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Terminology and methods used to differentiate injury intent of hospital burn patients in South Asia: Results from a systematic scoping review

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ABSTRACT

Introduction

A key component in the classification of all injury types is to differentiate whether the injury was deliberately inflicted and by whom, commonly known as “intent” in the surveillance literature. These data guide patient care and inform surveillance strategies. South Asia is believed to have the greatest number of intentional burn injuries, but national surveillance data is not disaggregated by injury intent. Scientific literature can be used for injury surveillance where national data collection does not exist. In order to synthesise research findings, it is essential to assess the potential impact of misclassification bias. We therefore conducted a systematic scoping review to understand terminology and methods used to differentiate injury intent of hospital burn patients in South Asia.

Methods

We followed the methods in our registered protocol (https://doi.org/10.17605/OSF.IO/DCYNQ). Studies met defined population, concept, context, and study design criteria. The databases Embase, MEDLINE, CINAHL, PsycInfo, and PakMediNet were searched. Two reviewers independently screened results. Data were extracted in a standardised manner and verified. The rigour of the method used to differentiate injury intent was appraised.

Results

1435 articles were screened. Of these, 89 met our inclusion criteria. Most articles were from India and Pakistan, and used an observational study design. There were 14 stem terms used in the articles. The most common was “cause”. There were 40 classifier terms. The most common were “accident”, “suicide”, and “homicide”. Few articles defined these terms. The method used to differentiate injury intent was only described explicitly in 17% of articles and the rigour of the methods used were low. Where methods of differentiation were described, they appear to be based on patient or family report rather than multidisciplinary assessment.

Conclusion

The heterogeneity in terms, lack of definitions, and limited investigation of injury intent means this variable is likely to be prone to misclassification bias. We strongly recommend that the global burn community unites to develop a common data element, including definitions and methods of assessment, for the concept of burn injury intent to enable more reliable data collection practices and interstudy comparisons.

KEYWORDS

Burns, Population Surveillance, Southern Asia, Accidental injuries, Self harm, violence.

1. INTRODUCTION

A key component in the classification of all injury types is to differentiate whether the injury was deliberately inflicted and, if so, by whom [1]. This concept is frequently referred to as injury "intent" in the surveillance literature, and is important to guide patient care and to inform prevention strategies [2]. The utility of these data is such that major global surveillance studies disaggregate morbidity data by injury intent. For example, the Global Burden of Disease study disaggregates injury data into 5 main groups: unintentional; self-harm; interpersonal violence; conflict and terrorism; and, execution and police conflict [3]. Standardisation of definitions and methods of assessment used to generate these data is essential to ensure meaningful international comparisons can be made.

The global standard for diagnostic health information is the World Health Organization's (WHO) International Classification of Diseases (ICD) [4]. ICD codes are used for intra- and inter-country disease comparisons. It includes a chapter on external causes of morbidity and mortality, which recommends that the first level of classification of an injury is according to intent [1]. Although ICD provides a definition for the concept of intent ("whether or not they were deliberately inflicted and by whom"), definitions for classifier terms (e.g. unintentional, self-harm, interpersonal) are not provided. There is also no recommended method for differentiation of intent, despite recognition from international classification groups that determination of injury intent is difficult [2]. Accuracy of intent surveillance data tends to focus on the coders precision compared to clinical documentation [5]. However, responsibility for clinical documentation lies with the health care practitioner looking after the patient [6]. Health care practitioners and patients are likely to be influenced by personal, cultural, social, and legal sensitivities that can lead to misclassified intent data. This makes injury intent an important, but potentially unreliable variable in surveillance data.

Standardised definitions and methods of assessment for variables of interest are a stalwart of good research practice to reduce misclassification bias. Items related to this are included in epidemiological study reporting guidelines and quality assessment tools [7, 8]. Observational research studies can be used to inform injury surveillance where national data collection does not exist, and to provide fine grain detail about antecedents, causal factors, treatments, and patient outcomes [9-11]. However, lack of standardisation of variables between studies can limit inter-study comparisons and data pooling.

The Global Burden of Disease study 2019 estimated that burn injuries account for 9 million annual hospital admissions, of which 79% are believed to occur in low- and middle-income countries [3]. Approximately 1.2 million injuries are thought to have occurred in South Asia, but this is likely to be an underestimate because of incomplete national level

surveillance data in the region [12, 13]. Local studies suggest South Asia has the highest number of intentional burns globally but national level surveillance data is not disaggregated by intent, which limits analyses [14, 15]. Hospital level burns data in India has been found to have poorly categorised external causes of injury when using ICD codes [16]. However, the research literature from South Asia has a wealth of non-standardised hospital level burn injury data that includes intent information. It may be possible to utilise these data for surveillance purposes such as estimating incidence and prevalence using research synthesis methodologies. This is an underexplored area, as existing systematic reviews from the region have excluded intentional injuries [17, 18]. Before such work can be undertaken, it is essential to understand how prone the intent variable is to misclassification bias. We therefore conducted a systematic scoping review to understand terminology and methods used to differentiate injury intent of hospital burn patients in South Asia. The objectives of the study were to:

1) Determine the breadth of terminology and most commonly used terms for burn injury intent, including the stem term and classifiers.

2) Determine if definitions are comparable across studies where the same term is used.

3) Appraise the rigour of methods used to differentiate burn injury intent and suitability for comparison across studies.

2. METHODS

Protocol and registration

The full protocol for this systematic scoping review has been published (*in press* with the journal Systematic Reviews). It was also registered with the Open Science Framework (https://doi.org/10.17605/OSF.IO/DCYNQ). A summary of the methods and any changes to the protocol are included below. This manuscript has been prepared in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [19, 20].

Eligibility criteria

Eligibility criteria were defined using a population, concept, context approach (Table 1). Detailed rationale for the eligibility criteria has been published in the protocol.

Information sources and search strategy

Searches were conducted using the Ovid platform for the databases Embase, MEDLINE, and PsychInfo. CINAHL was searched using the EBSCO platform. PakMediNet was searched using the database website. The most recent search for all databases was conducted on 15th July 2022. The search strategy used for each database is provided as supplementary online material (Appendix A).

Selection of sources of evidence

Search results were exported into Endnote X9 [22]. Duplicates were removed using the method by Bramer et al [23]. References were then uploaded into systematic review software Covidence [24]. Further duplicates identified by Covidence were reviewed manually before removal. Title and abstract screening, and full text screening was completed by two researchers (EB, PR). Conflicts were resolved by a third researcher (RM). A screening document was used to train the researchers and as a reference during screening. Utility of the screening document was appraised by calculating inter-rater reliability using percentage agreement and Cohen's kappa. A good level of agreement was defined as percentage agreement of greater than or equal to 80% and kappa of greater than or equal to 0.60 [25]. No automated tools were used to exclude articles.

Data charting process

A large number of articles met the study inclusion criteria, which necessitated a modification of the published protocol. A single researcher extracted data into a customised template in Covidence. Missing data were identified using spreadsheet filters on a download of the data. This method was used because validation parameters cannot be applied to extraction templates in the Covidence software. A random sample of 25% of articles (22 articles) were then verified by a second researcher using proofreading. Articles were chosen for verification using a random number generator [26]. It was decided by the review team prior to data extraction that no further verification would be completed providing error rates were below 5%.

Data items

Data was extracted for 29 variables from full text studies (Table 2). A full list of variables, prompts, and response options are included as supplementary data (Appendix B).

Synthesis of results

We summarised the data and produced descriptive statistics according to the study objectives. All analyses were completed using Microsoft Excel and RStudio [27, 28]. For articles where the method of differentiation of injury intent was described explicitly, the rigour of the method was appraised using a modification of the ranking system by Maguire et al. [29] (Table 3). The method was developed for determining burns due to abuse and accidents in a paediatric population. This means we did not appraise the rigour of the method used to determine injuries due to self-harm.

3. RESULTS

Study selection and data extraction

A total of 2054 records were identified from the database searches (Figure 1). Of these, 619 were duplicate records. Title and abstract screening was completed on 1435 records, and full text screening on 130 records. There was a good level of agreement between reviewers during title and abstract screening (percentage agreement 96.1%, Cohen's kappa 0.74) and full text screening (percentage agreement 82.3%, Cohen's kappa 0.60). Inclusion criteria were met by 89 studies. Manual validation checks identified 18 empty cells (0.49% of all fields) following data extraction. These were cross checked against the original paper and filled in. This was primarily due to absence of non-response codes (e.g. Not applicable). Minor errors were identified in seven cells during verification and amended accordingly. The estimated error rate from verification was 0.78% (i.e. one error in every 129 fields).

Study characteristics

Most studies were conducted in India (n = 51) and Pakistan (n = 27) (Appendix C). Only four articles were identified from Nepal, three from Sri Lanka, and two each from Afghanistan and Bangladesh. No articles were identified from Bhutan or the Maldives. The majority (n = 73) used an observational study design collecting data either prospectively through patient and family interview, or retrospectively from patient notes or admission registers. Qualitative interviews were used in five articles. 11 articles did not state how data were collected. The study population was most often patients admitted at a tertiary government teaching hospital burn department. Year of data collection ranged from 1962 to 2020. Median duration of data collection was 12 months (IQR 6-36 months) but ranged from 10 days to 17 years. The total number of participants across all articles was 81122. The median number of participants per study was 198 (IQR 89-678). The age of the study population included paediatrics and adults for 55 articles, only adults for 18 articles, and only paediatrics for 11 articles. No participant age range was stated for five articles. Some articles specified age cut-offs. For articles including only adults, age cut-offs were 15 years and over (n = 5) and 18 years and

over (n = 4). Whereas paediatric only articles used a wider variety of age cut-offs from 18 years and under, to 10 years and under.

Objective 1: Determine the breadth of terminology and most commonly used terms for burn injury intent, including the stem term and classifiers.

A total of 14 stem terms were used by 41 articles (median 1, range 1-3 per article) (Table 4; Full data for this objective can be found in Appendix D). The most commonly used term was "cause", which was used in 12 articles, followed by "mode" and "intent".

At least one classifier term was used in all articles. They were subdivided into five groups – accident, intentional, suicide, homicide, and other based on the most common terms used by the authors (Table 5). "Accident" was the most commonly used classifier term found in 73 articles. Out of the 11 articles that included only paediatric participants, eight used the classifier term "accident" and did not discuss the possibility of non-accidental injury. Activity at the time of injury (e.g. occupational, industrial, recreational, work related) was used in some articles as a proxy for accidental intent. The terms "unintentional" and "non intentional" were used interchangeably with the term "accident", and have become more common in the past 15 years. Conversely, "intentional" and "non accidental" were primarily used as a higher level of classification than terms such as "suicide" and "homicide". The term "suicide" was used in 45 articles. "Self-immolation" was only used in four articles despite the focus of all articles being on burn injuries. In one article it was used interchangeably with the term "suicide", in another article it was specified that self-immolation referred to the patient not having suicidal intent. The term "homicide" was used in 35 articles. There were only two instances where the term "homicide" and "assault" were used in the same article as different classifications of intent. "Accident", "suicide", and "homicide" remained as the dominant classifier terms when exploring the use of terms across all years of publication, country of study, and age groups of study participants.

Objective 2: Determine if definitions are comparable across studies where the same term is used.

A stem term definition was only found in one article (full data for this objective can be found in Appendix D). This was for the term "classification" and included a flow chart with the official procedure for women who have died from a burn injury in hospital [30]. The same article defined classifier terms of "accident", "suicide", "homicide", and "dowry death" according to victim allegations and relevant legal sanctions. Classifier term definitions were provided in one other article, which differentiated "suicide" as "those with suicidal intent" from "self immolators" as "those who

mutilate themselves" [31]. The lack of definitions for stem and classifier terms means they cannot be compared across studies.

One article provided examples of response options for the stem term "cause" as part of a wider definition of burn injury. This included "intentional (homicidal or suicidal) or unintentional (accidental)" [32]. Some articles (n=22) provided example injury mechanisms for classifier terms rather than definitions. Examples were provided for the term "accident" in 15 articles, of which five were studies that included only paediatric patients. The similarity of examples suggest concordance in how clinicians classify descriptions of how the injury occurred (Table 6). Classification of injury intent is not straightforward despite many articles presenting data disaggregated by intent. For example, "branding" was used as a classifier term in one article (Table 5) [33]. It was inferred in the article that branding is a full thickness burn used as a form of traditional medical treatment to relieve chronic pain. Such practices fall outside of the aforementioned groups of 'accident', 'suicide', and 'homicide' given that the patient has consented to the burn injury. Daruwalla et al. [34] also note that complex antecedents such as poverty, drug and alcohol use, and domestic violence lead to a "blurred distinction between homicide and suicide", further complicating differentiation.

Objective 3: Appraise the rigour of methods used to differentiate burn injury intent and suitability for comparison across studies.

The method used to differentiate burn injury intent was described explicitly in 15 articles (Table 7; Full data for this objective is available in Appendix E). For 58 articles the method of how the authors attributed injury intent could only be inferred based upon general data collection information (e.g. data collected from retrospective review of patient records). No information was available from 16 articles about how intent was determined. Conversely, 28 articles provided specific details about the assessment of 39 other variables. The most common was total body surface area (TBSA) of the burn using either the Lund and Browder chart or Rule of Nines (n = 18), followed by fluid resuscitation using the Parkland formula (n = 5), and socioeconomic status using the Kuppuswamy scale (n = 4).

Routine hospital admission processes that were used to differentiate burn injury intent were described in some of the articles (Table 7). These reveal that clinicians act upon and document what the patient or their relatives report the intent of the injury to be. This may trigger a police investigation to determine culpability. There is little opportunity for the clinician to investigate injury intent further when a patient reports the injury to be accidental, even if they suspect self-harm or assault. Only Laloe [40, 41] describes a method to capture if the clinician judges that there may be

misclassification of injury intent. Most articles also do not report injury intent outcomes following multidisciplinary assessment, or state the criteria used to differentiate intent. Consequently, the rigour of the method used to confirm assault or accidental injury was generally low (level 4/5, and C).

4. DISCUSSION

This is the first study to systematically investigate the terminology and methods used to differentiate burn injury intent of hospital patients in South Asia. We found there was a wide variety of stem and classifier terms for the concept of intent used across the 89 included articles. These terms were poorly defined. The method used to assess injury intent was only described explicitly in 17% of articles and the rigour of the methods were low. These are important findings because the variability and incompleteness of burn injury intent information found in the articles would increase the risk of misclassification bias if data were compared across studies.

We found that over half of the articles did not use a stem term for the concept of intent. The term 'intent' itself was only used in six articles. The most commonly used stem term was "cause". This is a broad term in the field of injury surveillance. For example, ICD-11 now uses six data elements for injury causation since the incorporation of the International Classification of External Causes of Injury [1, 2, 53]. These include intent (e.g. unintentional, self-harm, interpersonal), activity when injured (e.g. paid work), object or substances producing injury (e.g. hot drink), place of occurrence (e.g. home), and alcohol and psychoactive drug use in injury. We found that other elements of causation were sometimes incorporated with intent. Terms indicating activity when injured (e.g. occupational, industrial) were used as a proxy for accidental intent and it was not clear whether intentional injury had been considered. The workplace is recognised as a place where self-inflicted injuries occur, so unintentionality should not be assumed [54, 55].

All articles used at least one classifier term. "Intentional" was used as a higher level of classification, whereas "unintentional" or "non intentional" were used interchangeably with "accident" (Figure 2). We found the terms "unintentional" and "non-intentional" have become more common in the past 15 years. This is consistent with the international injury prevention community, which now favours the term unintentional over accident to emphasise the preventable nature of all injuries [56]. Common terms and their hierarchical structure in the articles were consistent with categories used in the WHO injury surveillance guidelines, although we found no terms referencing injuries caused by legal intervention or war [57]. Self-immolation is a commonly used term in the research literature about burn injuries [58, 59]. We found this term was only used in 4 articles possibly reflecting that it is not a term widely

used in clinical practice given that most articles included in this review report data from burn departments. The terms “accident”, “suicide”, and “homicide” were the most common classifier terms. Few articles differentiated between self-harm and suicide, or homicide and assault. The dominance of the terms suicide and homicide suggests that they are used as broad classifier terms reflecting who was responsible for the injury, rather than reflecting the desire of the patient or assailant to cause death. The use of broad classifier terms is a pragmatic approach for hospital based surveillance systems as it can be difficult to determine underlying motives in the acute setting [60].

Defining variables reduces the risk of misclassification bias in a study and is a key attribute in surveillance systems to improve reliability of data [57]. We found very few articles defined their stem or classifier terms. This may lead to different collection and interpretation of the data. A survey sent to the members of the International Association for Suicide Prevention found considerable variation in the definitions associated with English-language terms for suicidal behaviours, including variation between members from low- and middle-income countries compared to high-income countries [61].

Standardised methods of assessment are also recommended as a means to reduce misclassification bias [7]. This is particularly important for variables that are likely to result in inter-rater differences. We found that 18 articles described a method to assess TBSA. TBSA of the burn injury is a key predictor of patient outcome. Efforts to standardise assessment of TBSA have been ongoing since the 1920s, but the Lund and Browder chart and Rule of Nines are the most commonly accepted methods [62]. Almost twice as many articles provided specific methods of assessment for variables other than intent. This suggests that authors were not averse to using and documenting standardised methods of assessment where they exist. The development of a method to differentiate burn injury intent has been identified by numerous studies from South Asia as an area of research and service need [15, 63, 64]. A list of features suggestive of intentional burns in children was developed by Maguire et al [29] using systematic review methodology, but no similar tool exists for adults. Features suggestive of intentional burns were collated from 26 studies that rigorously confirmed intentional injury (rank 1-3) and excluded accidental injury (rank A or B). The majority of studies were identified from the United States (17 studies). Only two studies were from LMICs, but not from countries in South Asia. In our review, only two articles used a method of differentiation of intent that would meet the rigour criteria used by Maguire et al. This suggests that the same systematic review methodology could not be used to identify features consistent with intentional injuries using current literature from South Asia.

Of the articles included in our review that did describe a method for assessment of intent, there was clear evidence that misclassification could occur due to the healthcare professional or researcher documenting the history provided by the patient or family, rather than their own assessment of the presenting burn and circumstances. Only Laloe [40, 41] described documenting cases as 'doubtful' based on the pattern of the burn and behaviour of the patient and relatives. The WHO Global Burn Registry includes a question that allows the clinician to record the intent of the burn, and their degree of clinical suspicion that a burn of 'undetermined intent' was caused intentionally [65]. Based on our findings it is likely this variable would reflect who, if anyone, the patient or family reports to be responsible for the injury. The WHO Global Burn Registry pilot evaluation included burn experts from Afghanistan, Bangladesh, India, Sri Lanka, Nepal, and Pakistan. Over 20% of respondents believed that intent variables were likely to be inaccurate, which suggests that the approach to collection of intent data could be refined. Inclusion of a data item in registers that allows clinicians to document their degree of clinical certainty in the patients' reported injury intent could allow estimation of responder bias. However, further exploration is required with clinicians in South Asia to understand the acceptability of this approach given the requirement in some countries to report intentional injuries to the police [66].

There are a number of strengths to this systematic scoping review. There were minimal deviations from the registered and published protocol. Reporting guidelines for systematic scoping reviews were followed throughout [20]. A global study is underway to assess comparability of injury intent variables used in burn registers globally, but there are no active national burn registers in South Asia [67]. Our review helps to address this gap by assessing the comparability of injury intent variables from the research literature, which is a possible alternative source of surveillance data. We have identified a number of future research needs including qualitative exploration of the method of assessment of injury intent in hospitals by healthcare professionals. There are also some limitations to this review. We did not include grey literature due to the volume of articles that met our inclusion criteria in preliminary searches. This may mean some relevant articles were missed. Resource limitations meant that data could only be extracted by a single researcher. We tried to minimise errors in the data by checking for missing data and through verification. We were unable to fully complete objective 2 (determine if definitions are comparable across studies where the same term is used) due to lack of data in the included articles. However, this is an important finding for the study. Our results may not reflect practices across the whole of South Asia because the majority of articles were from India and Pakistan.

Overall, our findings hint at the potentially spurious use of the term "intent" in surveillance literature. From a philosophical and legal perspective, intent encompasses both who completed the act and why [68]. In an acute clinical

setting determination of why an act was carried out may not be feasible, but it is feasible to try to differentiate who, if anyone, was likely to have inflicted the injury. We recommend that the global burn community works together to develop a common data element for burn injury intent, including definitions and method of assessment. It should also be considered whether the term 'intent' itself is the correct term for the data being captured in surveillance systems. In the meantime, we recommend that all authors and journal editors define intent related variables and explicitly describe their method of assessment to bring more studies in line with international guidance for observational research. We also recommend that researchers conducting systematic reviews on a single classification of injury intent (e.g. unintentional injuries) scrutinise the method used to differentiate injuries to ensure data are comparable. The list of terms used to denote injury intent can be used to construct search strategies for systematic reviews that focus intentional or unintentional injuries. This may increase ascertainment of articles of interest.

5. CONCLUSIONS

We have shown that there is a wide breadth in terminology used for injury intent, but that the most common classifier terms are accident, suicide, and homicide. Few definitions and detailed description of the method of assessment of intent are provided in research articles, which limits interstudy comparisons. Where methods of assessment were described, they appear to be based on patient or family report rather than clinician or multidisciplinary assessment. The heterogeneity in terms, lack of definitions, and limited investigation of injury intent means this variable is likely to be prone to misclassification bias. We strongly recommend that the global burn community unites to develop a common data element, including definitions and method of assessment, for the concept of burn injury intent to enable more reliable data collection practices and interstudy comparisons.

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AUTHOR CONTRIBUTIONS

MKa, EB, RP, and CR had the original idea and designed the study. EB completed the searches. EB and PR completed screening. Conflicts were resolved by RM. EB completed data extraction, which was verified by PR. EB completed analyses and drafted the manuscript. All authors have been involved in the revision of the manuscript and its final approval.

DECLARATION OF INTERESTS

Declarations of interest: none.

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APPENDIX

Appendix A: Search strategies used for the databases MEDLINE, Embase, PsycInfo, CINAHL, and PakMediNet.
Appendix B: Data dictionary of the variables for which data were sought from included articles.
Appendix C: Study characteristics.
Appendix D: Stem and classifier terms, and their definitions.
Appendix E: Method of differentiation of intent and other variables.

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LEGENDS FOR TABLES AND FIGURES (in order of appearance in text)

Table 1. Study inclusion and exclusion criteria.

Table 2. List of variables for which data were sought from the studies.

Table 3. Ranking of the rigour of the assessment method for accidental burns and burns due to assault. Method modified from Maguire et al. [29].

Figure 1: PRISMA flow diagram of selection of sources of evidence [19].

Table 4. Number of stem terms used in the articles.

T**able 5.** Classifier terms used in the included articles.

Table 6. Mechanism examples given in articles for various classifier terms.

Table 7: Method of differentiation of burn injury intent from articles where this information is described explicitly. Ranking of the rigour of assessment of reported cases of assault and accidents uses a ranking system of 1-5 for assault and A-C for accident.* NA (not applicable) means there were no reported cases.

Figure 2. Common stem and classifier terms used by included articles including the most common hierarchy structure of classifier terms across all articles.