 points), severe difficulty (4 points), unable (5 points). The following calculation is performed to obtain the DASH score: [(sum of n responses / n)-1]* 25, where “n” is the number of completed responses. The total score ranges between 0 (normal function) and 100 points (full dysfunction) [53]. Its measurement properties were not tested in burns.

Functional Assessment for Burns (FAB score)

The FAB score was developed to assess level of physical functional independence in burn-injured patients. Seven daily activities are included in the score: feeding, washing, toileting, transfers, dressing, walking and stair climbing. Patients’ physical function is scored according to their ability to complete each activity either independently or with the minimum amount of assistance required to complete it. Each activity is scored as follows: unable to complete any part of the activity (1 point); completes activity with physical assistance (2 points); completes activity with supervision/verbal

prompting/requires set up of activity (3 points); independently completes activity with an assisting device/aid (4 points); independently completes activity without devices/aids (5 points); unable to assess (1 point). The total score ranges between 7 (fully dependent) and 35 (fully independent) [14]. The only FAB score measurement property studied in burns was its construct validity, being detected difference between two time points (P≤0.0001) [14].

Functional Assessment for Burns – Critical Care (FAB-CC)

The FAB-CC was developed for specific use in burns in intensive care units. The instrument can be administered if the patient is able to follow three simple commands: open/close eyes or mouth, poke tongue out of mouth and move a limb. The FAB-CC consists of six domains: functional strength testing, supine to side lying, supine lying to sitting, dynamic sitting balance, sit to stand transfer and stepping on the spot. The scoring system for domain is as follows: fully dependent (0 point); completes activity with physical assistance of > 2 people (1 point); completes activity with physical assistance of 1 or 2 people (2 points); independently completes activity with an assisting device/aid or verbal prompts (3 points); completes activity with only verbal prompts, no physical assistance or assisting devices/aids (4 points); independently completes activity (5 points). The total score of the FAB-CC ranges between 0 and 30 [47]. Excellent interrater reliability was demonstrated (ICC=0.99; Cronbach's α=0.999) [47]. No other measurement property has been studied.

Functional Independence Measure (FIM)

The FIM consists of 13 motor items divided into four dimensions: Self-care; Sphincter control; Transfers; Locomotion, and five cognitive items divided into two dimensions: Communication and Social cognition. It measures the level of dependence/independence across a scale ranging from 1 (total assistance/not testable) to 7 points (complete independence), recording what the person actually does, rather than what he/she is capable of (i.e., disability, not impairment). The total FIM score is obtained by summing the scores of all items, ranging between 18 and 126 points. Dependence levels are classified as: complete independence (104 to 126 points); modified dependence (61 to 103 points: assistance for up to 25% of

tasks); modified dependence (19 to 60 points: assistance for up to 50% of tasks); complete dependence (18 points) [54]. The FIM measurement properties were not tested in burns.

Lower Extremity Functional Scale (LEFS)

The LEFS is a 20-item questionnaire that measures disability related to activities of daily living, work and recreation that involve the lower extremity. For each item there are five possible responses ranging from 0 (extreme difficulty or unable to perform activity) and 4 (no difficulty). The total score ranges between 0 and 80, with higher scores indicating less disability [54]. Its measurement properties were not studied in burns.

Lower Limb Functional Index - 10 (LLFI-10)

The LLFI-10 is a self-reported questionnaire developed to assess functional status of individuals with lower limb injury and was validated in burn injured patients. It comprises four parts. Part 1: patients must answer whether the injured leg affects their ability to perform ten pre-determined functional tasks; total score ranges between 0 and 20 points. Part 2: patients need to choose five activities that are important to them and then to rate the ability to perform each activity; total score ranges between 0 and 50 points. Part 3: patients must rate their ability to perform pre-injury duties; response ranges between 0 to 100%. Part 4: patients are asked to rate their overall status on a scale ranging between “no problem” (0 point) and “worst possible" (10). For parts 1, 2 and 4, a lower score represents better function [56]. The LLFI-10 showed excellent internal consistency (Cronbach’s $\alpha = 0.86$ and 0.85, parts 1 and 2, respectively). In addition, it is a valid tool correlated with other functional parameters (TUG, SF-36, and the Burn Specific Health Scale - BSHS; $0.71 \leq r \leq 0.41$, $P<0.001$) and with time after burn ($r=-0.60$ and -0.35, 33 and 88 days, respectively) [44].

Michigan Hand Questionnaire (MHQ)

The MHQ is a hand-specific questionnaire comprising 37 questions that are categorized into six categories, including: overall hand function, ADL, pain, work performance, aesthetics, and patient satisfaction with hand function. All categories are subdivided into right and left hand-specific questions, except for

work performance and pain. Moreover, ADL are also divided into a set of bilateral task questions. The raw scores for each domain are converted to normalized scores which range between 0 and 100. Except for the pain category, higher scores indicate better hand performance [57]. Its measurement properties were not studied in burns.

Shortened Disabilities of the Arm, Shoulder and Hand Questionnaire (QuickDASH)

The QuickDASH consists of 11 items from the original DASH concerning patients' health status during the preceding week. These items address daily activities, house/yard work, shopping, recreation, self-care, eating, sleep, friends, work, pain and tingling/numbness. It measures function and symptoms of the upper limb complex and emphasizes motor tasks involving the larger joints. Each item is scored using a five-point Likert scale (1 to 5) and the total score is obtained by summing all items, ranging between 0 (no disability) and 100 (most severe disability) [58]. The QuickDASH showed to be valid in burns, detecting differences among clinical conditions ($P<0.005$) and correlating with the BSHS score in four time points ($-0.89 \leq r \leq -0.79$); its test-retest reliability was excellent (ICC=0.93), and it was responsive to changes over time (effect size=0.59 to 0.82) [33].

Upper Extremity Functional Index (UEFI)

The UEFI is a questionnaire used to measure upper extremity function in individuals with hand and/or upper extremity disorders. It examines the degree of difficulty when using the affected upper limb to perform 20 listed activities. It is measured on a fivepoint scale (0 to 4) with 0 indicating extremely difficult or unable to perform the task and 4 indicating no difficulty performing the task. The total score ranges between 0 and 80 points and the minimal detectable clinical change in score is 9 points [59]. The UEFI had not tested its measurement properties in burns.

Upper Extremity Index (UEI)

The UEI addresses patients' perceived disability in daily tasks rather than neurologic deficit. The patient is asked to rate their performance on activities of

daily living using a three-point grading scale describing accurately how easy or difficult it is to perform the activity 0 (normal or nearly normal), 1 (moderately) and 2 (severely impaired) [60]. Its measurement properties were not studied in burns.

Objective tests

Grocery Shelving Task (GST)

The GST replicates some daily activities that include unsupported arm activity. It was originally developed for patients with chronic obstructive pulmonary disease. Patients are instructed to move two shopping bags filled with 20 grocery cans (375 to 410 g each) from the floor up to a 90 cm-high cart (placed in front of the individual), and then put each item up to a shelf (placed 15 cm above shoulder level and 30 cm in front of the individual) in the stand position, as quickly as possible. The time spent to complete the task is recorded [61]. The GST was cited in one study [34]; however, its measurement properties have not been studied in burns.

High Mobility Assessment Tool (HiMAT)

The HiMAT is an instrument developed to assess people with high-level balance and mobility deficits after traumatic brain injury. It consists of 13 functional activities such as walking, running, skipping, getting up and down stairs. The activities are quantified (time or distance) and then, rated on a 6-point performance scale which scores from 0 to 5 points; the faster/greater distance the task is completed, the higher the score. The sum score ranges from 0 (worst) to 54 (best) [62]. The HiMAT was used to assess burn victim in a case report [51]; nevertheless, its measurement properties have not been investigated for this population.

Jebsen-Taylor Hand Function Test (JTHFT)

The JTHFT is an objective and standardized test designed to evaluate fine motor and hand skills related to activities daily living. It was proposed to evaluate adults with neurological or musculoskeletal conditions that lead to hand disability. The activities include: (1) writing a short sentence; (2) turning

over cards (approximately 13 x 8 cm); (3) picking up small objects and placing them in a container; (4) stacking checkers; (5) simulated eating; (6) moving empty large cans; (7) moving heavy large cans. The time taken to complete each activity is recorded in seconds and then, the sum of times gives the total score. Lower scores indicate better hand function [63].

The JTHFT demonstrated to be reliable (Kuder-Richardson coefficient = 0.95) in burns [42]. Other measurement properties of the test have not been studied until the present review.

Sollerman Hand Function Test (SHT)

The SHT comprises 20 subtests representing ADL tasks and handgrip patterns such as opening jars and cutlery use. It was described for patients with rheumatological and orthopedic disorders which lead to hand disability [64]. Items are timed for speed and accuracy. Compensatory and abnormal movement patterns are noted. The score for each task ranges between 0 (task cannot be performed at all) and 4 (task is completed without any difficulty within 20 seconds and with the prescribed handgrip of normal quality); the total score ranges between 0 and 80 points. A total score of 80 points and of 77 to 79 points indicates normal function for dominant and non-dominant hand, respectively [64]. The SHT has been tested in patients with burn-related hand disorders. It demonstrated excellent intra- and interrater reliability (ICC=0.98 for both), correlated with physical parameters ($0.50 \leq r \leq 0.68$) and it was discriminative when comparing hand function between burns and health volunteers (P=0.001). Its minimal detectable change of 7 points for intra- and inter-rater changes over time [43].

Test d'Evaluation des Membres Supérieus des Personnes Agées (TEMPA)

The TEMPA is an assessment of upper limb activity limitation that includes tasks which are representative of daily living activities, including unilateral and bilateral tasks and moving objects. There are five bilateral tasks (e.g., open a pot and take out a spoonful of coffee) and four unilateral tasks (e.g., handle coins). The instrument rating form includes both quantitative (speed of execution) and qualitative (functional rating and task analysis) parameters. The functional rating refers to the individual's independence in each task, being

graded in a four-level scale varying from 0 (task was completed successfully, without hesitation or difficulty) to 3 (unable to complete the task despite some assistance). The task analysis quantifies difficulties experienced by the subject on each task, considering five sensorimotor skills: strength, range of motion, precision of gross motor movements, prehension patterns and precision of fine movements. The total score is obtained by summing functional rating and task analysis, and higher scores indicate higher level of disability of upper extremity [65]. Although the TEMPA was cited in one study with burns [29], its measurement properties were not analyzed in this population.

Timed Up and Go test (TUG)

The TUG test measures a person's mobility, including both static and dynamic balance, by assessing the time it takes to rise from a chair, walk 3 m, turn around, walk back to the chair, and sit down. The TUG test is widely used in clinical and research settings because of its moderate to excellent reliability and it is valid in various condition, minimal use of equipment, easy administration, and because it incorporates various functional components essential for independent living [66-69]. Finlay et al. conducted a study to test validity and reliability of the TUG in burns. The results showed excellent interrater reliability (ICC=0.93) and that TUG was significantly associated with BSHB over time, i.e., at one and six months after discharge ($P \leq 0.006$) [45].

400-points evaluation test

In the 400-points evaluation test, the individual performs several daily activities which involve hands while the assessor observes four characteristics: motility of the hand, prehension strength, prehension and object displacement with one hand as well as bimanual hand function. Each characteristic is scored between 0 and 100 points; finally, scores are summed, divided by the maximum score (i.e., 400) and then multiplied by 100. Thus, the result of the test is expressed as percentage. A final score of 0% indicates complete loss of hand functionality, whereas a score of 100% indicates normal functionality [70]. Its measurement properties were not tested in burn population.

Measurement properties and quality assessment

Nine of the 34 included studies evaluated the measurement properties of the following performance-based protocols: BHOT, QuickDASH and the tests JTHFT and SHT for upper limbs [16,33,42,43]; CPAx, FAB score, FAB-CC for functionality [14,46,47]; LLFI-10 and TUG for lower extremity assessment [44,45]. More details can be found in Table 2.

[Table 2]

Evaluation of the clinical utility of the instruments

Only one test, the Test d'Evaluation des Membres Supérieus des Personnes Agées (TEMPA), had a score < 9; other instruments had scores ≥ 9 and were recommended for use in clinical practice (Table 3).

[Table 3]

DISCUSSION

The present systematic review demonstrated that a substantial amount of instruments has been used to assess upper and lower limb functionality in adults after a burn injury. From the nineteen tools identified, only three were specifically developed for burns (FAB score, FAB CC and BHOT), but none evaluated lower-limb function, and other four nonspecific tools were validated for this population (LLFI-10, SHT, TUG and QuickDASH). In addition, approximately half of the instruments had their measurement properties studied in burns; however, most of the studies were classified as having a fair or poor quality, and only three instruments had their responsiveness tested. Lastly, most of the tools demonstrated to be clinically useful. One of the most cited instruments was the MHQ, a nonspecific and not validated questionnaire focused on hands functionality. Three studies used the MHQ to investigate the short-term effects of surgical interventions (i.e., burn excision and skin grafting) [23-25] and two studies investigated the long-term impact of burns on hand function [26,27]. However, it is important to highlight that its responsiveness has not yet been studied in this population. The total score of the MHQ was moderately correlated with two objective tests, the TEMPA (r=0.68) [29] and the

JTHFT (r=-0.53) [28], and also with handgrip strength (r=0.45) [28]. In spite of the correlations found, it was consensus between the authors that the MHQ and the objective tests are complementary to each other, since the questionnaire provides information about patients' perception of difficulties while the objective tests can be helpful in identifying specific problem areas and, thus, contribute to individualized rehabilitation.

Qualitative methods can add valuable and valid information to quantitative findings, allowing more precise translation of research results into clinical practice. These methods produce reflective information that preserves the voice of the study participant. Consequently, better hypothesis can be raised based on individual's evaluation and more effective interventions strategies can be adopted [71,72]. Therefore, mixed methods research, i.e., the combination of at least one qualitative and one quantitative research component, using objective tests and qualitative data collection (e.g., structured interviews) to evaluate functionality in burn populations would be valuable.

Another vastly cited tool was the objective test JTHFT. Although it is a nonspecific upper-limb assessment instrument, it was previously validated for burns. Four studies used the JTHFT to investigate the effect of different types of intervention, such as inpatient rehabilitation, pressure garment gloves use, educational program, and surgical procedures [38-41]. Van Zuijlen and colleagues [42] demonstrated that hand function, evaluated by the JTHFT, was restored in 80% of cases one year after burn injury. Additionally, performance in the JTHFT tasks was negatively influenced by advanced age, amputation, poor auto-graft take, extensive total hand surface area and full thickness total body surface area burned. Despite the JTHFT has been used in longitudinal studies, its responsiveness was not tested in this population so far. The third most cited instrument was the QuickDASH, a nonspecific questionnaire previously validated to assess upper-limb function in this population [33]. One of a few instruments that had its responsiveness checked in burns, the QuickDASH was used to investigate the effect of interventions (i.e., exercise program and virtual reality game use) on hand function. It was also the assessment tool chosen by Ghalayini et al. [1930] and Jarrett et al. [9] to conduct follow up assessment in burn patients 6 and 12 months after hospital discharge, respectively. The first study found that a greater recovery of hand function (mean decrease of 55

points) occurred in the first three months which was sustained through out six months. Jarrett and colleagues observed that a total body surface area burned ≤ 10% was associated with larger decrease in the QuickDASH score (i.e., greater recovery), specially in the section related to the ability to participate in work activities [9]. Although the QuickDASH strongly correlated with the Burn Specific Health Scale (BSHS) (r=-0.80), its ability to detect change in functionality through out one, three and six months after discharge was higher than the BSHS (effect size: 0.78 to 0.82 versus 0.15 to 0.38, respectively) [33].
The BHOT is the most recent specific tool validated to assess hand functionality after burns. Although some instruments for assessment of upper extremity were previously validated for burns victims (e.g., QuickDASH), the BHOT was developed to be easy and quick to perform and to comprise multiple aspects of the impact of a hand burn on a patient's life. The knowledge of aspects including ability to carry out activities, strength, flexibility, skillful, discomfort (pain, itch), social, work, and emotional impact of the burn injury allows full guidance for the rehabilitation process. Higher BHOT scores (i.e., worse function) were observed in patients with severe burn injury in comparison to non-severe when they were assessed at discharge, 3, 6 and 12 months later (mean difference of approximately 27 points). Furthermore, the BHOT was strongly correlated with DASH score in all time points above mentioned ($0.78 \leq r \leq 0.91$ for all) [16].
This review has shown that there are more questionnaires than objective tests available to assess functionality of upper and lower limbs after a burn injury. Moreover, there is no objective test developed specifically for this population. It is well known that subjective tools such as questionnaires and scales can have their data biased by some factors, including mode of administration (interview or selfadministration), psychological factors and cognitive impairments [73]. Therefore, objective tests that are less influenced by such factors, since a standardized protocol is followed, can minimize bias in outcomes in rehabilitation settings. However, considering that it is crucial to known patients' view about their functional condition, it is recommended that subjective and objective assessment be used complementarily to each other [74].
Due to the considerable number of instruments used to evaluate the functionality of adults following a burn injury, it becomes a challenge for

clinicians to select the most appropriated one. Firstly, it is important to be aware that the use of tools which had not their measurement properties properly tested is discouraged in research and clinical settings. Among the nineteen tools found in the present review, only the BHOT and the QuickDASH had validity, reliability and responsiveness tested; other seven instruments had validity or reliability studied. It is relevant to reinforce that a tool used to follow patients or to assess effect of interventions must be responsive; otherwise, misunderstanding of the treatment outcomes can occur. Secondly, assessment tools that have had reference values in a healthy population developed for it are more likely to help professionals in the interpretation of results, adding valuable information about the severity of functional limitation and prognosis when evaluating adults after a burn injury. Finally, instruments that, in addition to detect whether there is a function limitation or not, are able to show which aspects are determining the limitation (e.g., muscle weakness, balance, stiffness, low selfconfidence, etc.), may guide decisions in the rehabilitation process, individualizing the treatment. In this line of thought, it seems that the following instruments may be suitable: BHOT, CPAx, FAB-CC, TUG, and 400-points evaluation test. The present review had some limitations. Considering the variety of terms used to define function or functionality, such as functional ability, performance, functional performance, and functional capacity, it made the search in databases very challenging. Despite the authors' effort to develop a comprehensive search strategy and adapt it to each database, some studies were not found the first time the search was run; thus, careful hand search was conducted to reduce the risk of selection bias.

Considering that all tools included in the present review showed good clinical utility, it is worth studying them in depth. Future studies investigating the validity of instruments that have better clinical utility would provide valuable information for clinicians working with burn patients. Furthermore, despite the vast number of instruments used to assess function and/or functionality of upper and lower limbs after a burn injury, a comprehensive comparison of them is needed in order to establish a standardized method of measurement and reporting of function and/or functionality in this population. Lastly, studies that investigate reference and prognostic values for the instruments will add important information to the literature, helping researchers and health professionals on

interpretation of assessment results.

CONCLUSIONS

In conclusion, there are currently few validated instruments to assess function and/or functionality in adults after a burn injury. The present systematic review demonstrated that, among studies that assessed function and/or functionally of upper and/or lower limbs in adults after a burn injury, nineteen instruments (12 questionnaires and seven objective tests) were identified. Only three tools were specifically developed for burns: FAB score, FAB-CC and BHOT; in addition, only four generic instruments (QuickDASH, LLFI-10, SHT and TUG) have been validated in this population. Finally, 18 of 19 instruments have demonstrated clinical utility. Therefore, considering that the management of burns in rehabilitation settings must be guided by reliable assessments, there is an urgent need to study validity of the available tools and, subsequently, compare them to each other.

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BOX 1 - Clinical utility assessment.

BOX 1 – Clinical utility assessment	
Question assessed	**Scoring**
Time taken to administer, analyse and interpret the measure	Less than 10 minutes scores 3 10 – 30 minutes scores 2 30 – 60 minutes scores 1 > 1 hour scores 0
Cost	< £ 100 scores 3 £ 100-500 scores 2 £ 500-1000 scores 1 > £ 1000 or unknown scores 0
Does the measure need specialist equipment and training to use?	'No' scores 2 'Yes, but only simple, easy to use equipment which does not need specialist training' scores 1 'Yes' or 'Unknown' scores 0
Is the measure portable? Can it be taken to the patient?	'Yes, easily (can go in pocket)' scores 2 'Yes, in a brief case or trolley' scores 1 'No or very difficult' scores 0

FIGURE 1 - PRISMA based flow diagram [18]

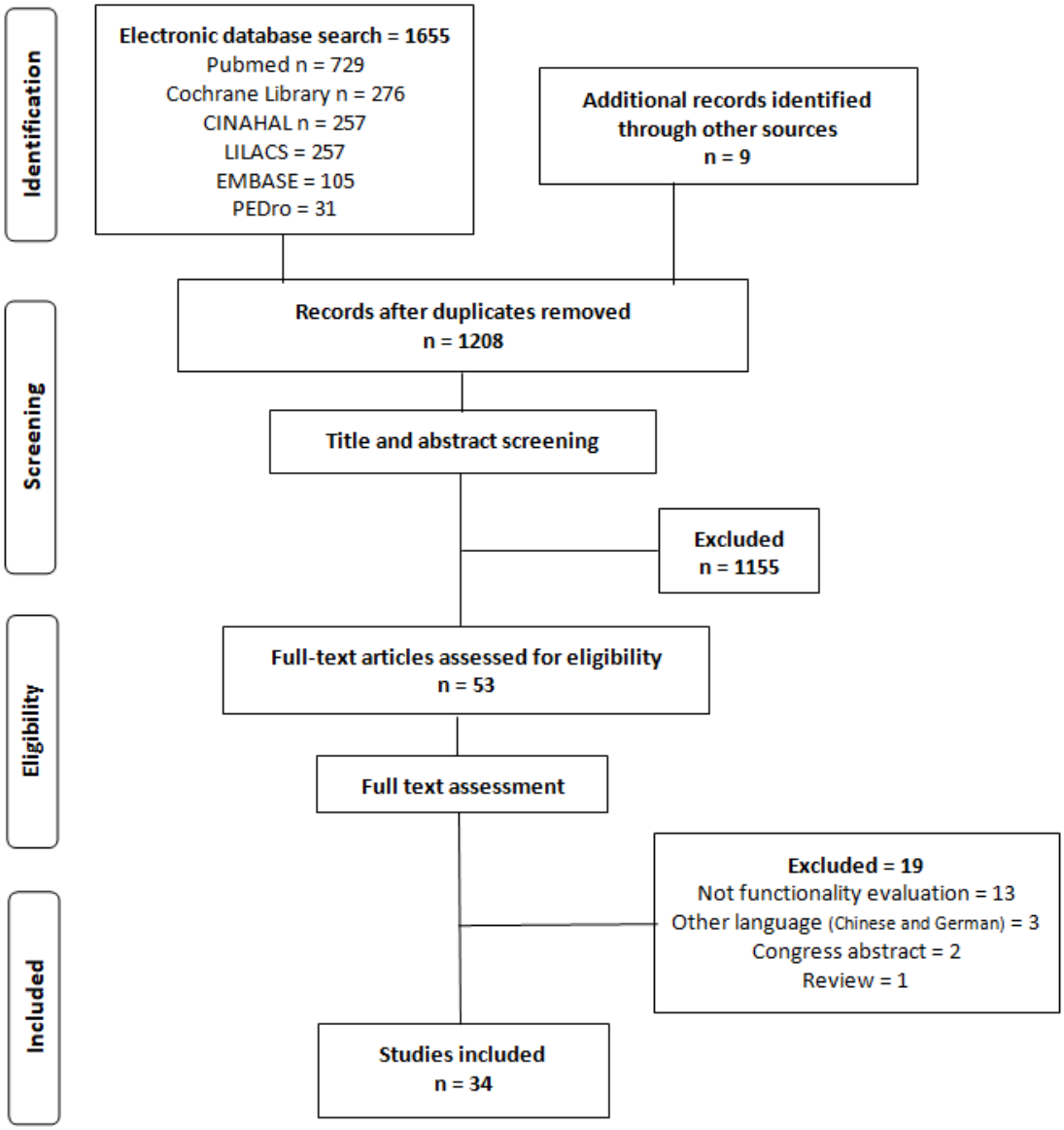

TABLE 1 - Characteristics of the included studies.

Table 1 – Studies characteristics

Studies	Year of publication	Country	Tools	Study design	Participants (N)	time administration
Ayaz et al. [14]	2019	Iran	MHQ	Randomized control trial	50	At 1, 3 months postoperative
Eagan et al. [39]	2018	UK	FAB-CC	Prospective study	10	NI
Ghalayini et al. [19]	2018	Australia	QuickDASH + FAB	Prospective study	10	At discharge, 3, 6 months post-discharge
Wu et al. [20]	2018	Taiwan	QuickDASH	Prospective study	16	At the beginning; at one week after 4 months of treatment
Bache et al. [10]	2018	UK	BHOT	Prospective study	94	At before; healed; 3 and 6 months; 1-year postburn
Mohammadi et al. [11]	2018	Iran	DASH	Prospective study	11	1 year after surgery
Smailes et al. [37]	2016	UK	FAB score	Prospective study	115	At discharge, 3 months postburn
Gittings et al. [34]	2016	Australia	LLFI-10	Cohort retrospective	739	At admission; 1,3,6 months and one-year postburn
Corner et al. [36]	2015	UK	CPAx	Observational study	30	At pre-admission; ICU admission; ICU discharge; hospital discharge
Byrne et al. [12]	2015	UK	DASH + MHQ	Retrospective study	13	3 months – 1,3 years
Ardebili et al. [28]	2014	Iran	JTHFT	Randomized control trial	60	At discharge
Smailes et al. [38]	2013	UK	FAB score	Randomized control trial	92	At discharge from ICU; at discharge from IBC
Paratz et al. [21]	2012	Australia	QuickDASH + LEFS	Randomized control trial	30	At 6 weeks; 3 months after exercise program
Schneider et al. [29]	2012	US	JTHFT	Prospective study	11	At admission and at discharge after impatient rehabilitation
Cuadra et al. [27]	2012	Chile	400 points	Cohort retrospective	14	Average 3.5 years after autograft
Willians et al. [15]	2012	Australia	MHQ	Prospective study	52	At admission; at 2 weeks, 1, 3, 6, 12 months postinjury
Kolmus et al. [24]	2012	Australia	UEFI + GST	Randomized control trial	52	At admission, on first, 3, 6, 12 weeks
Xie et al. [16]	2012	China	MHQ	Retrospective review	103	2 years or more postburn
Webb et al. [25]	2011	Australia	UEFI	Prospective case report	20	At admission, hospital discharge, at 12 weeks post

						discharge
Omar et al. [30]	2011	Egypt	JTHFT	Randomized control trial	40	At pre and postoperative
Weng et al. [33]	2010	China	SHT	Observational study	12	3 months or more since injury
Finlay et al. [35]	2010	Australia	TUG	Prospective study	28	At discharge, 1,3,6 months postburn
Grisbrook et al. [43]	2010	Australia	HiMAT	Case report	1	At 1, 4, 8,12 weeks after burn
Mazzetto-Betti et al. [13]	2009	Brazil	DASH	Observational study	18	15 months to 122 months
Jarret et al. [22]	2008	Australia	QuickDASH + LEFS	Prospective study	86	At admission and discharge and at 1, 3, 6, 12 months
Holavanahali et al. [17]	2007	US	JTHFT + MHQ	Cross sectional study	32	NI
Wu et al. [23]	2007	Australia	QuickDASH	Longitudinal study	85	At discharge, 1, 3, 6 months postburn
Farrel et al. [40]	2006	US	FIM	Observational study	202	At discharge
Sliva et al. [41]	2005	US	FIM	Cohort prospective	129	At admission and at discharge
Choo et al. [42]	2005	Canada	FIM	Retrospective study	164	At discharge
Umraw et al. [18]	2004	Canada	TEMPA + MHQ	Prospective study	20	3 – 64 months post injury
Weinstock-Zlotnick et al. [31]	2004	US	JTHFT	Quasi-experimental	2	NI
van Zuijlen et al. [32]	1999	Netherlands	JTHFT	Prospective study	88	12 months postburn
Questad et al. [26]	1988	US	UEI	Prospective study	49	3 months postburn

UK: United Kingdom; US: United States; MHQ: Michigan Hand Questionnaire; QuickDASH: Shortened Disabilities of the Arm, Shoulder and Hand Questionnaire; FAB score: Functional Assessment for Burns score; BHOT: Burnt Hand Outcome Tool; DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire; LLFI-10: Lower Limb functional Index – 10 items; CPAx: Chelsea Critical Care Physical Assessment; JTHFT: Jebsen Taylor Hand Function Test; LEFS: Lower Extremity Functional Scale; UEFI: Upper Extremity Functional Index; GST: Grocery Shelving Task; SHT: Sollerman Hand Function Test; TUG: Timed Up and Go test; HiMAT: High Mobility Assessment Tool; FIM: Functional Independence Measure; TEMPA: Test d'Evaluation des Membres Supérieus des Personnes Agées; UEI: Upper Extremity Index; NI: not informed.

TABLE 2 - Measurement properties and quality assessment via COSMIN.

Table 2 - Measurement properties and quality assessment via COSMIN

Instruments / Tests	Measurement Properties			
	Validity Construct/content	Validity Criterion	Reliability	Responsiveness
BHOT [10]	Fair	NA	Fair	Good
Quick DASH [23]	Good	Good	Fair	Good
SHT [33]	Good	NA	Fair	NA
JHTFT [32]	NA	NA	Poor	NA
CPAx [36]	NA	NA	NA	Fair
FAB score [38]	Poor	NA	NA	NA
FAB-CC [39]	NA	NA	Poor	NA
LLFI-10 [34]	Good	Poor	Fair	NA
TUG [35]	NA	Poor	Poor	NA

BHOT: Burnt Hand Outcome Tool; QuickDASH: Shortened Disabilities of the Arm, Shoulder and Hand Questionnaire; SHT: Sollerman Hand Function; JTHFT: Jebsen Taylor Hand Function Test; CPAx: Chelsea Critical Care Physical Assessment; FAB score: Functional Assessment for Burns score; FAB-CC: Functional Assessment for Burns – Critical Care; LLFI-10: Lower Limb functional Index – 10 items; Test; TUG: Timed Up and Go test; NA: not applicable.

TABLE 3 - Clinical utility of the tools.

Table 3 – Clinical utility of tools					
Tool	Time to complete	Cost	Portability	Equipment and specific training	Total max:10
BHOT	3	3	2	2	10
CPAx	3	3	2	2	10
DASH	2	3	2	2	9
FAB score	3	3	2	2	10
FAB-CC	3	3	2	2	10
FIM	3	3	2	2	10
LEFS	3	3	2	2	10
LLIF-10	2	3	2	2	9
MHQ	2	3	2	2	9
QuickDASH	3	3	2	2	10
UEFI	3	3	2	2	10
UEI	3	3	2	2	10
GST	3	3	2	2	10
HiMAT	3	3	1	2	9
JTHFT	3	3	1	2	9
SHT	3	3	1	2	9
TEMPA	2	3	1	2	8
TUG	3	3	2	2	10
400points	3	3	1	2	9

BHOT: Burnt Hand Outcome Tool; CPAx: Chelsea Critical Care Physical Assessment; DASH: Disabilities of the Arm, Shoulder and Hand Questionnaire; FAB score: Functional Assessment for Burns score; FIM: Functional Independence Measure; LEFS: Lower Extremity Functional Scale; LLFI-10: Lower Limb functional Index – 10 items; MHQ: Michigan Hand Questionnaire; QuickDASH: Shortened Disabilities of the Arm, Shoulder and Hand Questionnaire; UEFI: Upper Extremity Functional Index; UEI: Upper Extremity Index; GST: Grocery Shelving Task; HiMAT: High Mobility Assessment Tool; JTHFT: Jebsen Taylor Hand Function Test; SHT: Sollerman Hand Function Test; TEMPA: Test d'Evaluation des Membres Supérieus des Personnes Agées; TUG: Timed Up and Go test; 400-points: 400-points evaluation test.

5 ARTIGO 2

Artigo original formatado de acordo com as normas do periódico Burns & Trauma; Fator de impacto:5,099; Qualis A1

The Brazilian-Portuguese version of the Upper Extremity Functional Index (UEFI): Translation, cross-cultural adaptation and measurement properties for Brazilian adults after a burn injury

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ABSTRACT

Background: Advances in burn treatment have increased survival rates; however, comorbidities and functional deficiencies are increasingly present after burn healing. Instruments to identify these problems, such as the Upper Extremity Functional Index (UEFI), are needed to guide treatment prescription and measure individuals' progression. We aimed to translate, culturally adapt, validate, verify reliability and responsiveness, and to estimate the minimum detectable change (MDC) of the UEFI.
Methods: A longitudinal validation study was carried out with Brazilian adults after burn in upper limbs at two moments, at discharge and the first outpatient follow-up, in a Burn Treatment Center. It followed five internationally recommended steps: translation, synthesis, back-translation, evaluation by expert committee and pre-test. In addition, an evaluation of validation, reliability, responsiveness, estimation of the minimum detectable change was carried out. Participants were interviewed by two independent interviewers on the same day with, at least, 30 minutes between interviews, in order to assess intra- and inter-rater reliability; all of them answered the Brazilian version of the UEFI (UEFI-Br) and the function domain of the Burn Specific Health Scale-Brief Brazil (BSHS-B-Br) in both times. The BSHS-B-Br was used as the reference method to study construct validity of the UEFI-Br. The distribution-based method was used to estimate the MDC.
Results: In a sample with 131 Brazilian adults after burn in upper limbs (36 [26-50] years; 94 men), the UEFI-Br scores showed very strong correlations with the function domain of the BSHS-B-Br (r = 0.87 to 0.90). The intra- and inter-rater reliability was excellent with ICC of 0.986 (95% CI: 0.980-0.991) and 0.969 (95% CI: 0.955-0.979), respectively, at discharge and 0.997 (95% CI: 0.996-0.998) and 0.987 (CI) 95%: 0.981-0.991), respectively, in the first outpatient follow-up visit. There was an excellent internal consistency with Cronbach's α values 0.970 and 0.987, respectively, in both times. A moderate responsiveness over time without intervention was observed (Cohen's D and standardized response mean: 0.64 and 0.67, respectively). The MDC is between 10 and 13 points. The standard error of measurement was 4.42 and 2.31.
Conclusion: The UEFI-Br is a valid, reliable, responsible and useful tool to assess upper limb function and disability in Brazilian adults after a burn injury.

Keywords: Burns; Upper Extremity; Validation study; Patient Outcome Assessment; Physical Functional Performance.

HIGHLIGHTS

- The Brazilian-Portuguese version of the UEFI score demonstrated very strong correlation with BSHS-B-Br (function domain) score at hospital discharge and at first outpatient follow-up, so the UEFI-Br proved to be a valid tool to assess upper extremity function in Brazilian adults after a burn injury.

- The ICC intra- and inter-examiner were excellent for both moments; at hospital discharge (ICC=0.99 and 0.97) and at first outpatient follow-up (ICC=0.99 and 0.99 respectively). There was an excellent internal consistency with Cronbach's α values 0.987 and 0.996 at the two moments.

- The Cohen's *d* and the SRM were moderate (0.64 and 0.67, respectively).

- The MDC of the UEFI-Br lies between 10 and 13 points. The SEM in both moments were 4.42 and 2.31.

BACKGROUND

In the last three decades, advances in burn care have increased survival rates after burns; however, significant challenges still remain [1-3]. There is need to look at the sequelae and loss of functional mobility of victims of burn trauma to improve their physical, psychological and functional conditions [1,4].

Hands are the most commonly burned body part, comprising more than 50% of all burns and more than 80% of severe burns [5,6]. Hand and arm burns do not often play major roles in mortality, but they can cause crippling deformities and disabilities, which may affect the patient's ability to perform activities of daily living (ADLs) and fine tasks, leading to significant functional restrictions and impairments in physical and psychological health, and in overall quality of life [6,7].

Instruments to identify functional disabilities faced by these patients are necessary to guide treatment prescription and to measure functional progressions due to therapeutic interventions. To ensure confidence and veracity of results when evaluating patients, professionals must choose standardized and validated tools that are able to detect progress in the treatment and also to add prognostic information. Unfortunately, there are few tools translated and validated to assess function of Brazilian adults after a burn injury. This highlights the importance of translation and cross-cultural adaptation studies in this field [8,9].

The Upper Extremity Functional Index (UEFI) has been used to measure function of upper limbs in individuals after burns [10,11]. It is a 20-item patient-reported outcome that measures the degree of difficulty in some ADL performed using the affected upper limb. Although it was not specifically developed for burns, it is valid and presents excellent test-retest reliability and internal consistency in individuals with upper-extremity injuries [12]. In addition, the UEFI was previously used to verify change over time in victims of burn injuries, although its responsiveness has not been studied yet. The original version is available in English and was culturally adapted for the Turkish and Chinese languages [12-14]. It is easy to apply and understand, evaluates basic and instrumental activities of daily life; in addition, it assesses the status of the upper limb at the time of application of the test, unlike other tests that are based on

the status of the upper limb in previous weeks. Considering the importance of having tools such as the UEFI in research and clinical settings, the aim of this study was to translate, cross-culturally adapt, validate, verify the reliability and the responsiveness, and estimate the minimal detectable change (MDC) of the Brazilian-Portuguese version of the UEFI (UEFI-Br). To the best of the authors' knowledge, in case of successful results the Brazilian-Portuguese version of the UEFI will be the first available instrument validated to specifically assess upper extremity functional status of Brazilian adults after a burn injury.

METHODS

Study design and ethical procedures

This longitudinal validation study was carried out at the Burn Treatment Center (BTC) of the University Hospital at Londrina after approval by the institutional Research Ethics Committee (CAAE 75077317.1.000.5231). All patients voluntarily signed the informed consent form and agreed to participate in the study. Data collection occurred from November 2017 to January 2019. Participants were interviewed by two independent interviewers on the same day with, at least, 30 minutes between the interviews, in order to assess intra- and inter-rater reliability. The questionnaire was applied through interviews, since the level of education was predominantly low among the participants. The same interviewer conducted both interviews to measure intra-rater reliability. The use of the original questionnaire and interview format were approved by the original authors.

Sample

Study participants were adults who were hospitalized due to burn injuries. All of them received usual care according to the burn unit procedures, including physical therapy sessions three times a day during the intensive care unit stay; and two to three times a day during the hospital ward stay, being those who suffered burn injuries in the hands more assisted than the others. The volunteers were recruited during the hospitalization and assessed, consecutively, at hospital discharge and at their first outpatient follow-up care. Upon being discharged from the hospital, all participants went back to their city

of origin and were referred to outpatient physical therapy treatment; in addition, they were instructed to perform exercises at home. Inclusion criteria for the study sample were uni or bilateral upper limb burn injury (regardless of the affected body surface); both genders; 18 years or older; able to understand simple commands; and agreement to take part in the study. Participants were excluded if presenting psychiatric symptoms during the research protocol, and present neurological and/or musculoskeletal sequelae acquired between the time of discharge and the first return visit.

The GPower software was used to calculate the sample size. It was calculated according to Cronbach's α, which considered the expected value of Cronbach α: 0.80; significance: 0.05; power: 0.80; loss: 10%; number of items in the questionnaire: 20. This resulted in a total sample estimation of 115 participants.

Outcomes

Sociodemographic and clinical characteristics

A tool was developed by the authors to collect some sociodemographic data (i.e., age, gender, education level) and data related to burn injury (total body surface area – TBSA, causal agent, type of accident, length of stay – LOS, skin graft surgery and grafts performed on upper limb). Burn-specific data were obtained from medical records and the sociodemographic information were self-reported during an interview.

Upper Extremity Functional Index (UEFI)

The UEFI was originally published in English by Stratford et al in 2001. The questionnaire lists 20 activities and proposes to measure upper extremity function in individuals with hand and upper extremity disorders. Patients indicate a score to each activity using a 5-point adjectival response scale to rate their difficulty in performing upper-extremity activities in daily life (with the affected side) as follows: 0 = extreme difficulty or unable to perform activity, 1 = quite a bit of difficulty, 2 = moderate difficulty, 3 = a little bit of difficulty, and 4 = no difficulty. Possible range on the UEFI from 0 – 80 with 0 indicating the lowest functional status and 80 the highest functional status. If the individual has never

performed any of the activities evaluated in the questionnaire, e.g., driving, the question was excluded and the score was obtained from the other activities, following the instructions of the original UEFI author [12].

It takes about 3 to 5 minutes to complete the assessment and is easy to administer and score with minimal training. Since physical therapists are commonly consulted by people with upper limbs musculoskeletal disorders, they are able to apply and use the questionnaire in their clinical practice [15].

Burn Specific Health Scale-Brief (BSHS-B)

The Burn Specific Health Scale-Brief (BSHS-B) is a widely used instrument to assess quality of life in burn patients. The scale consists of 40 items encompassing nine subscales: simple abilities, hand function, work, body image, heat sensitivity, treatment regimens, affect, interpersonal relationships, and sexuality [16]. A recent analysis showed that all the above subscales can be grouped into three domains: *function domain* (simple abilities and hand function), *skin sensitivity domain* (body image, heat sensitivity and treatment regimen), and *affect and relationship domain* (affect, interpersonal relationship and sexuality) [17]. Each item describes a function or experience, which the individual must rate on a five-point scale, with four denoting “no problem” and zero indicating an “extreme problem” as follows: 0 = extreme difficulty, 1 = quite a bit of difficulty, 2 = moderate difficulty, 3 = a little bit of difficulty, and 4 = none. The final score ranges from 0 to 160 points, and the higher the score, the better the quality of life [16]. The BSHS-B was previously translated and validated to Brazilian-Portuguese (BSHS-B-Br) [18].

Cross-cultural adaptation process

The methodological procedures for translation and cultural adaptation of the UEFI were performed based on international recommendations as follows [19,20].

1. Translation: the original English version of the instrument was forward translated by two independent native language Brazilian translators, resulting in independent Portuguese versions from each translator (T1 and T2).

2. Synthesis and review of the translations by an expert committee: the researcher and translators evaluated the two Portuguese versions by

comparing them with the original instrument, resulting in a Brazilian-Portuguese version of the instrument (T-12). This consensual version (T-12) had semantic, idiomatic, cultural and conceptual equivalences evaluated by an expert committee composed by three independent members: two physiotherapists with experience in management of burn patients and one expert in functional physical assessment.

3. Back-translation: a back-translation of the T-12 was performed by an independent English sworn translator (B1).

4. Assessment by the original instrument author: semantic evaluation of each item of the UEFI Brazilian-Portuguese version (UEFI-Br) was performed; thus, the final version (FV) was obtained.

5. Pre-test: the UEFI-Br (FV) was applied to 10 individuals who met the inclusion criteria of the study. Participants were interviewed face to face and questioned about difficulties in understanding the items, incomprehension of words or clarity of the answer options. No change was necessary.

Psychometric documentation

Psychometric properties of the UEFI-Br were tested in two distinct moments: at hospital discharge and at the first outpatient follow-up care appointment (15 to 21 days after discharge).

- Construct validity: defined as the extent to which the instrument actually tests the hypothesis or theory it aims to measure [21].
- Reliability: defined as the capacity to obtain the same result when the instrument is applied in dependent groups at two different time points, i.e., the instrument's capacity to produce stable results when no alterations in patient characteristics occur [21].
- Internal consistency: the proportion of the total variance in the measurements which is due to true differences between patients [21].
- Responsiveness: the ability of an instrument to detect change over time in the construct to be measured [21].
- Minimal detectable change: the smallest change than can be detected by an instrument beyond measurement error, and only when an individual score change exceeds this level, the clinician can be confident that it was a real change [22].

Statistical analyses

Normality in data distribution was analyzed using the Shapiro-Wilk test. Results were expressed as mean±standard deviation or mean (CI 95%) in case of normal distribution, or median [IQR 25%-75%] in case of non-normal distribution or non-parametric data. Construct validity was studied calculating Spearman's correlation coefficient between UEFI-Br score and BSHS-B-Br (function domain); correlation coefficient <0.30 indicate weak correlation; r values >0.30 and <0.60 moderate correlation; r values >0.60 and < 0.79 strong correlation; and r values >0.80 indicate a very strong correlation. To check intra- and inter-rater reliability, intra-class correlation coefficients (ICC) and their 95% confidence interval were calculated based on a single-rating, absolute agreement, 2-way random-effects model. In addition, Bland & Altman plots were built. The Cronbach's alpha coefficient (Cronbach α) was used to test internal consistency, and a value above 0.7 was considered acceptable. To check responsiveness, UEFI-Br and BSHS-B-Br (function domain) scores at hospital discharge were compared with the scores at the first outpatient follow-up. Cohen's *d* statistic was used to measure effect size and therefore the relative sensitivity of each score. Cohen's *d* is the average difference in means between two groups divided by the pooled standard deviation (SD) of both groups. For this study, a Cohen's d greater than 0.5 indicated that the instrument was suitably responsive to change over time [23]. Standardized Response Mean (SRM) is another method of calculating effect size and is the average difference between groups divided by the standard deviation (SD) of the differences between paired measurements. Finally, the MDC was estimated by the following distribution-based methods: 1) 0.5 times the SD of the baseline measurement; 2) empirical rule effect size (0.08*6*SDΔ); 3) Cohen's effect size (0,5*SDΔ); and 4) SEM ($\sigma 1\sqrt{1 - r}$), where σ1 is the baseline SD and r is the test-retest and this result is put into a formula ($\Delta = 1.96*\sqrt{2} * \text{SEM}$) where the 1.96 derives from the 95 confidence interval. The level of statistical significance was set at $P < 0.05$. Statistical analyses were performed using the SPSS Statistical Package (IBM SPSS Statistics, USA) and the Graph Pad Prism 6.0 (Graph Pad Software, USA).

RESULTS

A representative sample of 131 Brazilian adults after a burn injury was enrolled. Of these participants, 100 (76%) answered the questionnaires in both moments, 15 (12%) answered only at hospital discharge and another 15 (12%) only at outpatient follow-up care. In general, participants were young adults with a median 36 [26-50] years; most of them (72%) were male; a median of TBSA 12 [7-21] %. Further sample characteristics can be found in Table 1.

[Table 1]

A very strong correlation between UEFI-Br and function domain of the BSHS-B-Br at discharge (r=0.87) and outpatient follow-up (r=0.90) was observed. There were no significant correlations between UEFI-Br at discharge and participants' characteristics such as: age, gender, LOS, TBSA, skin graph, and upper limb graph (r= -0.23 to 0.09; P>0.05 for all).

Intra- and inter-rater reliability were excellent with ICC of 0.986 (CI 95%: 0.98-0.99) and 0.969 (0.955-0.979), respectively, at discharge, and of 0.997 (0.996-0.998) and 0.987 (0.981-0.991), respectively, at first outpatient follow-up care. The Bland & Altman plots showed the agreement between the two times for both intra- and inter-observer. The agreement between measurements is shown in Figure 1.

[Figure 1]

Considering the excellent intra- and inter-rater reliability and for standardization reasons, the UEFI-Br scores considered for further analysis were those obtained from the first interview in both moments. The score values were 51 [27-75] points at discharge and 77 [53-80] points at the first outpatient follow-up appointment (30% of participants reached the maximum score of UEFI, i.e.,80 points, at this time). There was a good internal consistency with Cronbach's α values of 0.987 and 0.996 at discharge and first outpatient follow-up, respectively.

A moderate responsiveness of the UEFI-Br was observed with Cohen's d and the SRM values of 0.64 and 0.67, greater than BSHS-B-Br, 0.59 and 0.58

respectively.

The different MDC estimations using distribution-based methods lies between 10 and 13 points, the SEM in both moments was 4.42 and 2.31. More details can be seen in Table 2.

[Table 2]

DISCUSSION

In the present study we have translated, culturally adapted the UEFI to Brazilian-Portuguese in adults after a burn injury. It has provided evidence of validity, test-retest reliability, and level of responsiveness of the UEFI-Br outcome measure in patients with upper limb burn injuries, as the original instrument and can be used in practice and clinical studies.

There are a few questionnaires available in Brazilian-Portuguese which can be used to evaluate hand function and simple abilities through their function domain (e.g., BSHS-B-Br, BSHS-Revised) [17,22]. The BSHS-B-Br (function domain) evaluates ADLs such as eating, dressing, bathing and other fine skills as writing, grabbing coins and handling keys [17]. In addition, to these activities, the UEFI further evaluates skills such as driving, holding and lifting objects above the head, combing, cleaning, and carrying weight with the affected side, therefore evaluating more globally upper limb functionality and proving to be a more complete instrument for this purpose. The UEFI's strengths include: simple identification of areas of difficulty that may be relevant to address in therapies; instructions are simple and straightforward; and easy administration and scoring [12].

The UEFI-Br strongly correlated with the BSHS-B-Br (function domain) in the two study moments, showing that these instruments assess a similar construct. This finding confirms a good convergent construct validity as showed under other conditions: following breast cancer surgery, subacromial impingement syndrome, rotator cuff disease [13,25,26].

On the other hand, we found that there were no significant correlations between UEFI-Br scores and participant characteristics, corroborating with the study performed by Aytar et al. [13]. Some correlations, although expected,

were not found; it can be explained by the fact that most participants were young who tend to recover faster than older ones. In addition, due to the low socioeconomic status of most participants, there is an urgency to return to work activities as soon as possible; or even they may face difficulty in getting a caregiver to help them during activities of daily living, which imposes a need to perform activities by themselves. Another factor that deserves attention is the fact that participants of the present study with hand burn injuries received a greater number of daily physical therapy sessions during hospitalization.

In addition, the excellent values of the UEFI-Br Cronbach α coefficients and ICCs, as observed in the original version in English (0.95; 0.94), in the Turkish version (0.89; 0.90) and Chinese version (0.93; 0.97), demonstrating the internal consistency and reliability of the Brazilian-Portuguese version in both moments [12-14].

Moderate Cohen *d* and SRM values indicate that UEFI-Br responds adequately to changes over time; showing moderate responsiveness in Brazilian adults after a burn. Some factors may have influenced this moderate responsiveness. First, the time between hospital discharge and the first outpatient visit was a short period to achieve greater functional improvement. Second, the fact that most are not from the city where the BTC is located, there was no standardization of the physical therapy treatment offered to individuals. Some did not even do physical therapy in clinics, they only followed the guidelines given during the hospitalization period. Third, part of the participants reached the maximum score of the questionnaire in the second moment of the evaluation. It is possible to hypothesize that a ceiling effect may have occurred, i.e., the maximum score of the questionnaire may be unable to indicate improved maximum function of the upper limbs. And finally, it may be related to the median age of the participants; in general, they were middle-aged adults. For this reason, they tend to recover quickly with the desire to return to their work activities mainly; they are responsible for the family income, and to take care of their loved ones.

The original UEFI model does not provide any specific cut off points that could classify the upper limb disability degree. However, an MDC of 9 points is provided for any dysfunction of musculoskeletal origin; 9.4 points for adults with

upper extremity dysfunctions; 11,1 points for following breast cancer surgery; the latter showing a similarity to the results found for Brazilian adults after a burn injury [12,15,25].

Despite the authors' efforts, the study presented limitations which deserve consideration. The test-retest of the UEFI-Br occurred at the same day due to logistic reasons, i.e., the assessment routine in the BTC, especially in the follow-up consultation. In addition, the questionnaire was applied as an interview and not self-applied, as in the original study. However, the authors opted for the interview method since 11% of the subjects were illiterate and 35% had incomplete elementary study. A relatively low level of education is not uncommon in studies involving Brazilian burn victims [27-29]. Moreover, the present study also has strengths. Firstly, the adoption of international guidelines to guide the cross-cultural adaptation process [19,20]. Secondly, the UEFI-Br reliability and consistency were studied in two different and important clinical moments, at discharge and post-discharge. Finally, defining the MDC of the UEFI-Br allows a better interpretation of its scores, guiding professionals both in clinical practice and for research purposes.

CONCLUSION

The Brazilian-Portuguese version of UEFI proved to be a valid, reliable and responsive tool to be applied to Brazilian adults after burns in the upper limbs. The MDC of the UEFI-Br ranges from 10 to 13 points. This study showed that the use of UEFI is a plausible choice when the aim is to measure upper limb activity limitation and change in function after a burn. It may be suitable for both clinical and research settings.

DECLARATIONS

Ethics approval: Ethics Committee from State University of Londrina CAAE 75077317.1.000.5231

Consent for publication:
Not applicable.

Availability of data and materials:
Not applicable.

Competing interests:
The authors have no competing interest to declare.

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Author's contributions:
EYI, AAM, EEK, FP and NAH were involved in the conception and design of the study. EYI, AAM and EEK performed the collection and analyzed the data. EYI, and NAH wrote the manuscript. EHTA, RMK, FP and NAH revised the manuscript. All authors read and approved the final manuscript for submission.

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Table 1 - Studied sample characteristics.

Variable	Sample (n=131)
Education level, N (%)	
Illiterate	15 (11)
Elementary school	46 (35)
Junior high school	28 (21)
High school	35 (28)
College	7 (5)
LOS, days	16 [10-28]*
Etiology of burn, N (%)	
Flames	91 (69)
Scald	26 (20)
Electrical	13 (10)
Chemical	1 (1)
Type of accident, N (%)	
Domestic	88 (67)
Work	33 (25)
Homicide attempt	7 (5)
Suicide attempt	3 (3)
Skin graft surgery, N (%)	71 (54)
Upper limbs grafted, N (%)	49 (37)

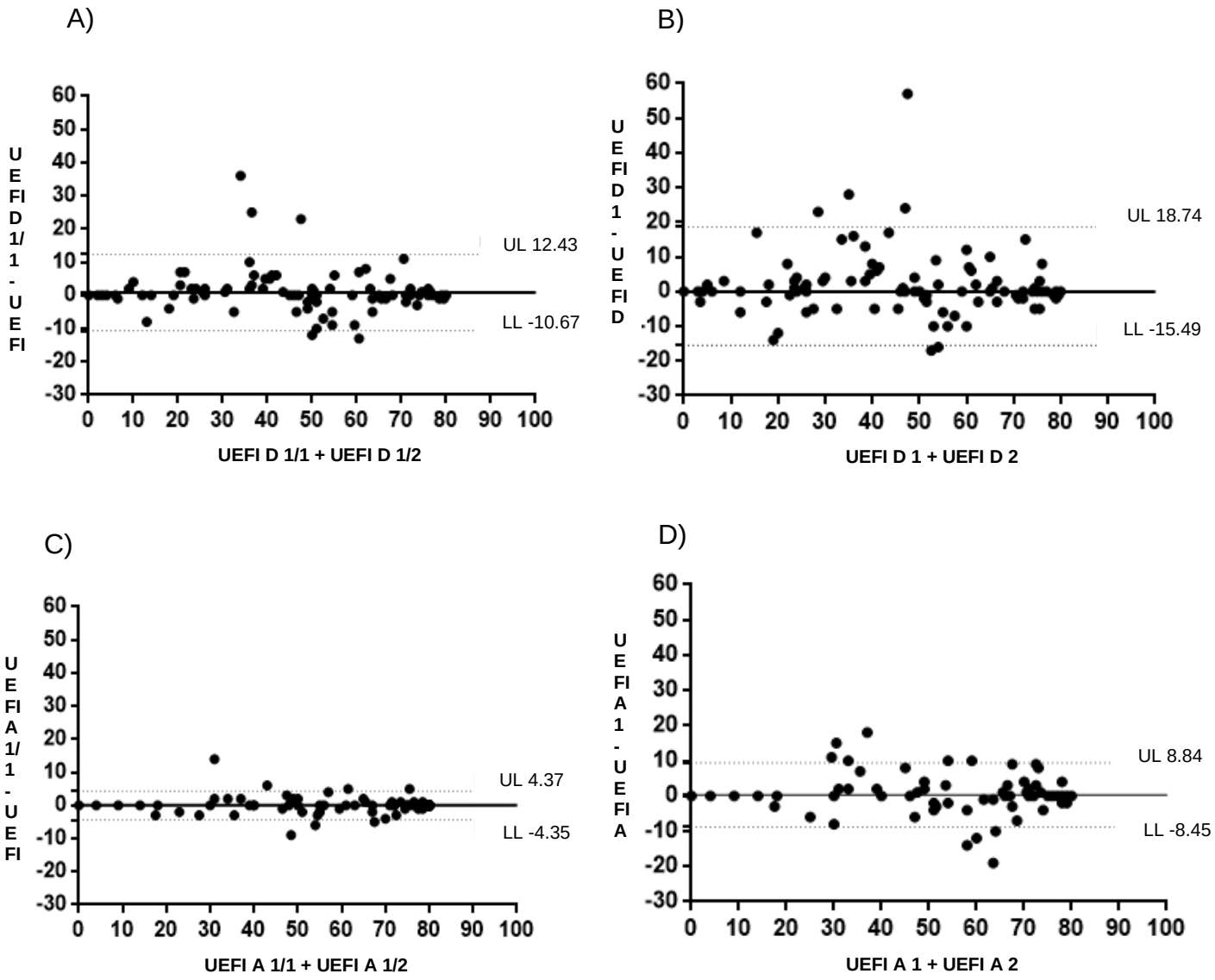
LOS: length of stay; *median [25th-75th]

Table 2 – Minimum detectable change (MDC) values by distribution-based methods:

Distribution-based methods		Discharge	Ambulatory
0.5 times SD	-	12.8	10.46
Cohen's effect size	11.2	-	-
Empirical rule	10.8	-	-
SEM	-	4.42	2.31

SD: standard deviation; SEM: Standardized Response Mean

Figure 1 - Bland & Altman plot of agreement between measurements at hospital discharge and outcome follow-up care.



A: agreement between intra-rater measurements at hospital discharge; B: agreement between inter-rater measurements at hospital discharge; C: agreement between intra-rater measurements at the first outpatient follow-up care; D: agreement between inter-rater measurements at the first outpatient follow-up care; UL: upper limit; LL: lower limit; UEFI D: UEFI at hospital discharge; UEFI A: UEFI at the first outpatient follow up.

THE UPPER EXTREMITY FUNCTIONAL INDEX (UEFI)

We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your upper limb problem for which you are currently seeking attention. Please provide an answer for **each** activity.

Today, do you or would you have any difficulty at all with:

(Circle one number on each line)

	Activities	Extreme Difficulty or Unable to Perform Activity	Quite a Bit of Difficulty	Moderate Difficulty	A Little Bit of Difficulty	No Difficulty
1	Any of your usual work, housework, or school activities	0	1	2	3	4
2	Your usual hobbies, re creational or sporting activities	0	1	2	3	4
3	Lifting a bag of groceries to waist level	0	1	2	3	4
4	Lifting a bag of groceries above your head	0	1	2	3	4
5	Grooming your hair	0	1	2	3	4
6	Pushing up on your hands (eg from bathtub or chair)	0	1	2	3	4
7	Preparing food (eg peeling, cutting)	0	1	2	3	4
8	Driving	0	1	2	3	4
9	Vacuuming, sweeping or raking	0	1	2	3	4
10	Dressing	0	1	2	3	4
11	Doing up buttons	0	1	2	3	4
12	Using tools or appliances	0	1	2	3	4
13	Opening doors	0	1	2	3	4
14	Cleaning	0	1	2	3	4
15	Tying or lacing shoes	0	1	2	3	4
16	Sleeping	0	1	2	3	4
17	Laundering clothes (eg washing, ironing, folding)	0	1	2	3	4
18	Opening a jar	0	1	2	3	4
19	Throwing a ball	0	1	2	3	4
20	Carrying a small suitcase with your affected limb	0	1	2	3	4
	Column Totals:					

Minimum Level of Detectable Change (90% Confidence): 9 points **SCORE: _____/80**

Suplement 2 - UEFI Brazilian version

UEFI: estamos interessados em saber se você apresenta alguma dificuldade nas atividades listadas abaixo devido ao seu problema nos membros superiores que atualmente necessita de atenção. Por favor, dê uma resposta para cada atividade. **Hoje, você apresenta ou apresentaria alguma dificuldade com:** (Circule um número em cada linha).

	ATIVIDADES	Extremamente difícil ou incapaz de realizar a atividade	Muita dificuldade	Dificuldade moderada	Pouca dificuldade	Nenhuma dificuldade
1	Qualquer trabalho habitual, tarefas domésticas ou atividades escolares	0	1	2	3	4
2	Suas atividades de lazer habituais, recreativas ou esportivas	0	1	2	3	4
3	Levantar um pacote de mantimentos até o nível da cintura	0	1	2	3	4
4	Levantar um pacote de mantimentos acima de sua cabeça	0	1	2	3	4
5	Pentear seus cabelos	0	1	2	3	4
6	Apoiar-se com as mãos para levantar-se (por ex. de uma cadeira ou banheira)	0	1	2	3	4
7	Preparar alimentos (por ex. descascar, cortar)	0	1	2	3	4
8	Dirigir	0	1	2	3	4
9	Passar aspirador de pó, varrer ou rastelar	0	1	2	3	4
10	Vestir-se	0	1	2	3	4
11	Abotoar	0	1	2	3	4
12	Utilizar ferramentas ou aparelhos	0	1	2	3	4
13	Abrir portas	0	1	2	3	4
14	Limpar	0	1	2	3	4
15	Colocar ou amarrar o cadarço dos calçados	0	1	2	3	4
16	Dormir	0	1	2	3	4
17	Cuidar das roupas (por ex. lavar, passar e dobrar)	0	1	2	3	4
18	Abrir um frasco	0	1	2	3	4
19	Arremessar uma bola	0	1	2	3	4
20	Carregar uma mala pequena com o seu membro acometido	0	1	2	3	4
	Somatória das colunas:					

Nível Mínimo de Mudança Detectável (90% Confiança): 11 pontos **PONTUAÇÃO: ____/80**

6 CONSIDERAÇÕES FINAIS

Os artigos apresentados nesta tese mostram que:

1. A revisão sistemática identificou uma grande variedade de instrumentos e testes para avaliação da funcionalidade em adultos após uma queimadura. O instrumento mais adequado para esse fim ainda não é um consenso entre os pesquisadores e clínicos, portanto a escolha do melhor teste ou questionário para esta avaliação deve ser cuidadosa e criteriosa, procurando utilizar os que tiveram as propriedades psicométricas avaliadas para esta população.

2. O processo de tradução do *Upper Extremity Functional Index* (UEFI) para a língua portuguesa do Brasil e sua adaptação cultural para os adultos que sofreram queimaduras foi realizado baseado em normas metodológicas internacionalmente aceitas. A versão brasileira do UEFI (UEFI-Br) manteve a equivalência semântica, idiomática, cultural e conceitual, e demonstrou excelente confiabilidade e consistência interna; mostrou ser um instrumento que responde adequadamente às mudanças ao longo do tempo. Além disso definimos sua mudança mínima detectável (MMD) o que permitirá uma melhor interpretação dos escores do UEFI-Br. Concluímos que o UEFI-Br será um instrumento útil para avaliação da funcionalidade de membros superiores em adultos brasileiros após uma queimadura.

É fato que todos os esforços para manutenção da vida se tornam discutíveis se não é oferecido ao indivíduo que sofreu uma queimadura a possibilidade de manter a mínima funcionalidade após a alta hospitalar. Ou seja, não basta mais devolvermos o indivíduo vivo, mas devemos garantir que ele retorne à sua casa com um nível funcional o mais próximo pré-lesão e uma qualidade de vida mínima para ele seguir nessa luta que ainda perdurará por anos após o evento inicial.

O olhar atento do fisioterapeuta desde o momento da admissão até a alta hospitalar e que se estende para o ambulatório, é imprescindível. Cada movimento, cada alongamento muscular, cada posicionamento é fundamental para a recuperação físico funcional e deve ser incentivado diariamente.

Persistência, determinação e firmeza seguem junto com o fisioterapeuta, uma vez que o tratamento da fisioterapia é considerado por eles “muito sofrido e doloroso”. Uma palavra de incentivo, um olhar de aprovação para cada tarefa executada, comemoração por cada conquista, fazem parte do arsenal do fisioterapeuta que atende este indivíduo que já sofre muito pelas queimaduras, pelas dores, pelas dúvidas e incertezas, pela discriminação e estigmatização.

Avaliar os resultados funcionais após uma queimadura é importante para nortear o melhor tratamento que podemos oferecer após uma queimadura (seja ainda durante a hospitalização), seja para direcionar os colegas que atendem nas cidades de origem, muitas vezes distantes dos grandes centros, onde os recursos disponíveis são escassos.

É notório o pequeno número de estudos e pesquisas no Brasil neste campo tão complexo que envolve a ‘queimadura’. Maiores incentivos são necessários, mais Centros Especializados em todo o país devem ser criados. Toda iniciativa deve ser incentivada e valorizada: Ligas Acadêmicas e Comitês Científicos de Queimaduras estão aos poucos surgindo no Brasil, com o apoio da Sociedade Brasileira de Queimaduras, que seguindo os passos da *ISBI* pretende padronizar o atendimento ao grande queimado, ou seja: **“One world, one burn rehabilitation”**.

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APÊNDICES

APÊNDICE A

Ficha de caracterização da amostra

FICHA DE CARACTERIZAÇÃO DA AMOSTRA

DADOS DA QUEIMADURA:

Data da queimadura: ___/___/_____ Data da internação:___/___/_____ Data da alta:___/___/_____

Dias de internação hospitalar: _____ Dias de UTQ:_____ Dias de enfermaria: _____
SCQ: _____% Áreas queimadas:_____

Articulações nobres acometidas? ( ) sim ( ) não

Agente Causal: _____ Ambiente aberto ( ) Ambiente fechado ( )

Auto-extermínio( ) Homicídio( ) Acidente doméstico( ) Acidente trabalho( ) Outros _____

DADOS RESPIRATÓRIOS	SIM	NÃO
Queimadura de vias aéreas		
Lesão inalatória		
Inalação com heparina		
VM/ IOT		
PEEP alta		
Extubação		
Traqueostomia		
Dias de AVM		

DADOS QUEIMADURAS	SIM	NÃO
Desbridamentos		
Enxertias		
Escarotomias		
Amputação		
Órtese		
Limitação ADM		
Mão(s) queimada(s)		
Axila(s) queimada(s)		

	Quantidade				
	0	1	2	3	4 ou +
Banheiros	0	3	7	10	14
Empregados domésticos	0	3	7	10	13
Automóveis	0	3	5	8	11
Microcomputador	0	3	6	8	11
Lava louca	0	3	6	6	6
Geladeira	0	2	3	5	5
Freezer	0	2	4	6	6
Lava roupa	0	2	4	6	6
DVD	0	1	3	4	6
Micro-ondas	0	2	4	4	4
Motocicleta	0	1	3	3	3
Secadora roupa	0	2	2	2	2

Grau de instrução do chefe de família e acesso a serviços públicos

Escolaridade da pessoa de referência	
Analfabeto / Fundamental I incompleto	0
Fundamental I completo / Fundamental II incompleto	1
Fundamental II completo / Médio incompleto	2
Médio completo / Superior incompleto	4
Superior completo	7

Serviços públicos		
	Não	Sim
Água encanada	0	4
Rua pavimentada	0	2

DADOS SOCIODEMOGRÁFICOS	SIM	NÃO
Mora na cidade		
Mora no sítio		
Metrópole?		
Interior?		
Casa própria?		
Convênio?		
Localização geográfica		
Distância do CTQ		

APÊNDICE B

Termo de Consentimento Livre e Esclarecido

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

““Tradução e adaptação transcultural para o português brasileiro e avaliação das propriedades psicométricas do Upper Extremity Functional Index (UEFI)”

Prezado(a) Senhor(a):

Gostaríamos de convidá-lo (a) para participar da pesquisa **“Tradução e adaptação transcultural para o português brasileiro e avaliação das propriedades psicométricas do *Upper Extremity Functional Index (UEFI)*”,** a ser realizada no Centro de Tratamento de Queimados da Universidade Estadual de Londrina**.** O objetivo da pesquisa é traduzir o questionário *UEFI* para o português brasileiro para ser aplicado em pacientes que sofreram queimaduras em membros superiores. Sua participação é muito importante e ela se daria da seguinte forma responder três questionários simples e curtos sobre as atividades com os braços e sobre sua qualidade de vida após a queimadura, em dois momentos, na alta hospitalar e no seu primeiro retorno ambulatorial no Centro de Tratamento de Queimados da Universidade Estadual de Londrina (CTQ/HU/UEL).

Esclarecemos que sua participação é totalmente voluntária, podendo você: recusar-se a participar, ou mesmo desistir a qualquer momento, sem que isto acarrete qualquer ônus ou prejuízo à sua pessoa. Esclarecemos, também, que suas informações serão utilizadas somente para os fins desta pesquisa e serão tratadas com o mais absoluto sigilo e confidencialidade, de modo a preservar a sua identidade.

Esclarecemos ainda, que você não pagará e nem será remunerado(a) por sua participação. Garantimos, no entanto, que todas as despesas decorrentes da pesquisa serão ressarcidas, quando devidas e decorrentes especificamente de sua participação.

Os benefícios esperados são para futuras pesquisas e para o processo de reabilitação de sobreviventes de queimaduras, pois com a validação do questionário poderemos aplicá-lo aos queimados no Brasil, avaliando como ficam os membros superiores após uma queimadura. Acredita-se que a presente pesquisa possa expor o participante ao risco de algum nível de constrangimento

ao responder os questionamentos do UEFI e do BSHS-B-Br, uma vez que este envolve atividades realizadas em seu cotidiano e o segundo apresenta questões sobre sexualidade após a queimadura. Portanto, caso o participante sinta que sua integridade moral será ferida, ele poderá se negar a responder qualquer pergunta que julgar necessário.

Caso você tenha dúvidas ou necessite de maiores esclarecimentos poderá nos contatar nos telefones (43) 3371-2692 ou 3371-2689 ou pessoalmente no Ambulatório Centro de Tratamento de Queimados: Av. Robert Koch, 60 – Vila Operária – Londrina – PR ou procurar o Comitê de Ética em Pesquisa Envolvendo Seres Humanos da Universidade Estadual de Londrina, situado junto ao LABESC – Laboratório Escola, no Campus Universitário – sala 14, telefone 3371-5455, e-mail: cep268@uel.br.

Este termo deverá ser preenchido em duas vias de igual teor, sendo uma delas devidamente preenchida, assinada e entregue a você.

Londrina, ___ de _____de 201_.

Edna Yukimi Itakussu
Pesquisador Responsável
RG:5.002.193-9

_____

_____ (**NOME POR EXTENSO DO PARTICIPANTE DA PESQUISA**), tendo sido devidamente esclarecido sobre os procedimentos da pesquisa, concordo em participar **voluntariamente** da pesquisa descrita acima.

Assinatura (ou impressão dactiloscópica):_____

Data:_____

ANEXOS

ANEXO A

Normas de formatação do periódico *Burns*

BURNS
Journal of the International Society for Burn Injuries
ELSEVIER

AUTHOR INFORMATION PACK

TABLE OF CONTENTS

ISSN: 0305-4179

DESCRIPTION

Burns aims to foster the exchange of information among all engaged in preventing and treating the effects of burns. The journal focuses on clinical, cientific and social aspects of these injuries and covers the prevention of the injury, the epidemiology of such injuries and all aspects of treatment including development of new techniques and technologies and verification of existing ones. Regular features include clinical and scientific papers, state of the art reviews and descriptions of burn-care in practice.

Topics covered by Burns include: the effects of smoke on man and animals, their tissues and cells; the responses to and treatment of patients and animals with chemical injuries to the skin; the biological and clinical effects of cold injuries; surgical techniques which are, or may be relevant to the treatment of burned patients during the acute or reconstructive phase following injury; well controlled laboratory studies of the effectiveness of anti-microbial agents on infection and new materials on scarring and healing; inflammatory responses to injury, effectiveness of related agents and other compounds used to modify the physiological and cellular responses to the injury; experimental studies of burns and the outcome of burn wound healing; regenerative medicine concerning the skin. Burns seeks to publish suitable material submitted by all professions

involved in the care, treatment and prevention of burn injuries. You are also welcome to submit to Burns? open access companion title Burns Open.

Submission of papers

Authors are requested to submit their original manuscript and figures online via https://www.editorialmanager.com/jbur, which is the Elsevier web-based submission and peer-review system. Please follow these guidelines to prepare and upload your article. Once the uploading is done, our system automatically generates an electronic pdf proof, which is then used for reviewing. All correspondence, including notification of the Editor's decision and requests for revisions, will be managed via this system. If any illustrations, diagram or part of the text have been published elsewhere the source must be given in full, permission having been granted by the author and by the publisher.

Submitted manuscripts will be reviewed by selected referees and the author will be informed of editorial decisions based on the referee comments as soon as possible. For information about the status of your paper, please log on to https://www.editorialmanager.com/jbur. On receipt of the first decision letter authors should submit their revised manuscript within three months in order to ensure that the scientific content of their manuscript is timely and up to date.

PREPARATION

Use of word processing software

It is important that the file be saved in the native format of the word processor used. The text should be in single-column format. Keep the layout of the text as simple as possible. Most formatting codes will be removed and replaced on processing the article. In particular, do not use the word processor's options to justify text or to hyphenate words. However, do use bold face, italics, subscripts, superscripts etc. When preparing tables, if you are using a table grid, use only one grid for each individual table and not a grid for each row. If no grid is used, use tabs, not spaces, to align columns. The electronic text should be prepared in a way very similar to that of conventional manuscripts (see also the Guide to

Publishing with Elsevier). Note that source files of figures, tables and text graphics will be required whether or not you embed your figures in the text. See also the section on Electronic artwork.
To avoid unnecessary errors you are strongly advised to use the 'spell-check' and 'grammar-check' functions of your word processor.

Article structure

Subdivision - unnumbered sections
Divide your article into clearly defined sections. Each subsection is given a brief heading. Each heading should appear on its own separate line. Subsections should be used as much as possible when cross-referencing text: refer to the subsection by heading as opposed to simply 'the text'.

Introduction
State the objectives of the work and provide an adequate background, avoiding a detailed literature survey or a summary of the results.

Material and methods
Provide sufficient details to allow the work to be reproduced by an independent researcher. Methods that are already published should be summarized and indicated by a reference. If quoting directly from a previously published method, use quotation marks and also cite the source. Any modifications to existing methods should also be described.

Theory/calculation
A Theory section should extend, not repeat, the background to the article already dealt with in the Introduction and lay the foundation for further work. In contrast, a Calculation section represents a practical development from a theoretical basis.

Results
Results should be clear and concise.

Discussion

This should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

Conclusions

The main conclusions of the study may be presented in a short Conclusions section, which may stand alone or form a subsection of a Discussion or Results and Discussion section.

Appendices

If there is more than one appendix, they should be identified as A, B, etc. Formulae and equations in appendices should be given separate numbering: Eq. (A.1), Eq. (A.2), etc.; in a subsequent appendix, Eq. (B.1) and so on. Similarly for tables and figures: Table A.1; Fig. A.1, etc.

Essential title page information

• ***Title.*** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.

• ***Author names and affiliations.*** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.

• ***Corresponding author.*** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any future queries about Methodology and Materials. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**

• ***Present/permanent address.*** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

Highlights

Highlights are mandatory for this journal as they help increase the discoverability of your article via search engines. They consist of a short collection of bullet points that capture the novel results of your research as well as new methods that were used during the study (if any). Please have a look at the examples here: example Highlights.

Highlights should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

Abstract

A concise and factual abstract is required. The abstract should state briefly the purpose of the research, the principal results and major conclusions. An abstract is often presented separately from the article, so it must be able to stand alone. For this reason, References should be avoided, but if essential, then cite the author(s) and year(s). Also, non-standard or uncommon abbreviations should be avoided, but if essential they must be defined at their first mention in the abstract itself.

Graphical abstract

Although a graphical abstract is optional, its use is encouraged as it draws more attention to the online article. The graphical abstract should summarize the contents of the article in a concise, pictorial form designed to capture the attention of a wide readership. Graphical abstracts should be submitted as a separate file in the online submission system. Image size: Please provide an image with a minimum of 531 × 1328 pixels (h × w) or proportionally more. The image should be readable at a size of 5 × 13 cm using a regular screen resolution of 96 dpi. Preferred file types: TIFF, EPS, PDF or MS Office files. You

can view Example Graphical Abstracts on our information site.
Authors can make use of Elsevier's Illustration Services to ensure the best presentation of their images and in accordance with all technical requirements.

Keywords

Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

Abbreviations

Define abbreviations that are not standard in this field in a footnote to be placed on the first page of the article. Such abbreviations that are unavoidable in the abstract must be defined at their first mention there, as well as in the footnote. Ensure consistency of abbreviations throughout the article.

Acknowledgements

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proofreading the article, etc.).

Formatting of funding sources

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Nomenclature and units

Follow internationally accepted rules and conventions: use the international system of units (SI). If other quantities are mentioned, give their equivalent in SI. You are urged to consult IUB: Biochemical Nomenclature and Related Documents for further information.

Math formulae

Please submit math equations as editable text and not as images. Present simple formulae in line with normal text where possible and use the solidus (/) instead of a horizontal line for small fractional terms, e.g., X/Y. In principle, variables are to be presented in italics. Powers of e are often more conveniently denoted by exp. Number consecutively any equations that have to be displayed separately from the text (if referred to explicitly in the text).

Figure captions

Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

Tables

Please submit tables as editable text and not as images. Tables must be placed on separate files and not embedded within the article text. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules.

References

Citation in text

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not recommended in the reference list but may be mentioned in the text. If these references are included in the reference list, they should follow the standard reference style of the journal and should include a substitution of the publication date with either 'Unpublished results' or 'Personal communication'. Citation of a reference as 'in press' implies that the item has been accepted for publication.

Reference links

Increased discoverability of research and high-quality peer review are ensured by online links to the sources cited. In order to allow us to create links to abstracting and indexing services, such as Scopus, CrossRef and PubMed, please ensure that data provided in the references are correct. Please note that incorrect surnames, journal/book titles, publication year and pagination may prevent link creation. When copying references, please be careful as they may already contain errors. Use of the DOI is highly encouraged.

A DOI is guaranteed never to change, so you can use it as a permanent link to any electronic article. An example of a citation using DOI for an article not yet in an issue is: VanDecar J.C., Russo R.M., James D.E., Ambeh W.B., Franke M. (2003). Aseismic continuation of the Lesser Antilles slab beneath northeastern Venezuela. Journal of Geophysical Research, https://doi.org/10.1029/2001JB000884. Please note the format of such citations should be in the same style as all other references in the paper.

Web references

As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references can be listed separately (e.g., after the reference list) under a different heading if desired or can be included in the reference list.

Data references

This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

References in a special issue

Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

Reference management software

Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support Citation Style Language styles, such as Mendeley. Using citation plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide. If you use reference management software, please ensure that you remove all field codes before submitting the electronic manuscript. More information on how to remove field codes from different reference management software.

Users of Mendeley Desktop can easily install the reference style for this journal by clicking the following link:
http://open.mendeley.com/use-citation-style/burns
When preparing your manuscript, you will then be able to select this style using the Mendeley plug-ins for Microsoft Word or LibreOffice.

Reference style

Text: Indicate references by number(s) in square brackets in line with the text. The actual authors can be referred to, but the reference number(s) must always

be given.

List: Number the references (numbers in square brackets) in the list in the order in which they appear in the text.

Examples:

Reference to a journal publication:

[1] Van der Geer J, Hanraads JAJ, Lupton RA. The art of writing a scientific article. J Sci Commun 2010;163:51–9. https://doi.org/10.1016/j.Sc.2010.00372.

Reference to a journal publication with an article number:

[2] Van der Geer J, Hanraads JAJ, Lupton RA. The art of writing a scientific article. Heliyon. 2018;19:e00205. https://doi.org/10.1016/j.heliyon.2018.e00205

Reference to a book:

[3] Strunk Jr W, White EB. The elements of style. 4th ed. New York: Longman; 2000.

Reference to a chapter in an edited book:

[4] Mettam GR, Adams LB. How to prepare an electronic version of your article. In: Jones BS, Smith RZ, editors. Introduction to the electronic age, New York: E-Publishing Inc; 2009, p. 281–304.

Reference to a website:

[5] Cancer Research UK. Cancer statistics reports for the UK, http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstatsreport/; 2003 [accessed 13 March 2003].

Reference to a dataset:

[dataset] [6] Oguro M, Imahiro S, Saito S, Nakashizuka T. Mortality data for Japanese oak wilt disease and surrounding forest compositions, Mendeley Data, v1; 2015. https://doi.org/10.17632/xwj98nb39r.1.

Note shortened form for last page number. e.g., 51–9, and that for more than 6 authors the first 6 should be listed followed by 'et al.' For further details you are referred to 'Uniform Requirements for Manuscripts submitted to Biomedical Journals' (J Am Med Assoc 1997;277:927–34) (see also Samples of Formatted References).

Journal abbreviations source

Journal names should be abbreviated according to the List of Title Word Abbreviations.

ANEXO B

Normas de formatação do periódico *Burns & Trauma*

Instructions to Authors

The Editors welcome submissions to *Burns & Trauma* which adhere to the Instructions to Authors. Manuscripts that do not meet all of the requirements below will not be considered for publication and may be returned to the authors for completion. For support and more information please contact the *Burns & Trauma* editorial office (editorial@burnstrauma.com).

Highlights

- Three to five bullet points that help increase the discoverability of the manuscript via search engines
- Should capture the novel results of your study as well as new methods that were used during the study (if any)
- Highlights sample
- The ‘Highlights’ file should be clearly named
- The editors may contact the authors for this content after acceptance

Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

- Ethics approval and consent to participate
- Consent for publication
- Availability of data and materials
- Competing interests
- Funding
- Authors' contributions
- Acknowledgements
- Authors' information (optional)

Please see below for details on the information to be included in these sections.

If any of the sections are not relevant to your manuscript, please include the heading and write 'Not applicable' for that section.

Ethics approval and consent to participate

Manuscripts reporting studies involving human participants, human data or human tissue must:

- include a statement on ethics approval and consent (even where the need for approval was waived)
- include the name of the ethics committee that approved the study and the committee's reference number if appropriate

Studies involving animals must include a statement on ethics approval.

Consent for publication

If your manuscript contains any individual person's data in any form (including any individual details, images or videos), consent for publication must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent for publication.

Patient Consent Form

Authors should state that in their paper that informed consent has been obtained from the subjects (or their guardians) as specified in the ICMJE Reccomendations, use of the Patient Consent Form is recommended. If another consent form is to be used, for example the standard consent form used by your institution, a blank copy of this form should be submitted to the journal so that the journal can verify that it meets best practice recommendations. If the patient or relatives of a deceased patient cannot be traced and consent cannot be obtained, the article can only be considered for publication if it is sufficiently anonymised. The Editorial Board reserves the right to reject papers for which the ethical aspects are, in the Board's opinion, open to doubt. Please contact the Editorial Office if you have any queries regarding consent.

Availability of Data and Materials

please see below for detailed requirements.

Data Citation

Burns & Trauma supports the Force 11 Data Citation Principles and requires that all publicly available datasets be fully referenced in the reference list with an accession number or unique identifier such as a digital object identifier (DOI). Data citations should include the minimum information recommended by Data Cite:

- [dataset]* Authors, Year, Title, Publisher (repository or archive name), Identifier

*The inclusion of the [dataset] tag at the beginning of the citation helps us to correctly identify and tag the citation. This tag will be removed from the citation published in the reference list.

ORCID

Burns & Trauma requires submitting authors to provide an ORCID iD at submission to the journal. More information on ORCID and the benefits of using an ORCID iD is available. If you do not already have an ORCID iD, you can register for free via the ORCID website.

Preprint policy

Authors retain the right to make an Author's Original Version (preprint) available through various channels, and this does not prevent submission to the journal. For further information see our Online Licensing, Copyright and Permissions policies. If accepted, the authors are required to update the status of any preprint, including your published paper's DOI, as described on our Author Self-Archiving policy page.

Competing interests

All financial and non-financial competing interests must be declared in this section. Please use the authors initials to refer to each authors' competing interests in this section. If you do not have any competing interests, please state "The authors declare that they have no competing interests" in this section.

Funding

All sources of funding for the research reported should be declared. The role of the funding body in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript should be declared.

Authors' contributions

The individual contributions of authors to the manuscript should be specified in this section. Please use initials to refer to each author's contribution in this section, for example: "FC analysed and interpreted the patient data regarding the haematological disease and the transplant. RH performed the histological examination of the kidney and was a major contributor in writing the manuscript. All authors read and approved the final manuscript."

Acknowledgements

Please acknowledge anyone who contributed towards the article who does not meet the criteria for authorship including anyone who provided professional writing services or materials. Authors should obtain permission to acknowledge from all those mentioned in the Acknowledgements section.

Group authorship (for manuscripts involving a collaboration group): if you would like the names of the individual members of a collaboration Group to be searchable through their individual PubMed records, please ensure that the title of the collaboration Group is included on the title page and in the submission system and also include collaborating author names as the last paragraph of the “Acknowledgements” section. Please add authors in the format First Name, Middle initial(s) (optional), Last Name. You can add institution or country information for each author if you wish, but this should be consistent across all authors.

Please note that individual names may not be present in the PubMed record at the time a published article is initially included in PubMed as it takes PubMed additional time to code this information.

Authors' information

This section is optional. You may choose to use this section to include any relevant information about the author(s) that may aid the reader's interpretation of the article and understand the standpoint of the author(s). This may include details about the authors' qualifications, current positions they hold at institutions or societies, or any other relevant background information. Please refer to authors using their initials. Note this section should not be used to describe any competing interests.

Peer Review

All submissions to the journal are initially reviewed by one of the Editors. At this stage manuscripts may be rejected without peer review if it is felt that they are not of high enough priority or not relevant to the journal. This fast rejection process means that authors are given a quick decision and do not need to wait for the review process.

Manuscripts that are not instantly rejected are sent out for double blind peer review, usually to two independent reviewers. Based on the feedback from these reviewers and the Editors' judgment a decision is given on the manuscript. The average time from submission to first decision is six weeks.

If a paper is not acceptable in its present form, we will pass on suggestions for revisions to the author.

Speed

40 days to first decision for reviewed manuscripts only
31 days to first decision for all manuscripts
123 days from submission to acceptance
35 days from acceptance to publication

Production Process

For *Burns & Trauma*, manuscripts arrive at OUP and go through the production process until final versions are ready to publish. These are then published into the current issue. Authors will receive a link to the PDF proof of their manuscript on our online system by email, and it is essential that a current email address is

supplied with all manuscripts. Proofing instructions will accompany the PDF file but the proof should be checked immediately upon receipt and uploaded in accordance with covering instructions. Only essential corrections should be made at the proof stage.

Open Access Charge

Burns & Trauma is a fully open access journal, and all articles are published in the journal under an open access licence immediately upon publication. *Burns & Trauma* does not currently charge for open access.

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If the corresponding author is based in one of the countries included in our Developing Countries Initiative, your article will be eligible for a full waiver of the open access charge.

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ANEXO C

Questionário Burn Specific Health Scale Brief versão Brasileira

(Domínio função)

BURN SPECIFIC HEALTH SCALE – BRIEF – BR

Responda se você tem alguma dificuldade em relação à pergunta proposta.

Formas de resposta	Extremo/ extremamente	Bastante	Moderadamente	Um pouco	Nenhum/ nenhuma
Quanta dificuldade você tem para:					
1. Tomar banho sem ajuda?	0	1	2	3	4
2. Vestir-se sem ajuda?	0	1	2	3	4
3. Sentar-se e levantar-se de uma cadeira?	0	1	2	3	4
4. Assinar seu nome?	0	1	2	3	4
5. Comer com talheres?	0	1	2	3	4
6. Amarrar laços, cadarços etc.?	0	1	2	3	4
7. Pegar moedas de uma superfície plana?	0	1	2	3	4
8. Destrancar uma porta?	0	1	2	3	4
9. Trabalhar em seu emprego antigo, cumprindo suas antigas obrigações?	0	1	2	3	4